9.0 SUMMARY OF OTHER ENVIRONMENTAL MANAGEMENT ISSUES

Based on the environmental impacts disclosed in Chapters 3 through 8, this chapter summarizes a range of issues that an EIS must address. These issues are identified at 40 CFR 1502.6, describing the analysis of environmental consequences in an EIS. The last two sections in this chapter describe mitigation measures (as required by 40 CFR 1502.1(h)) and identify unavoidable adverse impacts (as required by 40 CFR 1502.16).

9.1 Short-Term Uses Versus Long-Term Productivity

Section 1.2.1 in Appendix A discusses short-term costs versus long-term risk in setting OYs. As noted there, this tradeoff is possibly the most important tradeoff governing the management of renewable resources. Balancing short-term use and long-term productivity is the essence of the proposed action. The MSA and NSGs establish a framework for rebuilding overfished stocks—establishing long-term productivity—while recognizing short-term use as reflected in the needs of fishing communities. National Standard 1 guidelines establish outer boundaries for balancing this tradeoff: T_{MIN}, which places greatest emphasis on rapidly returning to maximum long-term productivity (MSY), and T_{MAX}, which places greatest emphasis on short-term use while rebuilding stocks. The specific tradeoff between short-term use and long-term productivity is expressed by the choice of a target year, T_{TARGET}, which must fall within these boundaries. If a T_{TARGET} closer to T_{MAX} is chosen, harvest rates will be higher, and short-term use is, thus, favored. If a T_{TARGET} closer to T_{MIN} is chosen, harvest rates will be lower, and the stock is more likely to rapidly rebuild, favoring long-term productivity.

Table 9-1 shows the results of a simple comparison of the tradeoffs between the alternatives for bocaccio, widow rockfish, and yelloweye rockfish.[1/] The table shows, for a range of discount rates, the relative discounted present value of the OY trajectories associated with the rebuilding alternatives. Standard discount rates of 5%, 7%, and 10% are applied, along with results under a 0% discount rate, which implies indifference between present and future returns. Also shown are the "break even" discount rates that set the relative present value of the OY trajectory under the most conservative harvest schedule for each species (Alternative 4) equal to the most aggressive harvest schedule (Alternative 1).

Generally, the results are sensitive to the value used for the MSY harvest rate. The default harvest rate was applied to projected exploitable biomass once the stock had reached T_{TARGET}. In the case of widow rockfish the resulting OY is much larger than rebuilding OYs up to the target year. Because of the much larger future returns once the stock is rebuilt, only at discount rates above 9% does the least risk-averse alternative (Alternative 1, P_{MAX} = 60%) show a higher present value than the other alternatives. However the default MSY harvest rate is a proxy value rather than the true value, which is unknown. If, as seems likely, the default value is too high, future harvests would be lower, reducing the present value and perhaps favoring higher short-term harvests. For bocaccio and yelloweye rockfish, future returns are sufficiently modest that Alternative 1 shows the highest present value at discount rates of 5% and above.[2/] However, this does not necessarily mean that Alternative 1, in fact, results in the greatest benefit at these rates. First of all, it should be noted that this calculation does not fully capture the risk of not rebuilding. Calculating an expected value of future harvests by multiplying the values in the table by the rebuilding probability inverts the results, favoring more risk-averse strategies even at relatively high discount rates. Such a calculation may overstate the risk associated with future harvests, since it applies to harvests in all years while the rebuilding probability is a measure of the likelihood that the target biomass, and thus MSY harvest rates, will be achieved by T_{MAX}.

1/ Since a simulation of rebuilding OYs was not produced for the cowcod rebuilding analysis, we were unable to include cowcod in this presentation.

2/ Rates of 5% to 10% cover the range generally considered when projecting financial returns.

Second, only the benefits derived from actual harvest are captured in this calculation. If nonconsumptive use and nonuse benefits have a sufficiently high value over the long term, this could also favor more risk-averse strategies. The “break even” discount rate, at which the present value under Alternative 1 equals the value under Alternative 4 provides an indicator of how future benefits would have to be valued in order to favor more risk-averse strategies.

9.2 Irreversible Resource Commitments

An irreversible commitment represents some permanent loss of an environmental attribute or service. The use of non-renewable resources is irreversible; unsustainable renewable resource use may be irreversible if future production is permanently reduced or, at the extreme, is extinguished.

