SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON LINGCOD AND CABEZON STOCK ASSESSMENTS FOR 2005-2006

Lingcod

The Scientific and Statistical Committee (SSC) reviewed results from the lingcod stock assessment at its November 2003 meeting (Exhibit D.6, Attachment 3, November 2003) and noted that values of the recruitment variability parameter (σ_r) in both the lingcod north (LCN) and lingcod south (LCS) models were too low (0.2 and 0.3, respectively) and should be increased. This parameter controls the level of year-to-year variation in recruitment. The SSC also recommended that the coastwide rebuilding analysis should be considered the sum of the outputs from the LCN and LCS models.

In reaction to the SSC's requests, the Stock Assessment Team (STAT) prepared a report (Addendum: February 1, 2004 – Response to November 2003 SSC Review, Exhibit E.2.a, Attachment 2, March 2004) that was reviewed by the SSC Groundfish Subcommittee during a public teleconference held February 25, 2004. In responding to the SSC's request the STAT Team re-evaluated the performance of the LCN and LCS lingcod models by increasing the σ_r parameter in increments of 0.1. The STAT Team found that model fit improved as the parameter increased, but that model convergence deteriorated when it exceeded 0.5. Overall, larger values of σ_r tended to better account for the observed data. Specifically, when $\sigma_r = 0.5$; (1) results indicate a much stronger 1999 year-class in both models, which is consistent with catch-at-age data obtained from both the NMFS shelf trawl survey and from commercial fisheries and (2) estimates of unfished spawning biomass (B_0) and spawning biomass in 2002 increase. As a consequence, a more favorable estimate of stock depletion ratio in 2002 results (31% for LCN and 19% for LCS). Moreover, for models with $\sigma_r = 0.5$ the estimated selectivity patterns for the various surveys and fisheries were more consistent with the comments of the STAR Panel, SSC, and Groundfish Management Team (GMT).

The SSC was concerned the model experienced convergence problems when σ_r was greater than 0.5. This problem may have been due to a combination of factors, i.e., (1) a very strong, partially-recruited cohort at the end of the modeled period, and (2) the inability of the assessment model to penalize the recruitment residual of a specific year. The latter problem is a limitation of the Coleraine modeling environment, which was used in the assessment. Given the time available, however, the SSC could not determine the exact reason for the convergence problem and concluded that some aspects of the behavior of the lingcod model are not fully understood. This issue should be explored during the next lingcod stock assessment update.

The STAT Team also re-estimated lingcod stock rebuilding, based on the new model runs using $\sigma_r = 0.5$, and computed coastwide rebuilding statistics as the sum of the outputs from the two models. For all rebuilding analyses, fishery selectivity was modeled with a dome-shaped function, which was the preferred scenario recommended by GMT, SSC, and STAR Panel. Projections from the LCN rebuilding analysis suggest that, if considered in isolation, the northern segment of the population may have rebuilt, with spawning biomass in 2004 estimated to be 28%

above the rebuilding target (40% of B_0). However, rebuilding projections from the LCS model indicate the southern stock has yet to rebuild, with current biomass estimated to be 70% of the target. However, because lingcod stock rebuilding is currently defined by the sum of outputs from the LCN and LCS models, the STAT Team evaluated rebuilding status by summing projections from the two models. Results are presented in the table below:

	LCN Coastwide						LCS		
Year	Biomass	Target	Ratio	Biomass	Target	Ratio	Biomass	Target	Ratio
2002	6,376	8,321	0.766	3,885	8,108	0.479	10,261	16,428	0.625
2003	8,477	8,321	1.019	4,482	8,108	0.553	12,959	16,428	0.789
2004	10,661	8,321	1.281	5,656	8,108	0.698	16,317	16,428	**0.993**

These findings show that on a coastwide basis lingcod has not rebuilt because the total spawning biomass is still less than the target, albeit by less than 1%.

While it is currently the Council's policy to manage lingcod as a coastwide stock, there may be compelling biological reasons to distinguish the northern and southern areas. For example, due to more rapid growth of lingcod in the north, spawning-per-recruit is greater than in the south. Such a biological difference would imply different optimal harvest rates in the two areas. As a matter of practical importance, coastwide stock assessments are based upon larger, more comprehensive data sets, but results may suffer from blending of important spatial differences. The SSC discussed the merits of spatially explicit management of lingcod and concluded that such an approach may be desirable based solely on biological grounds. More generally, this issue is likely to be important in other groundfish stock assessments (e.g., bocaccio in central California versus southern California). When sufficient data are available to support region-specific analyses and spatial differences in productivity are evident, overall management could be improved by region-specific regulations.

