GROUNDFISH MANAGEMENT TEAM REPORT ON HARVEST SPECIFICATIONS

The Groundfish Management Team (GMT) examined the Council's preliminary preferred harvest specifications alternatives (PPAs) and offers the following considerations.

Overfished Species

Introduction
We lead off this statement on the Council's rebuilding plan decisions with some reactions to the court order that was issued two weeks after the Council identified its preliminary preferred rebuilding ACL alternatives in April. After making those observations, we attempt to synthesize information that may be useful to the Council on its rebuilding ACL decisions on a stock by stock basis.

Discussion on the court order
The court order had specific remedies for 2010 yet the court's guidance beyond that is unclear to us. In light of this unclear guidance, we feel somewhat unsteady in our role of helping to identify and inform issues and tradeoffs for the Council. Much of our discomfort comes from our impression that the legal standards involved with rebuilding have been taken further away from the basic principles of fisheries conservation and management. We think it in the best interests of this policy process that these legal standards become more reconnected with these basic principles so that all involved have more objective standards on which to express their policy preferences.

Perhaps the best way to summarize our impression of the court order is that the court seems to still be looking for a framework to decide whether the Council's rebuilding plans show a "measured proportionality" between the statutory commands to rebuild as fast as possible while taking into account the needs of fishing communities. In the time available here, we cannot get much into specific instances of why we are left with this impression. Instead we focus on general reasons why the court has concluded that some of the Council's decisions have not shown the required proportionality between the needs of fishing communities and the need to rebuild as quickly as possible We break the concerns we see expressed by the court into two broad categories:

- Raising or not lowering catch when a new stock assessments makes the stock look "worse off" or not making expected progress;
- Overemphasizing short-term economic concerns at the expense of conservation

We believe both sets of concerns are based on certain misperceptions and misunderstandings that can and should be addressed. A full discussion would be lengthy. Given the volume of information before the Council in this agenda item, we do our best to outline the rationale

keeping only to the most salient of points. We can elaborate on the points made here for Thursday's agenda item if the Council would find it useful for its final decisions.

Rebuilding and Status and Biology

In general, the courts have tended to view the raising or not lowering of catch when a stock looks "worse off" as unfavorable (i.e. not making expected progress toward rebuilding). It is a very legitimate question and one that the Council and its advisors evaluate from cycle to cycle. However, the reasons why a stock looks "worse off" or "better off" can be complex given the considerable scientific uncertainty involved with rebuilding species. Terms such as "more optimistic" or "more pessimistic" tend to oversimplify what are often complex situations.

Changing Perceptions of Stocks
The Council tracks rebuilding progress on three dimensions of stock "status and biology":

a. Stock productivity
b. A*bsolute* stock abundance (or stock "scale")
c. *Relative* stock abundance (or stock "status")

Each is subject to considerable scientific uncertainty and can change the overall rebuilding outlook from cycle to cycle. These dimensions are not mutually exclusive and can change in concert with one another. To truly determine whether a stock is better or worse off compared to a previous assessment, all three dimensions must be examined.

a) Stock productivity
Changes in understanding of productivity can affect rebuilding plans by altering our perception of how quickly a stock can increase. Stock productivity generally refers to the ability of a stock to generate new individuals, usually via birth and often above that lost to mortality, thus allowing a population to grow over time. Changes in our perception of life history traits (e.g. mortality, maturity, fecundity, or growth) can change our perception of stock productivity. Measuring recruitment is difficult given the elusive and inaccessible early life histories of most groundfish species. Even if we could measure such traits, recruitment events are not constant, and in the case of many groundfish, highly variable and sporadic. Age or length data, along with survey biomass estimates and removal histories, all inform recruitment patterns, but to varying degrees of resolution. Unfortunately, recruitment is lagged to length and age compositions, thus the most recent couple of years of recruitment are often the most uncertain.

b) Stock scale
Absolute stock abundance, or stock scale, is another derived assessment quantity that has demonstrated considerable variability across assessments. This behavior is often a result of uncertainty in removal histories, which scales the biomass via estimates of fishing mortality, but is also sensitive to life history parameters such as growth and mortality. Any changes in these estimates can have large effects in perceived biomass. These changes in scale are commonly witnessed in estimates of unfished biomass, though the scale of the entire population trajectory can shift up or down. Changes in population scale will affect the level of catch acceptable to achieve rebuilding goals if catch are not based on harvest rates.

c) Status

We use status to define rebuilding reference points. Stock status is expressed as an estimate of current absolute abundance relative to the estimate of the absolute abundance of the unfished biomass. Estimates of status can also change conditioned on all of the previous mentioned factors. Importantly, changes in the scale of the estimated unfished biomass, even though the current population biomass stays the same, will vary the stock status. Likewise, productivity changes in current years may alter current year biomass relative to an unchanged unfished biomass. Since stock status is the basis of determining when a stock is rebuilt, subsequent estimates of T_{TARGET} may change with changing stock status.

Rebuilding by Constant Harvest Rate

We have observed that the constant harvest rate strategy to rebuilding also causes some confusion even amongst ourselves. The Council has chosen to manage overfished species using constant SPR harvest rates on the advice of the SSC. The SPR harvest rate removes a set proportion of the stock each year and takes into account the biology of the stock. Applying a constant SPR harvest rate is more precautionary in an uncertain environment because one is not chasing variability in the scale of biomass. When our understanding of stock scale changes, the constant harvest rate strategy is expected to keeps us on track to the T_{TARGET}. Constant catch rebuilding strategies, the other major to constant SPR strategies, do not have this feature. This becomes a problem when our understanding of stock scale changes downward and the catch becomes too large relative to the size of the population and adjustments become necessary to meet the same T_{TARGET}. An upward change in our understanding of stock scale does not present the same concern. Constant harvest rates are also subject to revisions between management cycles. Changes to our understanding of stock productivity and relative biomass can still change estimates to the time to rebuild.

