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Proceedings Series 2000/26 | **Série des compte rendus 2000/26**

Report of the PSARC Invertebrate Subcommittee Meeting, November 28-29, 2000

M. Stocker and I. Perry (Editors)
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Pacific Biological Station
Nanaimo, British Columbia V9R 5K6

December 2000

Canada

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PACIFIC SCIENTIFIC ADVICE REVIEW COMMITTEE

PSARC ADVISORY DOCUMENT 00-08
DECEMBER 2000

INVERTEBRATES

SUMMARY

The PSARC Invertebrate Subcommittee met November 28-29, 2000 in the Seminar Room at the Pacific Biological Station in Nanaimo, B.C. The Subcommittee reviewed two working papers and five Fishery Updates.

Working Paper I00-08: Estimated bycatch in the British Columbia shrimp trawl fishery

This paper provides information on the bycatch of non-target species in the shrimp-by-trawl fishery. Total estimated bycatch from beam trawls was generally higher than from otter trawls. Bycatch of some groundfish species were estimated to be a significant proportion of their Total Allowable Catch (TAC) in directed fisheries. The authors recommend that bycatch sampling continue and should be conducted using a more rigorous survey design. The Subcommittee agreed with these recommendations and noted the potentially significant impacts of this bycatch to certain species. The Subcommittee highlighted the need to account for all sources of fishing mortality in assessments of commercially-important species. The Subcommittee recommended a DFO multi-sector working group to examine bycatch issues. The Subcommittee also recommended that the use of bycatch reduction devices in the shrimp trawl fishery be documented, and the effect they have on bycatch quantities and composition be examined as an objective of this bycatch program.

Working Paper I00-09: Discussion on a framework for implementing northern abalone stock rebuilding experiments in British Columbia

This paper reports on rebuilding and restocking attempts for abalone. Pilot experiments are proposed that potentially may provide information on large-scale methods to rebuild northern abalone stocks in British Columbia. An ecosystem approach is recommended in which habitat parameters, algae and invertebrates are monitored. Maintaining the northern abalone fishery closure indefinitely and continuing large scale index site surveys every 4-5 years to monitor northern abalone populations are also important. Enforcement to prevent poaching of northern abalone will be critical to the success of rehabilitation attempts and long-term experiments. The Subcommittee agreed with the recommendations for the experiments, and noted the need to identify appropriate spatial scales. Continued enforcement, in particular of the experimental areas, will be essential to the success of these multi-year experiments. The Subcommittee expressed its desire to review the science components of the developing DFO Recovery Plan for abalone.

Fishery Updates

Fisheries Management staff, in consultation with Conservation and Protection

and Stock Assessment Divisions, prepare fishery updates. The updates provide summaries of commercial fishery performance, including significant management, enforcement, and stock assessment activities on an annual basis. The updates provide the opportunity to identify high priority issues that affect assessments and conservation concerns. The fishery updates for the euphausiid, prawn, scallop, red sea urchin, and razor clam fisheries were presented at this meeting.

Emerging Issues

One emerging issue was identified by the Subcommittee during its deliberations:

There is a need to account for all sources of fishing mortality in stock assessments. Un-reported catch can be a significant proportion of the allowable catch for some species, or may prevent the rebuilding of species at low levels of abundance. Such un-reported catch can occur as bycatch in other fisheries, or by poaching (e.g. of abalone). These removals are presently not included in stock assessments and, where they are significant, can have negative impacts on the Department's ability to determine stock status. The Subcommittee recommended that a DFO multi-sector working group be established to examine the issue of bycatch and its significance to stock assessment activities. For abalone, the Subcommittee recommended a program of public education and aggressive enforcement of the abalone closure.

INTRODUCTION

The PSARC Invertebrate Subcommittee met at the Pacific Biological Station Nanaimo, B.C., from November 28-29, 2000. The Subcommittee Chair opened the meeting by welcoming the participants. He provided introductory remarks on the roles and responsibilities of the Subcommittee, and the roles and responsibilities of external participants and observers. The Subcommittee accepted the agenda (Appendix 1). During its proceedings, the Subcommittee reviewed two working papers (Appendix 2), and five fishery updates. This Advisory Document provides the record of the Subcommittee's deliberations and recommendations.