The use of non-renewable energy resources, such as fossil fuel, represents a pervasive irreversible commitment associated with the proposed action, because fishing vessels are mechanically powered. The use of energy is discussed below in Section 9.4.

The proposed action does not by itself represent an irreversible commitment because renewable resources are being managed within an adaptive framework. If a stock were extirpated or species went extinct, this would represent an irreversible resource commitment. Although the proposed action is intended to rebuild stocks, there is some risk—albeit very small—that measurement or model error would lead to mis-specification of harvest rates. Such mis-specification would have to occur over a long period of time in order to drive stocks down to a level where the population was no longer viable and entered an extinction spiral. Even if stocks do not go extinct, however, stock condition could result in an irreversible resource commitment. First, although not conclusively demonstrated for the four overfished stocks considered in this EIS, ecological relationships can produce a depensation effect (Walters and Kitchell 2001). Smaller-sized co-occurring species whose population is kept in check, due to predation by adults of the overfished stock, are released from this constraint. They then prey on larvae and juveniles of the overfished stock, thus suppressing recruitment. If such a situation pertains, stocks may be very slow to rebuild even if fishing mortality is substantially decreased. A very long recovery period, amounting to hundreds of years, may be considered irreversible from a practical standpoint. Although the stock may eventually recover, it would have little relevance to any policy or planning time horizon.

9.3 Irretrievable Resource Commitments

A resource is irretrievably committed if its use is lost for time, but is not actually or practically lost permanently. The proposed action establishes a framework for setting harvest rates that allow overfished stocks to recover to target biomass over some time period. Rebuilding targets indirectly constrain fish harvests based on the harvest specifications necessary to rebuild stocks. The fish that are harvested represent an irretrievable resource commitment, as do the inputs in terms of capital and labor (including energy and resources) needed to harvest and market these fish.

9.4 Energy Requirements and Conservation Potential of the Alternatives

The proposed action indirectly affects energy use primarily in the form of fossil fuels used to power surveillance craft and fishing vessels. Energy used in at-sea and aerial monitoring and enforcement activities is a direct effect. Change in the level of this type of monitoring is hard to predict because it depends on the types of management measures that will be implemented biennially and inseason. Generally, the RCA, which was first implemented in late 2002, would require more surveillance to be effective. However, VMS, implemented at the beginning of 2004, will compensate for the increased surveillance need because vessel positions can be remotely monitored. Finally, the availability of ships and aircraft to conduct surveillance, which is partly contingent on U.S. Coast Guard mission priorities, will also dictate the level and the number of patrols, affecting energy use. For these reasons, it is difficult to predict how energy use would change from baseline conditions. The proposed action indirectly affects fishing activity, and thus, the consumption of fuel by fishing vessels. Fuel consumption is likely to correlate with harvest levels, which are, in part, determined by the effect of rebuilding measures. For example, Alternative 4 would likely sharply reduce much commercial and recreational fishing on the West Coast with a corresponding reduction in vessel fuel consumption. The other alternatives would allow higher harvest levels, but it is not possible to forecast how they might affect fuel consumption.

The proposed action could affect overall production efficiency, including energy consumption. Production efficiency can be likened to CPUE, except the effort measure would account for all energy consumption, not just energy consumed during gear deployment.[3/] Although overfished species may account for a small part of the production side of the balance sheet, they act as constraining stocks, limiting the amount of target species that can be caught on a given fishing trip due to restrictive management measures. Lower harvest limits for overfished species could, therefore, translate into lower overall production efficiency. All of the action alternatives are intended to allow stocks to return to B_{MSY}, so production efficiency should increase over time. For example, under the Alternative 4, the most restrictive alternative, groundfish fishing would be more restricted until stocks recovered in comparison to the other alternatives, but the target year for a given species is shorter. There would be a period of relatively low production efficiency, but reaching the target biomass sooner would produce higher efficiencies than the other alternatives. Of course, these scenarios do not account for a wide range of mitigating factors that could affect efficiency. For example, the number of fishing vessels could decrease, either through policy initiatives such as the implementation of individual fishing quotas, or fisheries reaching a new, lower open access equilibrium. In response to increases in cost resulting from lower production efficiency, fishermen could also invest in new technology, depending on availability and cost, which might reduce energy consumption (and thereby, costs). This might happen over the long term, but even a general trend is not predictable because of the various countervailing factors that could affect this type of capital investment.