Another feature of constant harvest rate strategies is the increase in the ACL as stock abundance increases. We tend to focus on the ACLs for the two years of a biennial cycle. A SPR harvest strategy is perhaps better thought of as a trajectory over time. For stocks with slow trajectories, the differences between two alternatives build up over time. For example, with yelloweye rockfish the difference in times to rebuild between the alternative that produces 13 mt in 2011-2012 and the alternative that produces 20 mt is nearly 20 years. Yet that difference cannot be attributed to the difference between 20 mt and 13 mt in 2011-12. Rather, the difference builds up over the full course of the respective rebuilding trajectories. To illustrate this, we requested a rebuilding analysis run for a constant catch scenario of 20 mt. That run projects that the stock would be rebuilt only 3 years later than the SPR constant harvest rate strategy represented by 13 mt in 2011 and 2012.

Measuring the Degree of Delay

Another issue we have noticed is that the courts have tended to focus on the delay in number of years from the F=0 mark ($T_{F=0}$). No court has produced a definite statement about how far is too far away from that mark, yet it appears rebuilding plans that are set farther away from $T_{F=0}$ have received more scrutiny.

We note here that years of delay is not the most biologically meaningful unit of measure because of differences in productivity between species. One year of delay for yelloweye rockfish (the slowest to rebuild) is not equivalent to one year of delay for petrale sole (the quickest to rebuild). This is an intuitive concept, yet we are not currently employing objective measure of relative delay other than number of years. The estimate of mean generation time recommended in the NS1 guidelines was meant to serve in this manner, yet mean generation time is only used to define T_{MAX} and T_{MAX} has largely been left aside in the analysis by the courts.

A refocusing on the difference between $T_{F=0}$ and T_{MAX} would be an improvement in our view. Assuming that will not happen, we would at least suggest expressing yearly delay as a percentage difference from $T_{F=0}$ as better measure than number of years.

An even more preferable alterative might involve comparing alternatives on their estimated rate of increase to T_{TARGET}. The rate of increase at F=0 still identifies the highest rate of increase given the biology of the stock. The other alternatives could be compared against this mark and against one another. For a productive species, a small difference in the number of years to rebuild might look large in terms of differences in the rate of increase. For low productivity species, large differences in the number of years result from smaller differences in the rates of increase. We suggest this not as a replacement to looking at years to describe differences in delay between species, but rather as complementary means of gauging what is biologically possible for each stock. Table 1 identifies expected rates of increase for each rebuilding alternative under consideration at this meeting.

Table 1. Comparing the estimated rates of increase to T_{TARGET} for each of the Council's rebuilding alternatives.

Expected rate of increase	Canary	Yelloweye	Darkblotched	POP	Cowcod	Petrale	Bocaccio
F=0	4.2%	2.4%	4.1%	4.4%	13.2%	36.3%	4.7%
Alt 1	3.9%	1.6%	3.1%	4.4%	13.2%	36.3%	4.7%
Alt 2	3.7%	1.4%	2.1%	4.4%	12.3%	24.2%	4.3%
Alt 3	3.5%	1.2%	1.5%	4.0%	11.7%	20.7%	3.5%
As a % of the rate at F=0 of increase	**Canary**	**Yelloweye**	**Darkblotched**	**POP**	**Cowcod**	**Petrale**	**Bocaccio**
Alt 1	93%	67%	75%	100%	100%	100%	100%
Alt 2	88%	58%	50%	100%	93%	67%	90%
Alt 3	82%	50%	35%	90%	89%	57%	75%

Rebuilding and Conservation

Some of the court's statements would appear to echo a generic criticism of fisheries management that holds the view that fisheries managers tend to overemphasize short-term economic concerns at the expense of the long-term environmental concerns. Such criticisms may be valid in certain circumstances yet it is an oversimplification to equate any delay in rebuilding to an improper prioritization of short-term economic concerns over conservation.

To probe that view here, we use the court's observation that conservation involves the "double benefit of both improving the environment and providing long-term economic return." The court

characterized this "double benefit" as only "[p]art of the reason that Congress elevated conservation over economic interests." We are not sure what other benefits the court may believe conservation involves, yet in our view the two mentioned—long-term yield and ecosystem considerations—articulate the fundamental reasons of why it is that we care about the abundance of a particular stock of fish. We consider how the Council's rebuilding plans compare to these measures of conservation.

Long-term Economic Return and Yield

None of the alternatives before the Council here or actions taken in recent years by this Council are likely to or likely to have sacrificed long-term economic return for short-term economic needs. In fact, the Council's rebuilding plans are much more likely to do the opposite and sacrifice long-term economic return for faster rebuilding.

We have shied away from analysis of long-term consequences of rebuilding because of the many species and many sectors involved with the rebuilding rockfish stocks. For petrale we were able to avoid these complexities and show quite simply that the slowest alternative to rebuild is the one that would provide the most yield overall and hence the best long-term economic return to fishing communities. The Council's PPA actually produces less overall yield than simply following the strategy of following the standard ABC harvest control rule through rebuilding.

We took the same look at yelloweye rockfish, which stands in contrast to petrale as the slowest stock to rebuild, yet provides a similar story. The Council's PPA provides more long-term economic return that either Alternatives 1, 2, and the F=0 rebuilding strategy. It would not provide as much economic return as other alternatives that are slower to rebuild. This simple look offers a general long-term picture that sharpens when more complex economic assumptions are considered (e.g., the time value of money, the marginal value of yield for constraining species, etc.).

The Slippery Slope Concerns

The perception that the Council is improperly emphasizing short-term economics may just be a product of the way we frame our rebuilding alternatives. It may also be a product of the fact the Council does have several overfished species. On the framing issue, we note that the Council does not consider alternatives at the level where delays in rebuilding cause long-term economic return. Such alternatives would involve overfishing or fishing the stock at its current biomass indefinitely. For yelloweye, we have an analysis of such alternatives (although they're not alternatives considered here) because the 40:10 harvest control rule and the F_{MSY} control rule are not projected to rebuild the stock over the 500 years analyzed in the rebuilding plan. That analysis would show that either alternative still provides more economic return over the next 500 years than the Council's PPA despite the fact that they do not rebuild the stock.