A number of external participants attended the meeting. All participants at the meeting and the days they attended are presented in Appendix 3.

EMERGING ISSUES

One issue emerged from the meeting for special consideration.

There is a need to account for all sources of fishing mortality in stock assessments.

Issue: Un-reported catch, which is not included in stock assessments, can at times be a significant proportion of the allowable catch for some species, or may prevent the rebuilding of species at low levels of abundance.

Discussion: Un-reported catches, and the impacts these may have to the Department's ability to determine stock status, was an important theme in both the working papers presented at this meeting. The un-reported catch (bycatch) of certain species of groundfish in the shrimp trawl fishery was estimated to be a significant proportion of the TAC for these species in their directed fisheries. The Subcommittee was certain that the magnitude of these bycatch removals were not being considered in the assessments of these species. The Subcommittee also expected that removals of commercially-important invertebrates were occurring as bycatch in the groundfish trawl fishery. Un-reported removals of abalone are believed to occur by poaching, which is threatening the rebuilding of this species and will reduce the chances for success of the abalone experimental framework.

Recommendations: The Subcommittee recommended that a DFO multi-sector working group be established to examine the issue of bycatch and its significance to stock assessment activities, with a focus on groundfish and invertebrate trawl fisheries. The intent is to identify species at significant risk from bycatch, and to develop methods to collect and exchange information. For abalone, the Subcommittee recommended a program of public education and aggressive enforcement of the abalone closure, with particular emphasis on experimental sites once they are established.

WORKING PAPER SUMMARIES, REVIEWS AND DISCUSSION

I00-08: Estimated bycatch in the British Columbia shrimp trawl fishery

N. Olsen, J.A. Boutillier, L. Convey
Accepted subject to revisions

Summary

This paper is the third in a series of PSARC documents that utilise data from the bycatch sampling programme to address the issue of bycatch in the British Columbia shrimp trawl fishery. The first two papers dealt specifically with the bycatch of halibut and eulachon, while the focus of the current paper is to provide information on the bycatch of other non-target species in the shrimp-by-trawl fishery.

Bycatch sampling took place from 1997 to 1999 in 20 different Shrimp Management Areas. The majority of the sampling was conducted on otter trawlers off the West Coast of Vancouver Island and in Queen Charlotte Sound.

Coverage of beam trawlers was more limited and focused on inshore areas and the Strait of Georgia.

Beam trawler bycatch was dominated by Selachii (dogfish, ratfish, and skates), followed by commercial flatfish, commercial roundfish, non-commercial roundfish, non-commercial invertebrates, and prawns. Selachii were particularly prevalent in beam trawl catches from the Strait of Georgia and Johnstone Strait. Otter trawl bycatch was dominated by eulachon, commercial flatfish, non-commercial roundfish, commercial roundfish, and Selachii.

Total estimated bycatch of beam trawls was generally higher than otter trawls both in terms of weight, and the percent of the total catch weight. Beam trawls from the Strait of Georgia had the highest ratios of bycatch to recorded catch. Otter trawls generally had much lower ratios of estimated bycatch to recorded catch, a notable exception being Area PRD in 1997.

The authors recommend that bycatch sampling continue and should focus on areas where reliable estimates of bycatch are not available. Future sampling should also address the questions of stock identity, migration, and population estimates for critical species. A more expensive program of at-sea charters with observers that get on and off vessels at sea or 100% observer coverage may provide better information in certain areas, such as the offshore areas of the west coast of Vancouver Island.

Reviewers' Comments

Reviewer #1

The reviewer felt that the paper was a reasonable presentation of shrimp bycatch information from 1997-99, but that the rationale for the paper could be more strongly stated. The stated objectives of the paper were all met adequately, although some refinement of more progressive objectives might improve the paper. The reviewer suggested that a more inclusive treatment of sampling coverage (coastwide as opposed to specific areas) would be appropriate. The reviewer cautioned that spatial and temporal comparisons should be considered qualitative due to the short time series and unresolved role of bycatch reduction devices. The reviewer suggested expansion of the information on bycatch categorization, to identify important bycatch species in this fishery, and a more detailed analysis of management strategies used to limit bycatch in other fisheries. The reviewer supported the recommendations to increase the program and focus on potentially important species, but was surprised that no recommendations arose from the analyses carried out in the paper, particularly in instances where bycatch exceeded target catch levels or when bycatch levels represented a significant proportion of the TAC allocated to directed fisheries on the same species.