9.5 Urban Quality, Historic Resources, and the Design of the Built Environment

The Newport Beach dory fleet, which would be affected by the proposed action, is considered a historic resource locally. Although the proposed action does not directly affect urban quality, other historic resources, or the design of the built environment, it may have indirect effects. Fishing fleets add to the character of many West Coast communities and are a determining factor in investment in port infrastructure, including the maintenance of navigation channels. Aside from any broad effects on community income, continued decline in the number of vessels, which is likely to occur under more restrictive management measures, could affect infrastructure investment and might contribute to changes in the character of waterfront areas. Significant adverse impacts are not predicted, which could trigger consultation under the National Historic Preservation Act.

9.6 Possible Conflicts Between the Proposed Action and Other Plans and Policies For the Affected Area

Overfished groundfish species are caught incidentally in fisheries managed under other Council FMPs (for salmon, coastal pelagic species, and highly migratory species). More restrictive measures, such as those that

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3/ The unit value of the effort term can be highly variable, depending on what measures are available. If effort were measured by total days at sea, then fishing effort and production efficiency would be closely correlated. However, if effort is measured as the amount of time fishing gear is deployed, then various "fixed cost" commitments, such as energy used transiting to fishing grounds and searching for fish to set on, would not be accounted for.

would be required to meet the harvest limits under Alternative 4, are likely to affect these fisheries and, thus, conflict with some of the objectives of these FMPs. (FMPs try to strike a balance between conservation and utilization, so they include objectives related to resource use.) To meet those harvest limits, harvest limits for target species in nongroundfish fisheries might have to be lowered.

9.7 Significant and Unavoidable Adverse Impacts

The EIS must include a discussion of those adverse effects that cannot be avoided (40 CFR 1502.16). This discussion focuses on potentially significant adverse impacts of the proposed action, as implemented by the different alternatives. Council on Environmental Quality (CEQ) regulations at 40 CFR 1508.27 define “significantly” in terms of both context and intensity, and provide ten factors to consider when evaluating the intensity of an impact. NOAA provides agency guidance in determining significant impacts of fishery management actions in administrative order NOAA Administrative Order (NAO) 216-6 at §6.02, which expands on the CEQ definition. These criteria focus on the components of the human environment most likely to be affected by these types of actions.

Based on the guidance in these two sources, the proposed action could *potentially* jeopardize the sustainability of any target or non-target species that may be affected by the action (NAO 216-6 §6.02a & b). This could occur due to both individual and cumulative effects (NAO 216-6 §6.02f, 40 CFR 1508.27(b)(7)). Each of the action alternatives establishes targets for rebuilding four overfished groundfish stocks. If a stock did not rebuild within the maximum permissible time period (T_{MAX}), this would constitute a significant impact. Under the No Action Alternative only bocaccio is projected to rebuild by T_{MAX}. Under the action alternatives the stocks are projected to rebuild by T_{MAX}, but the rebuilding probability, which indicates the likelihood the stock will rebuild, also presents the risk of this not occurring. Alternative 1 has the highest risk: a 40% chance that bocaccio, widow rockfish, and yelloweye rockfish would not rebuild, and a 45% change that cowcod would not rebuild. In addition, the rebuilding probability estimates are based on recruitment variability alone. The Council-preferred Alternative combines strategies for individual species from the other action alternatives. It is moderately risk averse, with 60% P_{MAX} (40% chance of not rebuilding) for cowcod and widow rockfish, 70% P_{MAX} for bocaccio, and 80% P_{MAX} for yelloweye rockfish. There are a variety of other uncertainties that, if quantifiable, could contribute to this risk. These include both measurement errors (e.g., inaccurate bycatch monitoring) and model uncertainty (e.g., errors in the causal relationships in stock assessment models) that could contribute to the over-specification of OYs, which could allow overfishing to occur or at least delay stock rebuilding. In addition, the effect of environmental conditions, including ecological interactions and shifts in the climate regime, have not been integrated into stock assessment models. These factors are complex and over time could have both adverse and beneficial impacts on stock rebuilding. CEQ regulations identify highly uncertain effects, including unique or unknown risks, as a factor in judging significance (40 CFR 1502.27(b)(5)). Both the risk and uncertainty involved in stock rebuilding, especially given the context of long rebuilding periods for many species, qualifies as a potentially significant impact.