In consideration of the Council's rationale for the modification to the yelloweye ramp-down strategy for 2010, the court observed that the Council could "delay rebuilding indefinitely." The court pointed this out under the assumption that such a delay came at some cost to long-term economic return. The incentive to postpone indefinitely becomes even stronger when there is no long-term cost.

Whatever Congress intended with the rebuilding provisions, the MSA requires stocks to be rebuilt back to B_{MSY} regardless of whether it is in the best economic interests of fishing communities or not. Not rebuilding is not an option. It is simply a matter of how quickly to rebuild.

None of the alternatives under consideration here would postpone rebuilding indefinitely. Sticking to a T_{TARGET} and justifying or explaining changes to the T_{TARGET} is what the Council strives to do. At the time the Council was considering the modification to the ramp-down, we expressed our opinion that doing so would be consistent with the original rationale of the ramp-down and we showed that the modification would not shift the T_{TARGET} in any appreciable manner. We also understood that such an action might give off the perception of serial delay and that is what occurred. This perception could still exist and can be answered to.

Marine Environment

Environmental or ecological considerations are the other major set of reasons that we care about fish abundance. What is meant by the "environmental" is a complex topic. Here we break it down into two parts.

First, we note used a few phrases such as "dire circumstances" to justify the necessity of following the court's order. We do not know whether such phrases are rhetorical flourish or a true indication of how the court perceives the condition of these stocks. Either way, we not here that the circumstances these populations face cannot be reasonably described as dire. Such terms are better reserved for species facing the risk of extinction. The best available science does not implicate such risks here.

Fishing pressure is the major threat faced by these stocks. If fishing pressure is set appropriately, the stocks are expected to increase as shown by our rebuilding analysis (summarized in Table 1). These rockfish may, as the court phrased it for darkblotched, have the "misfortune of comingling with profitable target species," yet they are perhaps somewhat fortunate in that they live far enough away from humans that they are not thought to be affected by many of the pressures other species face (e.g., habitat loss and degradation, pollution, etc.). Fishing pressure is the major population threat. And to put that threat into perspective, the harvest rates the Council establishes for these stocks most often takes less, and often much less, than 1 percent of the population per year.

The other major environmental side of conservation is the ecological role these rebuilding stocks play in the marine environment. We cannot really contrast the Council's rebuilding alternatives on how the compare in that ecological role. Again, given that rebuilding alternatives rebuild to the same level of abundance, it is really only the pace of rebuilding that is different between alternatives. And for many if not all of the rebuilding stocks, the quicker to rebuild alternatives would only have the stock at a higher abundance for a limited period of time (i.e., until the other alternatives caught up to it). More abundant stocks are certainly more valued by some because larger abundance equates to a more pristine environment. This is certainly a policy preference that can be argued to the Council through the MSA concept of optimum yield. However, the state of the science on this question is such that we can do little more than assume that more abundant stocks are better for the marine environment.

New Rebuilding Plans

[Note that the alternative labels in the following sections correspond to the numbering in chapter 2 where harvest specifications are described. This numbering is different that the numbering in chapter 4 for the integrated alternatives, which include both the overfished species ACL decision correlated with the appropriate management measures.]

Petrale Sole

The new petrale sole assessment treated the stock on a coastwide basis rather than having a north-south stock distinction at the INPFC Columbia-Eureka line (43° N lat.) and the updated treatment of ageing error. The new assessment indicated a similar scale and status trend from 1980 to the late 1990s relative to the previous assessment; however, unfished and terminal biomass estimates were very different and produced a lower current depletion and population trend. Specifically, the biomass scale is lower in the current assessment and does not show the sharply increasing population characterized by the 2005 assessment. According to the new assessment, the status of petrale has been $<B_{25\%}$ since 1953. Petrale is now considered overfished (it was above the MSST in the last assessment). Current exploitation is estimated to be 28% of the unexploited biomass.

	T_{MAX}	Med time to rebuild	2011 OY/ACL	2012 OY/ACL	SPR
2011/12	2021	2014	0	0	100%
		2014	459	624	50%
		2015	776	1,160	25:5 rule
		2016	976	1,160	ABC in 2011; 25:5 rule thereafter
		2017	1,021	1,279	F30%

Alternative 3 (976 mt/1,160 mt)

Status and Biology of the Stock

- Adds 2 years to rebuilding relative to the zero harvest option and rebuilds 5 years earlier than T_{MAX}
- Meets the 10 year rebuilding requirement

Fishery Impact

Petrale sole are a major target stock in the current trawl fishery. Industry has indicated that an allowable harvest below the 1,000-1,200 mt level risks losing market share and significantly disrupts the fishery. While this alternative is below this critical level of harvest, it is the highest alternative considered for 2011-2012 and would therefore cause relatively less disruption to the fishery and economic harm to trawl-dependent fishing communities.

Alternative 2 (776 mt/1,160 mt)

Status and Biology of the Stock

- Adds 1 year to rebuilding relative to the zero harvest option and rebuilds 6 years earlier than T_{MAX}

Fishery Impact
Trip limits for selective flatfish trawl would have to be reduced for all flatfish species (Dover sole, petrale sole, arrowtooth, and other flatfish).

Alternative 3 (459 mt/624 mt)
Status and Biology of the Stock

- Rebuilds in the same year relative to the zero harvest option and rebuilds 7 years earlier than T_{TARGET}

Fishery Impact
Trip limits for petrale would be reduced for all trawl gears. In addition, trip limits using selective flatfish trawl would also have to be reduced for all flatfish species (Dover sole, arrowtooth, and other flatfish). Trip limits for sablefish could be slightly increased for all gears.

Rebuilding Plans Requiring Revision (Canary and POP)

Canary
The biggest change in the 2009 canary assessment from the 2007 assessment was the addition of historical catch time series prior to 1981. Fishery and survey data were also updated to include the years since the last assessment, as well as data for earlier years.

