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Proceedings Series 2007/052 | **Série des comptes rendus 2007/052**

Proceedings of the PSARC Groundfish Subcommittee Meeting

Compte rendu de la réunion du sous-comité des poissons pélagiques du CEESP

November 21, 2007
Pacific Biological Station
Nanaimo, BC

21 novembre 2007
Station biologique du pacifique
Nanaimo, C.-B,

G. Logan

G. Logan

Fisheries and Oceans Canada
Pacific Biological Station
3190 Hammond Bay Road
Nanaimo, BC V9T 6N7

March 2008

Mars 2008

Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings include research recommendations, uncertainties, and the rationale for decisions made by the meeting. Proceedings also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

Avant-propos

Le présent compte rendu a pour but de documenter les principales activités et discussions qui ont eu lieu au cours de la réunion. Il contient des recommandations sur les recherches à effectuer, traite des incertitudes et expose les motifs ayant mené à la prise de décisions pendant la réunion. En outre, il fait état de données, d'analyses ou d'interprétations passées en revue et rejetées pour des raisons scientifiques, en donnant la raison du rejet. Bien que les interprétations et les opinions contenus dans le présent rapport puissent être inexacts ou propres à induire en erreur, ils sont quand même reproduits aussi fidèlement que possible afin de refléter les échanges tenus au cours de la réunion. Ainsi, aucune partie de ce rapport ne doit être considéré en tant que reflet des conclusions de la réunion, à moins d'indication précise en ce sens. De plus, un examen ultérieur de la question pourrait entraîner des changements aux conclusions, notamment si l'information supplémentaire pertinente, non disponible au moment de la réunion, est fournie par la suite. Finalement, dans les rares cas où des opinions divergentes sont exprimées officiellement, celles-ci sont également consignées dans les annexes du compte rendu.

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ISSN 1701-1272 (Printed / Imprimé)

Published and available free from:
Une publication gratuite de :

Fisheries and Oceans Canada / Pêches et Océans Canada
Canadian Science Advisory Secretariat / Secrétariat canadien de consultation scientifique
200, rue Kent Street
Ottawa, Ontario
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Printed on recycled paper.
Imprimé sur papier recyclé.

Correct citation for this publication:
On doit citer cette publication comme suit :

DFO, 2008. Proceedings of the PSARC Groundfish Subcommittee Meeting, November 21, 2007. DFO Can. Sci. Advis. Sec. Proceed. Ser. 2007/052.

PACIFIC SCIENTIFIC ADVICE REVIEW COMMITTEE (PSARC)
GROUNDFISH SUBCOMMITTEE MEETING

SUMMARY

The Pacific Scientific Advice Review Committee (PSARC) Groundfish Subcommittee met November 21, 2007 at the Pacific Biological Station in Nanaimo, B.C. The Subcommittee reviewed one working paper.

Groundfish working papers requiring intensive peer-review of a complex assessment should consider review opportunities in a workshop setting prior to the PSARC meeting where management advice is provided. This interim review could occur over several meetings and must be consistent with the formal National Advisory Framework that is part of the DFO (Canadian Science Advisory Secretariat) science advisory process documented at: http://www.dfo-mpo.gc.ca/csas/csas/Process-Processus/AsvisPro-ProConsult/asvispro-proconsult_e.htm#types

Working Paper G2007-04: Status report on Canary rockfish (*Sebastes pinniger)*

The Subcommittee accepted the working paper subject to revisions. The Subcommittee requested that the authors provide explicit rationale for their fixed parameter and model configuration choices, drawing support from the literature wherever possible. The inclusion of figures for “Run 05” and “Run 17” that match those already provided for “Run 02”, “Run 08”, and “Run 11” was requested. The Subcommittee requested the inclusion of a table that reports the harvest rates implied by the various levels of fixed catch used in the decision tables and calculation of F_{MSY}.

The Subcommittee determined that the data selected for analysis, the analytical methodology, and conclusions drawn were adequate to support the harvest advice provided as decision tables relating to the selected performance measures.

The Subcommittee recommended that the single model configuration (“Run 02”) lacking commercial age composition data be eliminated as a candidate. The rationale advanced by the Subcommittee was that the age composition data represented the only source of information on recruitment and age-dependent parameters estimated by the model.