The marked improvement in lingcod stock status is due to the estimation of a very strong 1999 year-class, a finding that is supported by a number of data elements in the assessment. It is important to realize, however, that this year-class is a transient phenomenon and that as the cohort ages, the projected acceptable biological catch will decline. To highlight this point, the SSC recommends that, in its final report, the STAT Team prepare a histogram of the 2004 population age-frequency distribution to accompany a graph that shows the projected spawning biomass trajectory of lingcod. Moreover, a set of management measures designed to impose effective harvest constraints will be an important issue for the Council to consider because the 2003 recreational harvest in the southern area seriously exceeded its target, and by year-end the coastwide catch was slightly more than twice the OY.

Cabezon

The SSC reviewed results from the cabezon stock assessment at its November 2003 meeting (Exhibit D.6, Attachment 1, November 2003) and expressed concern that the time series of California Department of Fish and Game (CDFG) Commercial Passenger Fishing Vessel (CPFV) logbook data used to model the stock was truncated to begin in 1960, although published information was available extending back to at least 1947[1/]. Moreover, cabezon harvests and catch rates were apparently highest during the excluded period from 1947-1959. Based on that concern, the SSC recommended to the cabezon STAT Team "that the CPFV logbook data be re-assembled, evaluated, and, if appropriate, included in the assessment model."

In reaction to the SSC's requests, the STAT Team prepared a response (SSC Requests from the November PFMC meeting, Exhibit E.2.a, Attachment 3, March 2004) that was reviewed by the SSC Groundfish Subcommittee during a public teleconference held February 25, 2004. Results presented in the STAT response (Table 3.SSC) indicate that inclusion of the earlier data in the model did not have a major impact on the conclusions of the assessment, especially with regard to depletion. For example, information in the original assessment (Exhibit D.6, Attachment 1, November 2003) indicated that cabezon spawning output in 2003 was 34.7% of that expected to occur in the absence of fishing, whereas when the earlier CPFV data (labeled "new catch & 1947-" in Table 3.SSC) were included, spawning output was estimated to be 33.4%. However, the model's estimate of 40-10 adjusted optimum yield (OY) changed more substantially, increasing from 60.5 mt to 74.5 mt (a 23% increase).

The STAT Team further argued in their response that "ignoring the data prior to 1960 is the most scientifically defensible approach" and recommended against inclusion of the earlier information. This view was founded on the belief that there was "no actual sampling" to verify the accuracy of self-reported CPFV logbook data from the earlier period. However, that conclusion is incorrect. Published results from a California Department of Fish and Game study[2/] that censussed the actual catch of CPFV vessels from 1947-1951 from San Francisco to San Diego showed that self-reporting by the fleet was very accurate (i.e., the total catch of 11,224 anglers was accurate to within 4%). With respect to cabezon specifically, actual catches were about 10% higher than were the self-reported CPFV logbook catches.

Other published information indicates the entire recreational catch of cabezon during the 1950s was quite high. For example, the CPFV harvest likely accounted for less than 15% of all sport catches[3/]. One investigator[4/] went so far as to say "in view of the sixfold increase in sport landings of the cabezon since the end of the war, the drain on the population may conceivably reach proportions capable of diminishing the stock in the foreseeable future." This opinion is supported by a cursory examination of the data presented in Young[1/], which shows that cabezon may well have been depleted by 1967. Morever, the STAT Team assumed that the average size of cabezon taken in the CPFV fishery was 0.8 kg-2.0 kg, depending on the year and area in question. However, Miller and Gotshall[3/] present information that shows the mean size of cabezon captured in the CPFV fishery in 1960 was 2.4 kg, which is consistent with results presented in O'Connell[4/]. Thus, underestimation of mean size is another potentially significant source of bias in establishing the historical catch of cabezon.

The reliability of the published information relating to cabezon that was collected by CDFG during the period 1947-1959 was discussed by the SSC, and it was concluded those data should

be included in the assessment model. Therefore, the SSC recommends the model labeled "New Catch + CPUE index: New catch & 1947-" be adopted by the Council for management of the cabezon stock in 2005-2006. The STAT Team acknowledged that recommendation and indicated a willingness to prepare comprehensive harvest projections using that model, which would include the Council's 40:10 groundfish harvest policy and the California Nearshore Fishery Management Plan 60:20 control rule. In addition, because the SSC has lingering concerns about the status of the cabezon resource, the SSC recommends that during next year's stock assessment update all historical CDFG recreational catch and effort statistics should be more fully evaluated through modeling of the stock.

1/ Young, Parke H. 1969. California partyboat fishery, 1947-1967. Calif. Dept. Fish and Game, Fish Bulletin 145, 91 p.

2/ Baxter, J. L., and P. H. Young. 1953. An evaluation of the marine sportfishing record system in California. Calif. Fish and Game 39(3):343-353.

3/ Miller, D. J., and D. Gotshall. 1965. Ocean sportfish catch and effort from Oregon to Point Arguello, California, July 1, 1957 – June 30, 1961. Calif. Dept. Fish and Game, Fish Bulletin 130, 135 p.

4/ O'Connell, Charles P. 1953. The life history of the cabezon, *Scorpaenichthys marmoratus* (Ayres). Calif. Dept. Fish and Game, Fish Bulletin 93, 76 p.

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