The change in historical catch caused a relatively large change in the unfished and terminal spawning biomass, resulting in a lower depletion level in recent years compared to the 2007 assessment. The perception of the relative status and productivity of canary rockfish has therefore changed. It cannot rebuild by the current T_{TARGET} (2021) and the rebuilding plan must be modified. Canary catch exceeded its cumulative OY by 14 percent over the period 2000-2007 due to an excess harvest in 2001 when groundfish constraints were first being imposed. Exploitation rates for the 2009/2010 ACL is 0.67%.

	T_{TARGET}	Med time to rebuild	2011 OY/ACL	2012 OY/ACL	SPR
2007/8	2074	2063	44		88.7%
2009/10	2063	2021	105		92.2%
2011/12	2021	2024	0	0	100%
		2025	49	51	94.4%
		2026	69	72	92.2%
		2026	94	99	89.5%
		2027	102	107	88.7%

Alternative 3 (102/107 mt)
Status and Biology of the Stock

- SPR harvest rate under the PPA is the same as that in the FMP
- Adds 3 years to rebuilding relative to the zero harvest option

- Due to the nature of the canary stock, even higher harvest levels have small impacts on the time to rebuild (155 mt option rebuilds by 2028, which is only one year beyond the PPA)
- Applies the SPR rate in the FMP

Fishery Impact
Canary rockfish are under the rebuilding paradox and are difficult to avoid, so this ACL would provide for those expected increased interactions. The California nearshore fishery would be constrained under this alternative, preventing access to target species.

Alternative 2 (94/99 mt)
Status and Biology of the Stock

- SPR harvest rate (89.5%) is more conservative than the SPR harvest rate in the FMP
- Adds 2 years to rebuilding relative to the zero harvest option
- Takes into account the less optimistic assessment update and applies a more conservative SPR rate than in the FMP

Fishery Impact
The California nearshore fishery would be constrained under this alternative, requiring changes to the RCA and/or reductions in catch.

Option 1 (49/51)
Status and Biology of the Stock

- Represents a more precautionary harvest rate (94.4%)
- Adds one year to rebuilding relative to the zero harvest option and rebuilds 4 years earlier than T_{TARGET}.

Fishery Impact
The limited entry fixed gear fishery would be constrained, requiring changes in RCAs or reductions in catch. The California nearshore fishery would be constrained, requiring a statewide 20 fm line and significant reductions in catch. All recreational fisheries will be constrained under this alternative, resulting in reduced season lengths and restrictive depth restrictions.

Pacific ocean perch
The 2009 assessment changed the perception of stock status due to revised estimates of stock productivity and depletion arising from the NMFS Northwest Fisheries Science Center trawl survey indices that were low in 2007 and 2008. Changes to age and length compositions were also included. These changes resulted in similar population dynamics from the last assessment, but changed the scale of terminal biomass enough to warrant a revision of T_{TARGET}. Total catch from 2000-2008 was 48%. Current exploitation rates are very low (<1%).

	T_{TARGET}	Med Time to Rebuild	OY/ACL	OY/ACL	SPR
2007/8	2026	2017	150		86.4%
2009/10	2017	2011	189	200	86.4%
2011/12	2017	2018	0	0	100%

		2019	80	80	93.6%
		2019	111	113	91.2%
		2020	180	183	86.4%

Council PPA (180 mt/183 mt)

Status and Biology of the Stock

- Represents the SPR harvest rate published in the FMP (86.4%)
- This option adds 2 years relative to the zero harvest option.

Fishery Impact

This alternative results in the same SPR harvest rate as applied in the 2009-10 Specifications EIS. This alternative results in slightly lower catches than those in 2009-10.

Rebuilding Plans Not Requiring Revision (Bocaccio, Cowcod, Darkblotched, Widow, and Yelloweye)

Bocaccio

The new 2009 assessment is more optimistic and continues to show that bocaccio is rebuilding ahead of schedule (2007 – 13%, 2009 - 28%). The new assessment used the SSC modeling framework instead of SS1, extended the northern boundary from Cape Mendocino to Cape Blanco, and extended the period modeled from one beginning in 1951 to one beginning in 1892. The results of the new assessment are consistent with those of the 2007 update except for a smaller starting biomass, which resulted primarily from the extension of the assessment period back to 1892.

Because the rebuilding progress was considered adequate, and the assessment did not change our fundamental understanding of the stock, the SSC recommended maintaining the status quo rebuilding plan (i.e., no modifications to T_{TARGET} or SPR harvest rate). Total catch from 2000-2008, was 50% of the OY, indicating that management has been effective at curtailing fishing mortality to facilitate rebuilding as quickly as possible.

	T_{TARGET}	Med Time to Rebuild	OY/ACL	OY/ACL	SPR
2007-08	2023	2036	218		77.7%
2009-10	2026	2023	288		77.7%
2011-12	2026	2019	0	0	100.0%
		2019	53	56	95%
		2020	109	115	90%
		2022	263	274	77.7%

Alternative 3 (263 mt/274 mt)

Status and Biology of the Stock

- Represents the SPR harvest rate published in the FMP (77.7%)
- This option adds 3 years relative to the zero harvest option and is still 4 years less than T_{TARGET}.

Fishery Impact
This alternative applies the same SPR harvest rates as in 2009-10, even though it results in slightly lower harvest levels. This alternative also takes into account the status of the stock and facilitates rebuilding early, while attempting to strike a balance between providing protection for the stock and minimizing severe economic consequences to communities. Since bocaccio is a relatively productive species which is difficult for fishermen to avoid because it co-occurs with other stocks (e.g., widow and chilipepper). This alternative does not constrain any sectors of the fishery.

Alternative 2 (109 mt/115 mt)
Status and Biology of the Stock

- Represents a more precautionary SPR harvest rate (90%)
- This option adds 1 year relative to the zero harvest option and is still 6 years less than T_{TARGET}.