The Subcommittee recommended that model configurations with deterministic recruitment not be used for advice because they dampen recruitment variability and are therefore unrealistic. The Subcommittee supported consideration of candidate results based on:

- stochastic recruitment, fixed commercial selectivity and steepness of 0.7 (“Run 5”);

- stochastic recruitment, estimated commercial selectivity and steepness of 0.7 (“Run 11”); and
- stochastic recruitment, estimated commercial selectivity and steepness 0.55 (“Run 17”)

SOMMAIRE

Le sous-comité du poisson de fond du Comité d’examen des évaluations scientifiques du Pacifique (CEESP) s’est réuni le 21 novembre 2007 à la Station biologique du Pacifique, à Nanaimo en Colombie-Britannique, pour examiner un document de travail.

Les documents de travail sur le poisson de fond nécessitant que l’on procède à un examen par des pairs intensif d’une évaluation complexe devraient être passés en revue dans un atelier avant la réunion du CEESP où un avis est formulé à l’intention des gestionnaires. Cet examen provisoire pourrait s’échelonner sur plusieurs réunions et doit être mené conformément au cadre de consultation scientifique national officiel, qui fait partie du processus de consultation scientifique du MPO (Secrétariat canadien de consultation scientifique), que l’on peut trouver à l’adresse suivante : http://www.dfo-mpo.gc.ca/csas/csas/Process-Processus/AsvisPro-ProConsult/asvispro-proconsult_f.htm#types

Document de travail G2007-04 : Rapport sur l’état du sébaste canari (*Sebastes pinniger)*

Le sous-comité accepte le document de travail moyennant l’apport de révisions. Il demande aux auteurs d’exposer clairement les raisons de leurs choix concernant le paramètre fixe et la configuration des modèles et d’étayer leur position avec la littérature dans la mesure du possible. On demande également que soit inclus des chiffres, pour le « passage 05 » et le « passage 17 », correspondant à ceux déjà fournis pour le « passage 02 », le « passage 08 » et le « passage 11 ». Le sous-comité demande l’inclusion d’un tableau indiquant les taux de récolte associés aux divers niveaux de captures fixes utilisés dans les tableaux de décision et pour le calcul de F_{RMS}.

Le sous-comité considère que les données choisies pour l’analyse, la méthodologie analytique et les conclusions tirées soutiennent l’avis en matière de récolte fourni sous la forme de tableaux de décision sur les mesures de rendement retenues.

Le sous-comité recommande que l’on élimine, de la liste des choix, la configuration de modèle simple (« passage 02 ») qui ne comportait pas de données sur la composition par âge commercial. Selon le sous-comité, les

données sur la composition par âge représentent la seule source d'information sur le recrutement et les paramètres dépendants de l'âge estimés par le modèle.

Le sous-comité recommande que l'on n'utilise pas de configuration de modèles avec un recrutement déterministe pour établir un avis du fait qu'ils amortissent la variabilité du recrutement et sont, de ce fait, peu réalistes. Le sous-comité supporte la prise en considération de résultats potentiels fondés sur :

- un recrutement stochastique, une sélectivité commerciale fixe et un taux de variation de pente de 0,7 (« passage 5 »);
- un recrutement stochastique, une sélectivité commerciale estimée et un taux de variation de pente de 0,7 (« passage 11 »);
- un recrutement stochastique, une sélectivité commerciale estimée et un taux de variation de pente de 0,55 (« passage 17 »).

INTRODUCTION

The PSARC Groundfish Subcommittee met November 21, 2007 at the Pacific Biological Station in Nanaimo, British Columbia. External participants from industry, academia, First Nations and conservation groups attended the meeting. The Subcommittee Chair, G. Logan opened the meeting by welcoming the participants. During the introductory remarks the objectives of the meeting were reviewed, and the Subcommittee reviewed the meeting agenda which also included a review of a draft Redbanded rockfish paper. That review was deferred to 2008 due to time constraints.