CEQ regulations also state that “the degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about future consideration” (40 CFR 1502.27(b)(6)) should be part of the significance evaluation. The proposed action establishes rebuilding targets upon which future actions are predicated, which differ among the species in the Council-preferred Alternative. First, in order to meet these targets, management measures have to be specified during biennial management. Management measures result in direct and indirect impacts, depending on the location and intensity of regulated fisheries. The most likely significant impacts would be socioeconomic, resulting from any potential reductions in fishing opportunity. (Note, however, that if rebuilding is successful, fishing opportunity will increase.) The choice of rebuilding targets for these four species also must be considered cumulatively in combination with rebuilding plans for canary rockfish, darkblotched rockfish, lingcod, and POP adopted by Amendment 16-2. Where two or more species regularly co-occur in a fishery, the OY for one overfished species can act as a constraint on the harvest of other overfished species (as well as non-overfished species). The 2004 groundfish harvest specifications offer a good example of this phenomenon, relevant to species considered in this EIS. The canary rockfish OY of 47.3 mt is low enough that projected bocaccio total fishing mortality, at 145.1 mt, is well below the bocaccio OY of 250 mt (see Table 5-12) because of the need to manage for the canary rockfish fishing mortality.

The proposed action may potentially impact biodiversity and ecosystem function within the affected area (NAO 216-6 §6.02g). Under the No Action Alternative, only bocaccio is projected to recover. Under the action alternatives, although unlikely, stocks could decline further, even if stocks are managed to rebuilding targets, due to the risk and uncertainty factors already discussed. Further decline could result in shrinking ranges and local extinctions for affected species, constituting a loss in biodiversity. Unrecovered stocks also affect ecosystem structure and function.

The proposed action could have significant social or economic impacts interrelated with the potential significant natural or physical environmental effects discussed above (NAO 216-6 §6.02h). In the short term, significant socioeconomic effects, resulting from lost fishing opportunity, could occur. Comparing projected OYs for 2005 and 2006 under the different alternatives to the OYs adopted by the Council for 2004 gives an indication of whether fishing opportunity would increase or decrease (see Tables 2-1 through 2-4). For each of the alternatives the picture is somewhat different. For example, for bocaccio, OYs would be lower under Alternative 4 and No Action than they were in 2004. However, looking at impacts over a longer time frame is more relevant. Stock rebuilding measures have necessitated substantial decreases in fish harvests since 1999. But if rebuilding strategies are successful, there will be significant socioeconomic benefits in terms of increased fishing opportunity. The risk and uncertainty discussed above makes it difficult to determine what the actual trends will be like. The recent history of bocaccio stock assessments offers an instructive example. The 2002 stock assessment was very pessimistic, necessitating an OY of 20 mt, which required severe cutbacks in fishing opportunity in Southern California in 2003. A new stock assessment from 2003 presented a more optimistic scenario, primarily because a strong 1999 year class began to show up in the data. The 250 mt 2004 OY is the result. Bocaccio may be an extreme example, but rockfish tend to have highly variable reproductive success and resulting recruitment into the fishery. This can cause destabilizing shifts in fishing opportunity as stock assessment results are fed into the management system.

Overall, the proposed action is beneficial. This net benefit, although unquantified, will occur if long-term benefits from rebuilding overfished stock outweigh the short-term costs. Potential significant impacts would occur if rebuilding strategies are unsuccessful, which is contingent on risk and uncertainty.