Reviewer #2:
The reviewer stated this paper is of value to the PSARC process as it quantifies a deficiency (unreported fishing mortality) in the input data used to assess various fish resources. The reviewer suggested highlighting the importance of this deficiency by indicating which assessments might be significantly affected by these "un-reported" removals.

The reviewer believed the purpose of the paper was clearly stated, but the conclusions were based on very limited data, and questioned whether these data could be considered representative. There is a need for expanded observer coverage. The reviewer stated that the recommendations need to be expanded with more detail. Further work is required to assess the reliability of the limited data and to determine the level of sampling necessary to produce reliable estimates. Work assessing the effectiveness of the excluder devices is also worth pursuing.

Subcommittee Discussion

The Subcommittee agreed with the authors' response to the reviewer's comments that there is a need to refine the recommendations. There is a need to include more detail in the paper on the description and use of bycatch reduction devices (BRD's). Length information of the bycatch is also important to capture, since it is suspected that much of the bycatch may be of young fish. A more detailed comparison of those regions for which adequate data exist is preferable to comparisons amongst all regions, regardless of data quantity. It was noted that there may be a problem in how "trace" amounts of bycatch are treated in the paper, and some discussion of this treatment is needed. The present method of assigning a weight of 0.1 kg to a trace amount of a species and then multiplying by the total hours towed in the fishery may result in an inflated total estimate.

There was discussion that the recommendations did not go far enough, and about the utility of identifying those bycatch species of special concern. The Subcommittee was concerned about the apparently large bycatch of some species, at least apparently large when compared with the current total allowable catches for those species (e.g. estimated bycatch of some rockfish species in the shrimp fishery may be a significant proportion of the TAC for these species). There is a need to account explicitly for all sources of mortality for exploited species, and the Subcommittee believes that the bycatch mortality from the shrimp fishery is not being included in assessments of other species. The Subcommittee also noted that the reverse is also likely: that bycatch mortality of invertebrates from the groundfish trawl fishery is not being included in assessments of these invertebrates. The Subcommittee strongly endorses an integrated management (ecosystem) approach, which would at least consider all sources of mortality due to exploitation (e.g. as was suggested for the Tanner crab multispecies approach). It is also unclear how the bycatch in the shrimp

fishery compares with bycatch in other fisheries in B.C. – is it of similar magnitude, species composition, etc. The Subcommittee agreed with the recommendation in the paper to form a cross-sectoral Working Group on this issue. As suggested by the authors, the bycatch classification of Hall (1999. The Effects of Fishing on Marine Ecosystems and Communities. Blackwell Science) could be a useful method to evaluate bycatch impacts.

There was discussion of the amount of detail in the Working Paper, and whether more details should be included to design a more rigorous bycatch sampling program, whether selected areas should be chosen on which to focus, and the extent to which the objectives of the sampling program should be modified to observe the influence of Bycatch Reduction Devices (BRD's) use of which became mandatory in 2000. The authors suggested that the paper should be used and considered as documenting the bycatch situation from 1997 to 1999, and as providing a benchmark against which changes due to the introduction of BRD's can be evaluated. In this context, the Subcommittee agreed that the recommendations in the paper (calling for a more detailed and directed bycatch sampling program) are appropriate, and that the objectives for the sampling program should be re-evaluated to include our present understanding of the issues and concerns (e.g. the use of BRD's).

Subcommittee Recommendations

1. The Subcommittee accepts the paper subject to revisions.
2. The Subcommittee **reiterates the urgency** for establishment of a DFO multi-sector Working Group to evaluate and compare bycatch among all trawl fisheries in B.C., so as to identify all sources of exploitation mortality. This is urgent considering that the bycatch of some species may be a significant proportion of the TAC for these species in directed fisheries.
3. That clear long-term objectives be identified for the shrimp trawl bycatch program, and that an appropriate sampling design be developed.
4. The use of bycatch reduction devices (BRD's) and their influence on bycatch, needs to be investigated explicitly in the future revised program.