The Subcommittee reviewed one Working Paper which is summarized in Appendix 1. The meeting agenda appears as Appendix 2. A list of meeting participants and reviewers is included as Appendix 3

DETAILED COMMENTS FROM THE REVIEW

Compliance with National Policy on Fishery Decision Making

The Subcommittee was asked to consider a proposal to routinely evaluate whether working papers that provided harvest advice were compliant with the national policy on fishery decision-making. The Subcommittee noted that a Science Advisory Report (DFO 2006) on harvest strategies compliant with the Precautionary Approach was now national policy. Furthermore, in March of 2007 Fisheries and Aquaculture Management (FAM) advanced a Fishery Decision-Making Framework for consultation that includes requirements to identify:

1. Objectives for desirable resource and fishery outcomes;
2. Reference points and stock status zones linked to stock and ecosystem indicators (i.e., DFO 2006);
3. Harvest rate strategies and harvest decision rules to scale resource use to its condition in a manner that avoids undesirable outcomes and defines stock growth criteria (i.e., DFO 2006);
4. Explicit consideration of status uncertainty and uncertainty related to the implementation of the management approach;
5. Explicit advice on the risk of decline associated with a management action;
6. Participation of fishery interests in the development of decision rules, long-term planning and consultation.

Although the FAM framework has not been finalized, the final policy will likely be similar to the existing policy document. Thus, the Subcommittee was asked to discuss a proposal to comment in the Subcommittee Report on the degree to which working papers that provide harvest advice are (*i*) compliant with the harvest strategy policy described by DFO (2006), and (*ii*) consistent with FAM fishery decision-making framework. Where working papers depart from policy

with respect to the provision of harvest advice, the Subcommittee should assess whether the departure is appropriate for the stock under consideration.

G2007-04: Status report on Canary rockfish (*Sebastes pinniger*)

R.D. Stanley, P. Starr and N. Olsen

Paper accepted subject to revisions

The first reviewer complemented the authors on their efforts, noting that the document was well-written, logically organized and relatively easy to follow. The reviewer concluded that the data and methods are adequate to support the conclusions, though he noted other interpretations of the analyses are possible. The catch-at-age model was judged to be a relatively standard application of the methodology. The reviewer raised three points on the treatment of the age composition data:

1. The rationale for setting a plus group at age 60 was unclear given the near absence of females after age 30 and the presence of relatively few males after age 40;
2. The presentation of the fit to age proportions needed to be improved by inclusion of bubble plots of the age residuals by age and year, and
3. With the exception of some signs of the 1977 year class there is little evidence of the progression of strong age classes through the population. Given the likelihood of ageing errors (e.g. smearing of age classes) for rockfish species, the reviewer noted the absence of modeling of ageing errors in the catch-age analysis such as has been implemented recently for New Zealand hoki.

Some confusion was expressed over the ratio of 8,000 to 9,000 t of female spawning biomass to a total vulnerable coast-wide population of 25,000 to 30,000 t. He noted that the selectivity function alone did not seem to explain this disparity (later Subcommittee discussion pointed out that the vulnerable biomass includes both males and females and the fish recruit to the fishery before they mature). The authors pointed out that the tripling in biomass from spawning biomass to exploitable biomass is consistent with the lower M for males. The males dominate in the exploitable biomass because they survive longer. The reviewer suggested that the model fit the age data closely at the expense of the fit to the survey indices and thought it is reasonable to include a weighting scheme where the survey indices were favored over the ageing data. The model fits the age data not because of excess weight but because of it. While the model cannot fit short term changes owing to the inertia of rockfish population dynamics, the model does provide a population trajectory that is effectively balances between survey results. Furthermore, the runs which exclude ageing data indicate the results when survey indices are completely favoured.

On the issue of sensitivity analyses, the reviewer thought that worthwhile tests might include additional model configurations with alternative assumptions about *M*. For example, *M* could be increased over time based on the increase in abundance of predator species that has taken place synchronously with the perceived decline of canary rockfish. It was suggested that since the majority of canary rockfish appeared to be captured between 100 and 200 m depth, that the abundance indices might show more trend signal if the indices were based on data extracted from that depth range. The authors noted that this core depth range was exactly what was used in the treatment of the shrimp survey. The reviewer concluded his evaluation of methodological issues by suggesting that alternative, swept-area expansions of habitat-specific densities might yield a (relative) biomass index to supply as input to the catch-at-age analysis.