9.8 Mitigation

An EIS must discuss "means to mitigate the adverse environmental impacts" stemming from the proposed action (40 CFR 1502.1(h)), even if the adverse impacts are not by themselves significant. Under all the alternatives, four overfished groundfish stocks will be rebuilt to the target biomass. The alternatives differ in terms of the tradeoff between how quickly stocks are likely to rebuild and the reduction in OYs necessary to rebuild the stock in a given time period. (Under the No Action Alternative, however, only bocaccio is projected to rebuild.) In order to meet these targets, total fishing mortality for each species would be limited to different annual OY levels projected to allow the stocks to rebuild. However, implementation of the means—or management measures—that would constrain fishing mortality is not part of the proposed action. This will be accomplished through the biennial specification of ABCs, OYs, and management measures authorized by the FMP management framework. Given this context, in comparison to the No Action Alternative, any of the action alternatives would reduce adverse impacts resulting from the regulated activity. Nonetheless, further mitigation measures could address the adverse impacts that would still occur with implementation of any of the action alternatives. Potential mitigation measures are discussed with respect to the components of the human environment potentially affected by the proposed action.

Habitat and ecosystem: Although adverse impacts to overfished species' habitats may be caused by a range of natural events and human activities, mitigation measures within the scope of NMFS authority would address fishing-related impacts. The RCA, currently used to reduce overfished species bycatch, also reduces related adverse impacts to benthic habitat within its boundaries, because bottom trawling is prohibited in these areas. In a separate action, NMFS is preparing an EIS to identify and describe groundfish EFH, and identify habitat areas of particular concern (HAPCs) within EFH. The alternatives in the EFH EIS will include measures to minimize adverse effects on EFH caused by fishing.

Groundfish, including overfished species: Management measures implemented through the biennial process could provide additional mitigation if overfished species bycatch (or total fishing mortality on these stocks) is less than the OYs computed for a given rebuilding target. In some cases, this is simply a function of the constraints imposed by the overfished species with the lowest OY. Management measures needed to stay within this OY limit keeps harvests of all co-occurring stocks—including other overfished species—to levels below their OYs. (Tables 5-4 and 5-5 show estimated total fishing mortality of various managed species compared to OYs for 2002-2003.) This is not intended mitigation but does have a mitigative effect. Management measures intended to further reduce bycatch rates below current rates would be explicitly mitigative. (A reduction in the bycatch *rate* means, that for every unit of target species harvested, a smaller increment of the overfished species is caught.) NMFS and the Council released a groundfish bycatch mitigation draft programmatic EIS on February 20, 2004 (NMFS 2004b), which evaluates different bycatch reduction programs for the groundfish fishery. Alternatives in this EIS propose a variety of new management measures. Many of these measures will require additional FMP amendments and/or regulatory actions to implement. In addition, accurate bycatch monitoring is necessary, both to ensure total fishing mortality is actually below the OY for a species and to evaluate the efficacy of new management measures. NMFS implemented the WCGOP in May 2001, which is providing more accurate data to estimate bycatch rates than previously used data sources (trawl logbooks, for example). However, the WCGOP covers a fraction of the fleet at any given time (in the first year of the program about 20% of bottom trawl trips carried observers). A higher level of observer coverage, resulting in more reliable estimates of total fishing mortality on a per-vessel basis, would make a wider range of bycatch reduction measures feasible. For example, sector- or vessel-specific bycatch caps or a tradable quota system could be implemented. Tradable quotas would likely be allocated for both target and bycatch species. In addition to limiting total mortality, these types of management programs could provide incentives for fishermen to find ways to reduce their bycatch rates, since they would more directly bear the cost of producing bycatch. Gear modifications can also reduce bycatch rates. Experimental bycatch-reducing gear could be more widely tested through the EFP program authorized under the groundfish FMP.

Socioeconomic sectors: Adverse socioeconomic impacts are attributable to reductions in commercial harvests and recreational fishing opportunities necessary to rebuild stocks. Evaluating these impacts is made difficult because of the tradeoff between short- and long-term costs and benefits. Imposing short-term costs in the form of harvest reductions should result in a long-term net benefit in the form of future MSY harvests. (Note that the MSY concept encompasses both maximum *and* sustainable harvests, so that once rebuilt, these stocks could support an ongoing stream of higher harvests.) One general form of mitigation is to compensate fishermen directly through subsidies or the provision services, such as job retraining programs for displaced workers. The forms of mitigation discussed above for impacts to groundfish stocks are also a form of socioeconomic mitigation if target species harvests can be sustained or increased while reducing overfished species bycatch.