Fishery Impact
This alternative does not constrain any sectors of the fishery.

Alternative 1 (53 mt/56 mt)
Status and Biology of the Stock

- Represents a more precautionary SPR harvest rate (95%)
- This option rebuilds in the same year relative to the zero harvest option and is 7 years less than T_{TARGET}.

Fishery Impact
This alternative would constrain the California recreational fishery, resulting in a 5 month season reduction in the Southern Management Area and a 1 month season reduction in the South-Central Management Area.

Cowcod
The 2009 update assessment is slightly more optimistic than the previous assessment. The stock continues to display a slow upward trend but this is little more than a stock projection due to the lack of data. There is little change in the view of stock status. The update was reviewed by the SSC and represents the best available science. Total catch has been 44% of the total OY during rebuilding (2002-2007).

Cowcod is extremely important to the recreational fishery and the trawl fishery south of 40°10' N lat. Trawl activity has declined south of 40°10' N lat over the last few years due in part to the buyback program. Trawl activity is expected to increase due to the new trawl rationalization program.

	T_{TARGET}	Med Time to Rebuild	OY/ACL	OY/ACL	SPR
2007-08	2090	2039	4	4	90.0%
2009-10	2039	2072	4	4	82.1%
2011-12	2072	2060	0	0	100%

		2064	2	2	90.0%
		2068	3	3	82.7%
		2071	4	4	79.0%

Alternative 3 (4 mt)

Status and Biology of the Stock

- Less conservative SPR harvest rate (79%)
- Adds 11 years to rebuilding relative to the zero harvest option and is one year less than T_{TARGET}
- Most of the cowcod habitat is protected within the CCA

Fishery Impacts

Since cowcod impacts have been variable over the last 5 years (according to the total mortality reports), this alternative would encompass the variability. No sectors would be constrained under this alternative

Alternative 2 – (3 mt)

Status and Biology of the Stock

- SPR harvest rate (82.7%) is more conservative than other ACL options
- Adds 8 years to rebuilding relative to the zero harvest option and is 4 years less than T_{TARGET}
- Most of the cowcod habitat is protected within the CCA

Fishery Impacts

Under this lower alternative extractive research may not be available under this alternative. No sectors would be constrained under this alternative.

Alternative 1 – (2 mt)

Status and Biology of the Stock

- Matches SPR harvest rate in the FMP (90.0%)
- Adds 4 years to rebuilding relative to the zero harvest option and is 8 years less than T_{TARGET}.

Fishery Impacts

Under this lower alternative extractive research may not be available under this alternative. Modifications to the Southern Management Area in the California recreational fishery may be necessary.

Darkblotched

The status of darkblotched increased above 25% of the unfished biomass with an upward trajectory. Despite the addition of a new historical catch series prior to 1980 and updated length compositions, the population trajectory is the same as the 2007 assessment and our perception of the stock has not changed. The 2009 assessment results indicated that the fishing mortality rate has been greatly reduced and darkblotched appear to be rebuilding gradually at close to previous rebuilding projections. A total of 97% of the prescribed OY was achieved from 2001-2007. Exploitation rate is less than 1%.

	T_{TARGET}	Med Time to Rebuild	OY/ACL	OY/ACL	SPR
2007-08	2030	2011	290	330	2007-64.1% 2008 – 60.7%
2009-10	2011	2028	285	291	62.1%
2011-12	2028	2016	0	0	100%
		2018	130	131	81.8%
		2022	222	222	71.9%
		2025	298	296	64.9%
		2027	332	329	62.1%

Alternative 3 (332 mt/329 mt)

Status and Biology of the Stock

- More conservative than 2007 SPR harvest rate
- Adds 11 years to rebuilding relative to the zero harvest option and rebuilds one year faster than T_{TARGET}

Fishery Impacts

No sectors would be constrained under this alternative.

Alternative 2 (298 mt/296 mt)

Status and Biology of the Stock

- More conservative harvest rate
- Adds 9 years to rebuilding relative to the zero harvest option and rebuilds 3 years faster than T_{TARGET}

Fishery Impacts

No sectors would be constrained under this alternative

Alternative 1 (130 mt/131 mt)

Status and Biology of the Stock

- Most conservative harvest rate
- Adds 2 years to rebuilding from the zero harvest option and rebuilds 10 years faster than T_{TARGET}

Fishery Impacts

Trawl opportunities on the slope would be constrained by this alternative. Further, the whiting trawl fishery could be constrained by this alternative.

Widow

The widow rockfish incorporated several changes from the 2007 assessment, including a longer time series, a reconstructed catch series, new fishery-independent indices of abundance, and a new modeling platform (Stock Synthesis 3). Despite the changes, the stock status and scale did not appreciably change, though some estimates of recruitment were noticeably different. The 2009 assessment indicated that the stock is at 38.5% of unfished biomass, just short of being

rebuilt. The rebuilding analysis projects that the stock will be rebuilt by 2010. A full assessment is scheduled for 2013-14 to confirm the rebuilt status. A total of 45% of the prescribed OY was taken between 2002 and 2007. Exploitation rate remains well below 1%.

	T_{TARGET}	Med Time to Rebuild	OY/ACL	OY/ACL	SPR
2007-08	2015	2015	368		95%
2009-10	2015	2009	522	509	95%
2011-12	2015	2010	200		constant catch
			400		
			600		

Alternative 3 (600 mt)
Status and Biology of the Stock

- This constant catch scenario is expected to rebuild by 2010, which is 5 years earlier than T_{TARGET}
- Catches are slightly greater than status quo catches

Fishery Impacts
Widow is difficult for fishermen to avoid because it co-occurs with other stocks (e.g., bocaccio and chilipepper), therefore this higher ACL alternative may be able to provide additional opportunities for some sectors of the fishery. The mothership and shoreside whiting sectors may be constrained under this alternative

Alternative 2 (400 mt)
Status and Biology of the Stock

- This constant catch scenario is expected to rebuild by 2010, which is 5 years earlier than T_{TARGET}
- Represents less than status quo catches

Fishery Impacts
The whiting trawl fishery may be constrained under this alternative.