This reviewer then considered the harvest advice provided by the six projections that contrast assumptions regarding productivity (steepness at 0.55 or 0.7), recruitment (deterministic or stochastic), age-composition (included or not), and selectivity (estimated or fixed). The reviewer provided a rationale that empirical evidence appeared to suggest adoption of steepness of 0.55 and results from "Run 17" (catch-at-age data included, stochastic recruitment, estimated commercial selectivity and steepness of 0.55) would be an appropriate reflection of stock productivity. This choice implies that the annual catch would be approximately 250 t to achieve a 90% probability of the stock being greater than $0.2B_0$ in five years. The reviewer pointed out the requirement to identify a time-frame for rebuilding and commented during the meeting that annual catches of approximately 300 to 400 t might be appropriate.

The second reviewer noted the substantial effort by the authors and concluded that despite not being regarded as a "data-rich" species, Canary rockfish allowed for the application of a more sophisticated modeling approach than is usually possible in the context of candidate species-at-risk. He deferred most of his commentary, reasoning that most of his substantive issues had been dealt with in the course of the discussion resulting from the first review. However, the reviewer questioned the magnitude of unreported catches cited by the authors for the period beginning in the mid-1980s until 1995 when the stock is perceived to have endured the highest rate of decline since the mid-1940s. Specifically, the reviewer was concerned that there was evidence that the unreported catches were of sufficient magnitude to alter perceptions about the trajectory of the stock reconstruction. This reviewer commented during the meeting that the authors' interpretation of the results, which suggested annual catches of less than 700 t, would be consistent with the application of the proposed performance measures.

The Subcommittee further discussed the following issues:

Technical Issues

A discussion focused on (*i*) whether the choice of the plus group for the catch-at-age model could cause bias given the relative absence of female Canary rockfish after the age of about 30 and the paucity of males after about the age of 40, and (*ii*) the magnitude of the contribution of age classes with zero proportions to the age likelihood component. With regard to (*i*), it was suggested that results would be more accurate when the plus was set as old as possible, and that any sensitivity of the results to the choice of the plus group may vary in magnitude across different model configurations. The authors offered the view that the model would not be sensitive to the choice of the plus group. The contribution of the zero proportions to the likelihood was not quantified but the authors believed it would be small. The Subcommittee considered whether additional model configurations should be investigated for this issue and whether sensitivity tests related to the choice of fixed parameters in the model (such as the sex-specific natural mortality values) should be conducted. The Subcommittee concluded that changes to the model configuration and sensitivity analyses would more profitably be conducted in the course of a recovery potential assessment. However, the Subcommittee requested that the authors revise the document to provide explicit rationale for their fixed parameter and model configuration choices, drawing support from the literature or their analyses wherever possible. Uncertainties that cannot be resolved based on the existing analyses or the literature should be flagged for consideration during the conduct of a recovery potential assessment. The Subcommittee noted that the opinion of the authors that *"for a detectable level of rebuilding to occur within a 5-10 year time frame, the annual harvest should drop below 700 t per year*" was not supported by adequate analysis.

The importance of the age composition data relative to the five survey indices was debated by the Subcommittee. The Subcommittee requested that the authors clarify how a reader might interpret the likelihood components included in Table J.7 of the Appendices. The Subcommittee briefly considered whether specific surveys could be identified that were relatively better than others for the purposes of indexing Canary rockfish but no resolution to this question was achieved.

Trawl industry stakeholder commentary on current experience with Canary rockfish included the view that a recent increase in the Area 3CD stock had occurred, concurrent with a general increase in slope and shelf rockfish species in the southern regions of Area 3D. The view of trawl fishermen was that Canary rockfish are a pelagic species rather than a bottom-dwelling rockfish; this view was supported with experience related by a longline hook industry stakeholder. Concerns were expressed that (*i*) reduction of NMFS survey coverage into the northern regions of Area 3CD means that abundance trends in that area have not

been indexed, (*ii*) surveys that use bottom trawl gear may be unable to adequately monitor Canary rockfish, and (*iii*) the several of the available indices have restricted spatial coverage. In particular, the shortcomings of the WCVI shrimp trawl survey gear for monitoring Canary rockfish were pointed out, as evidenced by the low numbers/weight of Canary rockfish caught by the survey. It was also suggested that the habitat type covered by the shrimp trawl survey (soft bottom) may not represent typical Canary rockfish habitat. The point was also made that abundance trends in Areas 3CD and 5AB are possibly different, which suggested problems with the spatial resolution of the current analysis. Industry perceptions of recent abundance trends in Area 5AB were not reported.