9.9 Environmentally Preferred Alternative and Rationale for Preferred Alternative

NEPA regulations, at 40 CFR 1505.2(b), state that the ROD will identify an alternative or alternatives considered "environmentally preferable." In order to inform the public and facilitate preparation of the ROD, the rationale for identifying Alternative 4 as the environmentally preferable alternative is summarized here.

Guidance, in the form of *Forty Most Asked Questions Concerning CEQ's NEPA Regulations*, states that the environmentally preferable alternative is "the alternative that will promote the national environmental policy as expressed in NEPA's Section 101. Ordinarily, this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources" (Question 6.A). Alternative 4 represents the environmentally preferable alternative because it is the most risk averse (a 90% P_{MAX} for all species except cowcod, for which it is 60%) and because it is estimated to have the least effect on biological resources in terms of impacts to habitat and ecosystem, total fishing mortality, and harm to protected species. However, in comparison to the other action alternatives, Alternative 4 could have a greater adverse impact, especially cumulatively, on West Coast fishing communities substantially engaged in or dependent on groundfish fisheries. Generally, the more severe short-term impacts are projected to result in faster rebuilding in comparison to the other alternatives.[4/] Once a stock is recovered, it should be possible to increase OYs and still, on average, keep the population size above the precautionary threshold ($B_{40\%}$). Thus, earlier recovery under Alternative 4 would allow these higher harvests sooner. On the other hand, given the fairly long recovery times under all the alternatives, income from these future harvests is heavily discounted in the present. Combined with substantial declines over the past five years, harvest limits in the short term under Alternative 4 could affect the character and viability of these communities. Furthermore, NEPA describes national policy in terms of the human environment, which includes the relationship of people with the natural and physical environment (40 CFR 1508.14). Fishing, whether commercial or recreational, is a direct expression of this relationship.

The Council identified a preferred alternative at its April 4-9, 2004, meeting in Sacramento, California. The Council-preferred Alternative combines rebuilding strategies for individual species included in other action alternatives. The rationale for each species-specific strategy is summarized below.

<u>Bocaccio</u>. The Council chose a risk-averse strategy based on a P_{MAX} of 70%. This is the same as the interim strategy applied for 2004 harvest specifications and similar to the strategies pursued in 2002 and 2003. The stock assessment used for 2003 management found that the stock could not rebuild by T_{MAX} even at a zero harvest level. This resulted in setting a very low harvest limit of 20 mt, which was estimated to allow eventual recovery. A subsequent stock assessment and rebuilding analysis showed the stock could rebuild. Pursuing a strategy determined from the 70% P_{MAX} resulted in a possible OY of 306 mt, using the base STATc model in the most recent stock assessment. The Council applied a precautionary reduction for the 2004 fishing year, setting the OY at 250 mt. Even at this level, total fishing mortality is projected to be 136 mt (PFMC 2004) because of management measures needed to constrain harvests of other overfished species. OYs adopted by the Council for 2005-2006 are derived from the 70% P_{MAX} strategy, but without the precautionary reduction. However, total fishing mortality is, again, likely to be well below the OY. Thus, in the near term, management measures are predicted to result in fishing mortality equivalent to a still more risk-averse strategy. However, over the rebuilding period changes in stock productivity as revealed by future stock assessments could conceivably require reductions in the OY from one biennial management period to the next. In addition, as stocks recover, allowing some relaxation of management restrictions, the catch rate for bocaccio could increase, resulting in a larger proportion of the OY being taken. The Council-preferred Alternative is thus risk averse while allowing some latitude in structuring fisheries in future years.

<u>Cowcod</u>. The available information from the last stock assessment and rebuilding analysis provide limited information to predict cowcod rebuilding likelihoods. This resulted in only two distinct strategies for this

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4/ The No Action Alternative, based on the 40-10 rule in the FMP management framework, uses a variable harvest rate, depending on stock size. In the case of bocaccio and cowcod, OYs are lower in the early years than under the other alternatives. However, application of the 40-10 rule is projected to allow recovery only in the case of bocaccio.

species identified in the alternatives. The Council chose the more risk averse of the two strategies, with a P_{MAX} of 60%. This is slightly more risk averse than the interim strategy, based on a 55% P_{MAX}, applied in 2004. The practical difference in predicted short-term OYs between these two strategies is slight, only 0.6 mt. Management policy is to minimize cowcod catch while recognizing some level of bycatch will occur if recreational and commercial fisheries in Central and Southern California are to be prosecuted at all. Predicted catches of cowcod for 2004 are less than half of the OY. A full cowcod stock assessment is scheduled for 2005, for use in determining OYs for the 2007-2008 biennial management period. This should provide better information to guide the adopted rebuilding strategy.