Alternative 1 (200 mt)
Status and Biology of the Stock

- This constant catch scenario is expected to rebuild by 2010, which is 5 years earlier than T_{TARGET}
- Represents catches far less than status quo

Fishery Impacts
All whiting sectors may be constrained under this alternative

Yelloweye
Although the 2009 assessment did not significantly alter the perception in stock status, it had many structural changes which resulted in a slightly higher depletion level (20.3%) compared to the 2007 assessment (16.4%). Changes to the 2009 assessment include the following:

- revised inputs (weight-length relationship, maturity schedule, addition of a fecundity relationship)
- estimation of parameters for natural mortality, steepness, and growth which were previously fixed
- two sex model instead of a combined sex model

	T_{TARGET}	Med time to rebuild	OY/ACL	OY/ACL	SPR
2007-08	2058	2084	23	20	
2009-10	2084	2082	17	14	2009 – 66.3% 2010 – 71.3%
2011-12	2084	2047	0	0	100%
		2065	13	13	80.7%
		2074	17	17	76%
		2084	20	20	72.8%
		2087	20	21	71.9%

Alternative 3 (20 mt)

Status and Biology of the Stock

- SPR harvest rate under the PPA, 20 mt (72.8%) is more conservative than the SPR harvest rate under the ramp down strategy for 2010 (71.3%)
- Represents a more conservative harvest rate than adopted in the FMP (71.9%)
- More conservative harvest rate than applied previously
- Rebuilds 3 years earlier than the median time to rebuild under the SPR harvest rate in the FMP
- Adds 37 years to rebuilding relative to the zero harvest option which is T_{TARGET}.

Fishery Impacts

This alternative results in higher catches for 2011-12 due to the increased stock projection. This alternative provides slightly higher fishing opportunities for recreational and commercial fixed gear fisheries relative to the other alternatives.

Alternative 2 (17 mt)

Status and Biology of the Stock

- Represents a more conservative harvest rate (76%)
- Reduces the time to rebuild by 10 years compared to the 20 mt alternative.

Fishery Impacts

The Oregon and California nearshore fisheries will be constrained under this alternative, resulting in more restrictive depth closures and/or reductions to landed catch. All recreational fisheries will be constrained under this alternative, resulting in reduced season lengths and restrictive depth restrictions

Alternative 1 (13 mt)

Status and Biology of the Stock

- Represents the most conservative harvest rate (80.7%)
- Reduces the time to rebuild by 19 years compared to the 20 mt alternative.

Fishery Impacts

The Oregon and California nearshore fisheries will be constrained under this alternative, resulting in more restrictive depth closures and/or reductions to landed catch. All recreational fisheries will be constrained under this alternative, resulting in greatly reduced season lengths and restrictive depth restrictions.

Table 2 provides a summary of the 2011 ACLs for overfished species and other details relative to overfished species.

Table 2. Range of 2011 annual catch limit (ACL) alternatives (mt) adopted for detailed analysis with time to rebuild.

Stock	Amendment 16-4 2007-2008 OY	Amendment 16-4 SPR	No Action Alternative 2010 OY	No Action Alternative SPR	2011 Action Alternatives Alt 1 ACL	Alt 2 ACL	Alt 3 ACL	PPA SPR	T F=0	Current T_{TARGET}
OVERFISHED SPECIES										
BOCACCIO S. of 40°10' N lat.	218	77.7%	288	77.7%	(2019) 53	(2020) 109	**(2022) 263**	N/A	2019	2026
CANARY	44	88.7%	105	92.2%	(2025) 49	(2026) 94	**(2027) 102**	88.7%	2024	2021
COWCOD S. of 40°10' N lat.	4	90.0%	4	82.1%	(2064) 2	(2068) 3	**(2071) 4**	79.0%	2060	2072
DARKBLOTCHED	290-330	64.1-61.7%	291	62.1%	(2022) 222	(2025) 298	**(2027) 332**	62.1%	2016	2028
PACIFIC OCEAN PERCH	200	86.4%	200	86.4%	(2019) 80	(2019) 111	**(2020) 180**	86.4%	2018	2017
WIDOW	368	95.0%	509	95.0%	(2010) 200	(2010) 400	**(2010) 600**	Constant catch	2010	2015
YELLOWEYE	23-20	Ramp-down	17	66.3%	(2065) 13	(2074) 17	**(2084a/ or 2087b/) 20**	72.8%	2047	2084
PETRALE SOLE	N/A	N/A	1,200	ABC	(2014) 459	(2015) 776	**(2016) 976**	25:5	2014	2021

BOLD indicates PPA ACLs

a/ YE rebuilding by 2084 is a 20 mt ACL in 2011 and a 20 mt ACL in 2012

b/ YE rebuilding by 2087 is a 20 mt ACL in 2011 and a 21 mt ACL in 2012

Non-Overfished Species

Sablefish

ACL Alternatives

The GMT was informed that the sablefish ACL alternatives listed in Table 2-10 in Agenda Item B.3.a, Attachment 2 were incorrectly calculated under the option 2 40-10 harvest control rule. A corrected version of the tables is provided below (Table 3).

Table 3. Updated version of Table 2-10 in Agenda Item B.3.a, Attachment 2 with corrected sablefish ACLs.