Industry stakeholders described the strategy adopted by individual trawl fishermen with respect to quota-limited species such as Canary rockfish. One tactic is to manage catches to 70% of ITQ holdings for Canary rockfish in order to maintain a 30% reserve to cover unintended large tows. It was reported that the trawl fleet is managing to the 70% margin, suggesting that avoidance fishing dominates their consideration of Canary rockfish. Stakeholders concluded that the onset of the ITQ system in 1996 and subsequent industry perception of increased Canary rockfish abundance in northern regions of Area 3CD was a natural consequence of avoidance fishing.

The authors responded that the NMFS trawl survey had less influence on the recent model trajectory as it was discontinued in 2001, and that there was some indication of a modest increase in abundance from several of the available biomass indices in recent years which was in keeping with industry perception. However, the authors made the point that the decline in abundance perceived by the model is in the context of the total model trajectory and that useful data to inform the model were available beginning from the mid-1960s.

The Subcommittee considered the potential inclusion of commercial trawl CPUE in the analysis. The authors reported that, while they had developed a long-term CPUE index, they did not include it in the catch-at-age modeling due to concerns about hyper-stability and problems with data quality in earlier years. They elaborated that the basis for starting the synoptic survey series was to avoid issues such as hyper-stability and pointed to future analyses that will be based on the results of synoptic surveys. Although not included in the document, the authors reported that initial model results that included fishery CPUE as an abundance index were not appreciably different from the results reported in the working paper that were based only on survey indices.

The Subcommittee noted that even the most optimistic of the model runs presented gave estimates of recent exploitation rates in the range of 0.15 to 0.2 (e.g. Figure J.8), which is likely to be high for Canary rockfish, given the known low productivity of this species. The Subcommittee therefore asked for information on the fishing mortality reference points for this species, for example, F_{MSY}, that could be compared with the exploitation rates in the projections. In

particular, the Subcommittee noted that Canary rockfish mature after they become vulnerable to fishing and that this could create a situation where recruitment overfishing of females could occur at exploitation rates not much higher than F_{MSY}. The Subcommittee requested the inclusion of a table that reported the harvest rates implied by the various levels of fixed catch reported in the decision tables and calculation of F_{MSY}. The authors agreed to evaluate whether this information could be supplied for the current analysis in a timely fashion.

Management Advice

Harvest advice to fishery managers was provided in the form of a series of decision tables associated with the following performance measures

1. The probability that projected biomass is great than or equal to $0.2B_0$ (a candidate limit reference point);
2. The probability that projected biomass is greater than or equal to $0.4B_0$ (a candidate upper stock reference);
3. The probability that projected biomass is greater than the biomass in 2008, B_{2008}.

Other performance measures related to the magnitude of the expected change in the stock over the projection period were provided in a working paper Appendix. The performance measures were computed for fixed catch levels ranging from 0 to 1,200 t in 100 t increments over a five year projection period. Results advanced in the main body of the paper represented five year projections of the fixed catch levels.

The authors clarified their recommendation that catch be reduced to less than 700 t by noting that the quota could be set higher and still result in catches of 700 t or less because of the constraints imposed by ITQ system (i.e., individual fishermen could not fully prosecute area-specific allocations because ITQ constraints). The authors re-iterated that recent catches had not achieved the assigned quota probably because of ITQ constraints rather than the inability of the trawl fleet to capture Canary rockfish. This viewpoint was also emphasized by stakeholders as noted above.

Considerable Subcommittee discussion was centered on the choice of stock-recruitment steepness value (0.55 versus 0.7). One author commented that although the literature based on west coast rockfish assessment favours the lower steepness value, plausible values of this parameter are in dispute. It was pointed out that the choice of steepness represents an uncertainty that cannot be resolved, given the available data. The Subcommittee noted that the pairing of a model configuration with stochastic recruitment, fixed commercial selectivity, and steepness of 0.55 was not included for comparison with a configuration where steepness was assumed to be 0.7 (“Run 05”). The authors responded that it

was felt that the runs where selectivity was fixed were less credible than the runs where selectivity was estimated and that time precluded doing all possible pairings. Nevertheless some members of the Subcommittee requested that this additional run be provided.