I00-09: Discussion on a framework for implementing northern abalone stock rebuilding experiments in British Columbia

A. Campbell, B. Lucas, and G. Parker
Accepted Subject to Revisions

Summary

This paper reviews published reports on rebuilding and restocking attempts for abalone stocks. Pilot experiments are proposed that potentially may provide information on large-scale methods to rebuild northern abalone stocks in British Columbia. These include (1) establishing 3 or 4 experimental marine reserves throughout British Columbia to allow experimental manipulation of wild abalone

adult densities for increasing abalone recruitment, (2) experimental outplanting of hatchery-reared northern abalone juveniles, on a small scale, to determine optimal size and density for release and probability of success in increasing juvenile and adult abalone densities. An ecosystem approach is recommended in which habitat parameters, algae and invertebrates are monitored. Manipulation of red sea urchin abundance to determine the effects on abalone survival and growth is suggested. Maintaining the northern abalone fishery closure indefinitely and continued large scale index site surveys every 4-5 years to monitor long-term trends in northern abalone populations are also important. Enforcement for the prevention of poaching northern abalone will be important in the success of any rehabilitation attempts and long-term experiments.

Specific recommendations of the paper are summarised as:

1. Enforcement to prevent poaching is imperative to the success of any rehabilitation attempts and long-term experiments;
2. Maintain the northern abalone fishery closure and continue large-scale index site surveys;
3. Establish experimental marine reserves in selected locations; experimental manipulation of wild abalone adult densities should be attempted to investigate abalone recruitment;
4. Experimental outplanting of hatchery-reared northern abalone juveniles should be attempted on a small scale to determine optimal size and density for release;
5. An ecosystem approach is recommended in which habitat parameters, algae and invertebrates are monitored in all surveys and experiments.

Reviewers' Comments

Reviewer #1

This reviewer noted that this study applies good literature coverage on world-wide abalone knowledge to our northern abalone problems. It is a useful step towards establishing the scientific basis for northern abalone stock rebuilding in British Columbia.

The reviewer was concerned at its top-down tone. DFO has a limited track record on basic abalone life-history research since the late 1970s (exceptions; S. Bower – diseases in hatcheries [1980s] / R. Withler – genetics [current]). Therefore, the reader needs to know what has changed that will enable such an ambitious, 10-year research program? The answer is in partnerships with their attendant political and financial support. How else will the critical mass be achieved to do such demanding, diving-based work over a decade? The reviewer asks where is the reality-check on partnering and funding?

The reviewer noted that the political commitment to pursue abalone hatcheries and "juvenile seeding" has already been made (Request for Proposal, June

1999, first money flow March 2000). Given the importance of timeliness of science advice backing management decision-making, the reviewer questioned why this framework paper was appearing now? Perhaps the answer is the outcome of the 1999 Abalone Workshop, therefore, the paper should explain how the Workshop led to the commitment to hatchery work. Without such a context, should not this paper have preceded the commitment to do the abalone hatchery work?

Reviewer #2

The reviewer complimented B.C. for the impressive work analysing options for abalone restoration. The reviewer complimented the authors of this paper for their carefully thought out framework for abalone rebuilding. The experimental framework is appropriate, as is the emphasis on local brood stock for seeding. The pilot experiments proposed are appropriate, and in the right order as listed in the abstract.

The reviewer was concerned, however, that insufficient mention was made of what should be the first priorities of the program: public education, improved enforcement, and realistic penalties for poachers. Without a serious program on these issues, a 10 year experimental program will not succeed. Therefore, the basics also need to be considered: protection of existing stocks and enhancement of broodstock densities to facilitate natural reproduction.

Subcommittee Discussion

The Subcommittee noted that a Departmental Recovery Plan for abalone is being developed. The Subcommittee accepted this working paper as a framework for implementing abalone rebuilding experiments as part of this developing plan, but noted that more details will be needed regarding specifics and prioritization of the experiments to be conducted. For example, what change in density, recruitment or geographic representation will be used as a measure of success? This relates to a need to identify the objectives of the experimental program clearly (rehabilitation, rebuilding or enhancement - increasing the populations of abalone in specific locations, or increasing the natural recruitment of juveniles) and whether success should be measured as a doubling of the adult density; reaching a minimum viable spawning density, etc.? To conduct the full scope of the experiments with the level of replication described in this paper will require significant resources. It was also noted that sea otters will make significant changes to abalone populations, and the Subcommittee expects that areas with and without otter populations will have very different ecological dynamics. In terms of experimental manipulations of predator/competitor species, the Subcommittee noted that these manipulations may involve more than just red sea urchins (as outlined in the working paper). The Subcommittee noted that recommendation 5 in the working paper concerning an ecological approach applies to all previous recommendations.