2011 ABC = 8,418							
Apportionment Method		40-10 (Opt. 1) 8,485			40-10 (Opt. 2) 8,110		
North/South Proportions	Basis	N ACL	S ACL	S ACL *.5	N ACL	S ACL	S ACL *.5
72/28	2003-06 survey	6,061	2,357	1,179	5,839	2,271	1,135
68/32	2003-08 survey	5,724	2,694	1,347	5,515	2,595	1,298
64/36	2003-08 survey (Variance weighted)	5,388	3,030	1,515	5,190	2,920	1,460
2012 ABC = 8,242							
Apportionment Method		40-10 (Opt. 1) 8,227			40-10 (Opt. 2) 7,863		
North/South Proportions	Basis	N ACL	S ACL	S ACL *.5	N ACL	S ACL	S ACL *.5
72/28	2003-06 survey	5,923	2,304	1,152	5,661	2,202	1,101
68/32	2003-08 survey	5,594	2,633	1,316	5,347	2,516	1,258
64/36	2003-08 survey (variance weighted)	5,265	2,962	1,481	5,032	2,831	1,415

Apportionment

The Council chose to apportion the coastwide sablefish ACL north and south of 36° N latitude using the 2003-2008 average swept area biomass estimates from the NMFS trawl survey, but declined the variance weighted approach to apportion the coastwide ACL. The GMT re-emphasizes that the variance weighted approach uses both the variability as well as the mean swept area biomass to inform this relationship, not just the mean. This inclusion of the variance balances uncertainty in the mean value rather than ignoring it. Unless the variance in these estimates are considered unreliable, **the GMT recommends using the variance weighted approach to determine the relative sablefish abundance north and south of 36° N latitude.**

The Implications of Removing Chilipepper from the Minor Shelf Rockfish North Complex

In 2007 an assessment was conducted for chilipepper off Oregon and California. Results from that assessment were incorrectly used to set harvest specifications for just the portion of the stock occurring south of 40°10’ N lat.; north of 40°10’ N lat., chilipepper was managed within the minor shelf complex. Chilipepper is a more southerly distributed species with only 7 percent occurring north of 40°10’ N lat.

All trawl IQ analyses and initial issuance regulations have been completed based on current management of chilipepper north of 40°10’ N lat. within the minor shelf complex. Removing

chilipepper from the northern minor shelf rockfish complex and designating a coastwide species-specific specification would require modifications to initial issuance rules, and control and vessel limits (for individual species and aggregate QS) for chilipepper and minor shelf rockfish. Determining the permit catch histories of chilipepper separately from the other northern minor shelf rockfish catch histories may be a very difficult task and may not be doable in time for January 1, 2011 implementation. For these reasons and considering the relatively small estimated biomass of chilipepper north of $40^0$10' N lat., **the GMT recommends the Council continue to manage chilipepper within the northern minor shelf complex for 2011-2012.**

Although initial allocation of trawl quota shares only occurs once, modifications to quota shares will occur in the future based on changes to our understanding of stock status from new assessments (e.g., removing stocks from complexes or declaring species rebuilt). Provisions to account for such changes have already been included in the trawl IQ program. There have been no discussions on the timing of these changes to allow incorporation into the biennial specifications. When a stock rebuilds and final specifications are decided in June, will NMFS have time to recalculate and issue IQ by January 1?

The GMT acknowledges that there are other species (e.g., greenstriped and splitnose rockfish) currently being managed within complexes that the Council may wish to consider removing in the future and species such as widow that are very nearly rebuilt. As such, guidance from NMFS relative to the process and timing needed for January 1 implementation of these specifications within the context of a rationalized trawl fishery would be beneficial.

Stock Complexes

OFL Apportionment

The OFLs determined using DCAC/DB-SRA methods were approved by the SSC, and the apportionment of those coastwide OFLs using the catch data are considered the best available science. The SSC approved use of average landings for the periods 1983-1989 and 1993-1999 for apportioning catch north and south of 40°10' N lat. in the 2011-2012 management cycle. However, in their April 2010 statement under Agenda Item I.2.b, the SSC acknowledged that although the apportionment method may not be ideal, other allocation or apportionment methodologies are not available at this time for any of the complexes or their component species. Other apportionment methods that should be examined for the next management cycle include survey indices of relative abundance and species habitat maps.

Concerns surrounding the current apportionment method based on historical landings arise from the fact that the depth distribution of effort and targeting of the species composing the complex may bias the apportionment relative to the actual abundance north and south of 40°10' N lat. The SSC recommended future consideration of species habitat maps and fishery independent surveys to revise the apportionment for the 2013 and 2014 management cycle. In addition, fishery-dependent data stratified to the appropriate depths such as commercial passenger fishing vessel (CPFV) onboard sampling data from Oregon and California may be used to develop an alternative measure of the relative abundance of minor nearshore rockfish to inform the apportionment of catch north and south of 40°10' N lat. The GMT supports more refined methods of apportioning coastwide OFLs and/or setting area-specific OFLs where possible in future management cycles.

Subcomplex Harvest Specifications

At the April 2010 Council meeting, the Council adopted the status quo OY of 155 mt as their preliminary preferred alternative ACL for the minor nearshore rockfish north subcomplex. The GMT is concerned that this ACL is higher than the summed OFL contribution of the component stocks in the complex as determined using the SSC approved OFL estimation methods (Agenda Item B.3.b, GMT Report 1). Table 2 in GMT Report 1 is augmented and corrected in the following table (Table 4). Table 4 provides another year of estimated catch (2006) for comparison and corrects the research catch of minor shelf rockfish in the north for 2008 from 1 mt to 14 mt and the total from 62 to 75 mt.

Table 4. Updated catch by sector of the minor rockfish subcomplexes by year for 2006-2008.