One author noted that many assessments in New Zealand typically used steepness values that were higher than 0.7, including for orange roughy (a long-lived and low productivity species) where a steepness of 0.75 is assumed. This author felt that a steepness of 0.55 was implausible for a teleost fish with high fecundity, but also agreed that it is not possible, given the available data, to distinguish between the two steepness hypotheses investigated in the model runs. The Subcommittee noted that steepness values of 0.9 and above in effect implied that no stock recruitment relationship existed and allowed no possibility of a decline in recruitment except at very low stock size. The Subcommittee noted examples based on analyses of east coast gadid species where impairment of recruitment at low stock sizes had occurred (e.g. Northern cod, haddock on Georges Bank).

The Subcommittee suggested that fishery managers disregard the model outputs (*i*) where age composition data were not included (Run 02), and (*ii*) results with deterministic recruitment (Run 08 and Run 14). The Subcommittee then noted that model configurations with stochastic recruitment were not completely reported in the working paper and requested that figures corresponding to specific configurations (e.g., fixed selectivity and steepness of 0.55) be included in the document to match those already provided.

Subcommittee Recommendations

Recommendation 1: The Subcommittee accepted the working paper subject to revisions. The Subcommittee requested that the authors provide explicit rationale for their fixed parameter and model configuration choices, drawing support from the literature wherever possible. The inclusion of figures for “Run 05” and “Run 17” that match those already provided for “Run 02”, “Run 08”, and “Run 11” was requested. The Subcommittee requested the inclusion of a table that reports the harvest rates implied by the various levels of fixed catch used in the decision tables and calculation of F_{MSY}.

Recommendation 2: The Subcommittee determined that the data selected for analysis, the analytical methodology, and conclusions drawn were adequate to support the harvest advice provided as decision tables relating to the selected performance measures.

Recommendation 3: The Subcommittee recommended that the single model configuration (“Run 02”) lacking commercial age composition data be eliminated as a candidate. The rationale advanced by the Subcommittee was that the age composition data represented the only source of information on recruitment and age-dependent parameters estimated by the model.

Recommendation 4: The Subcommittee recommended that model configurations with deterministic recruitment not be used for advice because they dampen recruitment variability and are therefore unrealistic. The Subcommittee supported consideration of candidate results based on:

- stochastic recruitment, fixed commercial selectivity and steepness of 0.7 ("Run 5");
- stochastic recruitment, estimated commercial selectivity and steepness of 0.7 ("Run 11"); and
- stochastic recruitment, estimated commercial selectivity and steepness 0.55 ("Run 17").

Recommendations on Groundfish PSARC Process

The Subcommittee noted that the increasing level of detail and sophistication of analyses has recently threatened to overwhelm time constraints imposed by the traditional PSARC format for technical review. In particular, the increased requirement for technical review cannot always be accommodated while at the same time ensuring due consideration of the formulation and interpretation of harvest advice. Various options for ensuring adequate technical review were considered by the Subcommittee. These ranged from a multi-step process that takes the review through several stages, to informal *ad hoc* meetings. Subcommittee members indicated that (*i)* interim review stages were unlikely to be conducted unless accommodated by the PSARC process, and (*ii*) the completion of interim reviews prior the final meeting should not preclude technical discussion as warranted during the final PSARC meeting.

Recommendation 5: Groundfish working papers requiring intensive peer-review of a complex assessment should consider review opportunities in a workshop setting prior to the PSARC meeting where management advice is provided. This interim review could occur over several meetings and must be consistent with the formal National Advisory Framework that is part of the DFO (Canadian Science Advisory Secretariat) science advisory process documented at: http://www.dfo-mpo.gc.ca/csas/csas/Process-Processus/AsvisPro-ProConsult/asvispro-proconsult_e.htm#types

In particular, input from reviewers both internal and external to DFO will be solicited whenever possible. The need for interim reviews should be identified as early as possible in the process such as during the development of the request-for-working-paper. The products of the workshops will include a Proceedings Document to be posted on the CSAS website that documents the deliberations of the workshop(s).

The purpose of the review will be to resolve issues of (*i*) sampling design, (*ii*) intermediate data processing steps, (*iii*) model algorithms, (*iv*) model assumptions and estimation methods, (*v*) incorporation and representation of

uncertainty, (*vi*) sensitivity analyses, (*vii*) vetting of plausible alternative models, (*viii*) presentation of results in a format suitable for fishery management advice, and (*ix*) assessment of compliance with the Precautionary Approach (DFO 2006) and the national fishery decision-making policy framework. The review team shall call upon internal/external experts as required and shall call upon the appropriate Fisheries Management personnel to determine requirements for the provision and format of management advice.