Widow rockfish. The Council-preferred Alternative is based on a moderately risk-averse 60% P_{MAX} strategy. Although once a major target fishery, overfishing and the need to rebuild this stock requires management measures addressing widow rockfish in fisheries targeting other species. Because widow rockfish occur primarily in the pelagic and bathypelagic zones, the Pacific whiting fishery currently takes the largest proportion of the OY in bycatch. Targets based on the 60% P_{MAX} value continue the interim strategy, although the most recent stock assessment and rebuilding analysis (He, *et al.* 2003a; He, *et al.* 2003b) required substantial reductions in the OY from 2003 to 2004. Given projected OYs in the near term, this strategy allows full prosecution of the Pacific whiting fishery, which uses widow bycatch avoidance strategies and is closely monitored, and modest bycatch in other sectors. More risk-averse strategies would likely require curtailing or closing the whiting fishery, especially if the policy to "hold harmless" other groundfish fisheries is continued. (This policy is to structure fisheries so that any additional bycatch reduction required to stay below the OY is first applied to the whiting fishery before measures are applied to other fisheries.)

Yelloweye rockfish. Comparing the rebuilding strategies for yelloweye rockfish in the action alternatives, there is a small difference in near-term OYs. In light of this small difference, the Council-preferred Alternative adopts a very risk-averse strategy for yelloweye rockfish based on an 80% P_{MAX}. Management measures in 2004 are predicted to result in total fishing mortality accounting for most of the OY. Although OYs adopted by the Council for 2005 and 2006 are slightly higher, about the same proportion of the OY is likely to be actually caught. In the near term the Council could have pursued the most risk-averse strategy (90% P_{MAX}) with the same set of management measures since projected catches in 2005-2006 are projected to fall below even this lower OY. However, over the long term the less risk-averse 80% P_{MAX} strategy could allow slightly more latitude as the mix of OY-related constraints, which dictate how fisheries must be managed, changes over time. For example, if stocks recover as expected, management constraints could be relaxed accordingly, and the slightly larger OYs resulting from the adopted strategy could play an important role in structuring expanded fisheries.

TABLE 9-1. Relative present value of OYs under rebuilding alternatives for Amendment 16-3 species.[a/b/c/d/] (Page 1 of 1)

Bocaccio

Discount rate:	Alt 1 P= .6	Alt 2 P= .7	Alt 3 P= .8	Alt 4 P= .9	No Action 40-10 Rule
0%	11.07	11.03	11.76	**11.83**	11.82
2.60%	7.52	7.33	**7.65**	7.52	7.50
5%	**5.43**	5.18	5.28	5.04	5.00
7%	**4.24**	3.98	3.96	3.66	3.60
10%	**3.05**	2.79	2.67	2.34	2.25

Widow Rockfish

Discount rate:	Alt 1 P= .6	Alt 2 P= .7	Alt 3 P= .8	Alt 4 P= .9
0%	6.28	8.55	10.81	**13.02**
5%	1.74	2.05	2.42	**2.82**
7%	1.17	1.26	1.39	**1.55**
9.14%	**0.82**	0.81	0.81	**0.82**
10%	**0.72**	0.69	0.66	0.64

Yelloweye Rockfish

Discount rate:	Alt 1 P= .6	Alt 2 P= .7	Alt 3 P= .8	Alt 4 P= .9
0%	28.20	30.26	31.69	**33.09**
3.25%	10.47	**10.54**	10.51	10.47
5%	**7.17**	7.08	6.92	6.74
7%	**5.13**	5.01	4.83	4.63
10%	**3.56**	3.44	3.29	3.11

a/ Includes only those alternatives that rebuild within T_{MAX}, excluding F=0.
b/ Assumes a constant uniform value per unit of OY from present until T_{MAX}.
c/ OYs assumed to revert to MSY after T_{TARGET} is reached.
d/ OYs each year are expressed as a fraction of MSY.