	Minor Rockfish North			Minor Rockfish South		
2006	Nearshore	Shelf	Slope	Nearshore	Shelf	Slope
Commercial	42	115	373	64	74	197
Recreational	58	13	0	649	275	0
Research	0	5	3	0	3	1
Total	100	133	376	713	352	198
	Minor Rockfish North			Minor Rockfish South		
2007	Nearshore	Shelf	Slope	Nearshore	Shelf	Slope
Commercial	75	127	517	70	54	148
Recreational	58	20	0	396	308	0
Research	0	6	5	0	3	1
Total	133	153	522	466	365	149
	Minor Rockfish North			Minor Rockfish South		
2008	Nearshore	Shelf	Slope	Nearshore	Shelf	Slope
Commercial	51	49	480	90	41	189
Recreational	46	12	0	304	171	0
Research	0	14	4	0	0	0
Total	97	75	484	394	212	189

Blue Rockfish Harvest Guidelines

Blue rockfish are currently managed in the minor nearshore rockfish subcomplexes with a California statewide harvest guideline (HG) specified to prevent overfishing the assessed portion of the stock. Blue rockfish is currently estimated to be in the precautionary zone at 30.3% of unfished biomass and is managed using a statewide California HG of 220 mt. The GMT notes the status quo HG is calculated based on the estimated OFL from the assessment despite the fact the stock is in the precautionary zone. While an HG based on the projected OFL from the 2007 assessment provides protection from overfishing the stock, it may not provide adequate harvest control to rebuild the stock to B_{MSY}. Therefore, a statewide HG based on the 40-10 harvest control rule should be considered.

The Council has identified option 2 as the preferred alternative for applying the 40-10 harvest control rule to stocks in the precautionary zone under Amendment 23. If the option 2 control rule is used in determining the blue rockfish HG, it would only apply to the assessed portion of the stock in California waters north of Pt. Conception. The HG contribution of the assessed portion of the stock would use the projected OFL from the assessment, apply a P* buffer to

determine the ABC contribution, and then apply the 40-10 adjustment as contemplated under an option 2 control rule. The south of Pt. Conception HG contribution would be based on the OFL determined using a DB-SRA approach and then applying a P* approach for determining the ABC. The ACL is set equal to the ABC and the two contributions are summed to calculate the HG. Therefore, the HG can depend on the choice of the P*/ABC buffer in cases where that approach is used. The GMT has requested the option 2 40-10 adjustments and will provide alternative HGs for Council consideration under Agenda Item B.7.

High OFL Contribution Species

The following species present a concern in the setting of harvest specifications given the estimates of abundance from new stock assessments or OFL calculations that result in large proportional contributions to the complexes and subcomplexes they are managed in. There are potentially two methods of constraining their contribution both at the complex and subcomplex levels. The first is to calculate their ABC contribution using an extremely low P* value. While this might work mathematically, it seems a corruption of the original intent of P* (i.e., assigning the probability of overfishing based on the risk of incorrectly assigning the OFL) that would provide a buffer against overharvest of co-occurring stocks in the complex rather than scientific uncertainty. The second is to specify the contribution of the component stock directly. This may be done through either an HG or ACT with the following considerations.

An HG or ACT would require sorting of landings and/or estimation of bycatch and discard levels at sea. In addition to the justification for lowering harvest of these component species, inseason monitoring capability may be spotty even with a sorting requirement. Greenstriped and splitnose are primarily bycatch species that are discarded at sea. As such they are likely to be estimated based on species composition estimates of all associated species within their subcomplex. The concepts of ACT and HG appear very similar, if not equivalent in concept in the draft Amendment 23 FMP language. ACTs are described as an accountability measure that might be particularly important for species for which inseason monitoring is less certain.

Ideally the specifications used to control the effect of these large contributor stocks would mimic the ratios of the component species encountered in the fishery. This is difficult to achieve for a number of reasons. Often data are only available at the subcomplex level, the ratios of catch change over time, and the biomass of component species relative to one another is not static over time. This leaves little option but to reduce catch of the large contributor stocks to an order of magnitude that would be expected from incidental fishery interactions.

The Council's PPA for setting subcomplex ACLs was to use the status quo harvest levels from the last biennial cycle. While the GMT has noted some issues with the PPA for subcomplex ACLs, one potential method of aligning the PPA with the notion of reducing large contributions of stocks down to an order of magnitude that would approximate what might be expected from the current level of catch is to set HGs or ACTs for these species that would lower their contribution and result in the status quo harvest levels. This is based on the assumption that status quo harvest levels would more closely approximate status quo ratios of interactions in the fishery. The GMT requests guidance on whether the Council would like to see this concept analyzed further.

<u>Greenstriped</u>

Greenstriped rockfish is currently managed in the northern and southern minor shelf subcomplexes. In addition to the issue of transferring catch from the shelf to other subcomplexes

discussed in Agenda Item B.3, GMT Report 1, the same issue potentially exists within the minor shelf subcomplexes. This is due the fact that greenstriped is primarily a bycatch species with the majority of the catch discarded. The stock is also estimated to be abundant giving it a large ABC/ACL contribution to the complexes. As such, allowable catch resulting from the large contribution of greenstriped is likely to be transferred to more vulnerable species and/or species with much lower OFL estimates within the minor shelf subcomplexes.

Splitnose

Splitnose rockfish presents a similar problem to greenstriped rockfish in that it is an abundant species that is mostly discarded. It is managed within the northern minor slope rockfish subcomplex. The current ABC/ACL contributions are 58 and 60 percent of the subcomplex for 2011 and 2012, respectively.

Yellowtail

Yellowtail rockfish has a large contribution to the southern minor shelf subcomplex which may also be of concern given its co-occurrence with more vulnerable species. Yellowtail is not a bycatch species like greenstriped and splitnose, but the ABC/ACL contribution is greater than 50 percent of the subcomplex.

GMT Recommendations:

1. **Correct the Sablefish ACL alternatives.**
2. **Use the variance weighted approach to determining sablefish abundance ratios north and south of 36° N latitude.**
3. **Manage chilipepper within the minor shelf rockfish subcomplex in the north rather than specifying a coastwide ACL.**
4. **Request guidance from NMFS relative to the process and timing needed for January 1 implementation of new harvest specifications within the context of a rationalized trawl fishery.**
5. **Examine alternative methods that may improve apportionment of stocks north and south of 40° 10' N lat. prior to 2013-2014.**
6. **Consider whether or not to apply the 40-10 default harvest control rule for determining a California blue rockfish HG.**
7. **Consider setting HGs or ACTs for greenstriped, yellowtail, and/or splitnose rockfish that would lower their contribution to subcomplexes (e.g., by setting them such that the result is status quo harvest for the subcomplex).**