The final draft working paper submitted to PSARC shall include a record of the interim meeting(s) that documents technical issues identified during the development of the document.

References

DFO. 2006. A harvest strategy compliant with the precautionary approach. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2006/023.

APPENDIX 1. Working Paper Summary

Working Paper G2007-04: Status report on Canary rockfish (*Sebastes pinniger)*

R.D. Stanley, P. Starr and N. Olsen

The status of the B.C. population of canary rockfish (*Sebastes pinniger*) is assessed as one coastwide stock. The analysis used a catch at age model tuned to five fishery-independent surveys and age composition data from the commercial fishery. It uses estimates of catch starting in 1940. The model was started from an equilibrium state in 1940 while the available fishery-independent survey data span a period from 1967 to 2007, although not all intervening years are represented. There is one age sample from 1978 while the remaining samples cover the period from 1990 to 2004.

The stock assessment specifically investigated the following factors: 1) the effect of including the proportion-at-age data from the commercial fishery; 2) the impact of deterministic or stochastic recruitment; 3) the impact of estimating or fixing the commercial selectivity, and 4) the impact of steepness of values 0.70 or 0.55. Six model runs covered the above uncertainty options. A Bayesian approach, based on the Markov Chain Monte Carlo (MCMC) algorithm was used to estimate the joint posterior distributions of model parameters and to make projections for five years from 2009 to 2013 across a range of fixed catch options.

The results were consistent in indicating that the stock has declined from its original biomass levels to between 15% and 35% of B_0. It is likely that this decline has been arrested and it is even possible that the stock is presently rebuilding at recent harvest levels, which have averaged about 875 t since 1997. What is not certain from this assessment is whether current catch levels will ensure a rebuild. Some of the runs investigated in this assessment suggest that current removals will allow a slow rebuild. The runs with lower steepness or which do not estimate the commercial selectivity suggest that this is not the case. Taken collectively, the results of this analysis indicate that to be reasonably confident for a detectable level of rebuilding to occur within a 5 to 10 year time frame, annual harvests should probably drop to below 700 t. Decision tables are provided to assist managers in selecting the optimal harvest option.

APPENDIX 2: PSARC Groundfish Subcommittee Meeting Agenda

DRAFT AGENDA
PSARC Groundfish Subcommittee Meeting
November 21, 2007

Seminar Room
Pacific Biological Station

Wednesday-November 21	
Introduction and procedures	9:00 – 9:15
Canary Rockfish Assessment	9:15 – 12:00
Lunch Break	12:00 – 1:00
Redbanded Rockfish Assessment	1:00 – 4:00

APPENDIX 3. List of Attendees

Subcommittee Chair: Gary Logan
PSARC Chair: Al Cass

External Participants	
Name	**Affiliation**
Ashcroft, Chuck	SFAB
Buchanan, Scott	Archipelago Marine Research
Chalmers, Dennis	MOE
Clayton, Lorne	Pacific Coast Shrimpers Cooperative Assoc.
Koolman, John	Hook and Line Groundfish Association
McAllister, Murdoch	UBC
Mose, Brian	CGRCS
Starr, Paul	CGRCS
Turris, Bruce	CGRCS
DFO Participants	
Acheson, Schon	
Anderson, Scott	
Cass, Al	
Dunsmore, Gary	
Fargo, Jeff	
Haigh, Rowan	
Keizer, Adam	
King, Jackie	
Kronlund, Rob	
Logan, Gary	
McFarlane, Sandy	
Rutherford, Kate	
Schweigert, Jake	
Sinclair, Alan	
Smedbol, Kent	
Stanley, Rick	
Workman, Greg	
Yamanaka, Lynne	

Reviewers for the PSARC papers presented at this meeting are listed below, in alphabetical order. Their assistance is invaluable in making the PSARC process work.

Palsson, Wayne	Washington Department of Fish and Game
Schweigert, Jake	Fisheries and Oceans Canada, Pacific Region
Smedbol, Kent	Fisheries and Oceans Canada, Maritimes Region
Yamanaka, Lynne	Fisheries and Oceans Canada, Pacific Region