The Subcommittee identified a number of concerns around the translocation of abalone, i.e. whether abalone should be moved from locations where they occur. An important concern is the spatial scale of discrete populations. The Subcommittee was unable to reach a consensus on this issue of translocation, and noted the need for a more complete evaluation of this issue. The Subcommittee discussed the importance of the genetic studies currently being conducted and how they might help to define the scale for the choice of sites, the size of experimental manipulations, and the geographic parameters of the choice of study locations.

There was discussion of the use of marine protected areas or ecological reserves for abalone experiments and what criteria would be used to define them. There is a total fishery closure in place for abalone at present, and this needs to be continued and enforced. The Subcommittee discussed whether closure of all dive fisheries in each of the experimental areas was necessary to protect the experimental stocks, but did not reach agreement on this issue. This may require increased resources for enforcement.

There was discussion about the need for partnerships with local communities, First Nations, and other government departments to refine objectives, conduct the work, and to assist with enforcement activities. The Subcommittee noted this should be an essential component of the abalone Recovery Plan that is under development. The Subcommittee expressed a desire to review the science needs and components of this developing Recovery Plan. Recovery plans for abalone that are expected to be developed under the Species at Risk Act will also require community participation.

Subcommittee Recommendations

1. The Subcommittee accepted the paper subject to revisions.
2. The Subcommittee concurred with recommendation 1 concerning the need for enforcement of the total closure and the need for sufficient resources to provide security for experimental locations.
3. The Subcommittee concurred with recommendation 2 concerning continued surveys to establish baselines to measure changes.
4. The Subcommittee concurred with the recommendations concerning the experimental manipulation of conditions to define a useful methodology but identified the need for more detail on the spatial scale of the experimental approach.
5. The Subcommittee recommended that the science aspects of the developing DFO Recovery Plan for abalone should be reviewed by PSARC.
6. The Subcommittee requested that the genetic analyses of abalone be presented at its next meeting, in order to help assess spatial scales of abalone populations.

FISHERY UPDATES

Euphausiids

There were few changes in the fishery for 1999. The total quota was 500 tons. A total of 460 t was harvested in 1999. This is a slight decrease in landings from 1998 that may be due to weaker markets in the fall/winter fishing period rather than from decreased stock abundance.

For the past 3 years the fishery has been managed by an industry-funded "hail in and dockside" validation program that has been effective in preventing significant quota overages. In 1999, industry experimented with paired trawling techniques, which increases the fishing power. This new gear was described in 2000, but there remains a need to observe the gear in action. There also remains a need to encourage enforcement on the grounds.

Prawn Fishery

Trap limits were introduced in 1995. These were effective at reducing effort, but also had the result of increasing vessel capitalisation and leading to hauling traps more than once per day. As a result, in the 2000 fishery, a pilot program was introduced to permit trap hauls only once per day, and to enforce this by reducing the number of hours per day during which prawn fishing may take place. This appears to have resulted in a better product, and most of the industry appears to be in favour of this change. As a result of concerns expressed by recreational fishers, Saanich Inlet was managed in 2000 so that more prawns would be left on the grounds after the closure of commercial fishing. The funding arrangements for managing the prawn trap fishery will be changing in 2001, as a result of changes in DFO policy.

The fishing season for prawns starts May 1 of each year, however, larger sized animals would be caught if they were fished later in the summer. Fisheries Management has been unable to convince the Industry that they would receive higher value if they fished later in the year. Issues in this fishery include growth of the recreational fishery for prawns, treaty negotiations (there is little or no historical information on prawn fishing by First Nations), continued poaching and theft of gear, and the expiration of the Treasury Board agreement.

Razor clams

This fishery occurs only in Haida Gwaii. There are management concerns about this fishery because of high catch levels in 2000 (three times those of 1999), which exceeded the MSY. This year saw record landings (fishery data are available from 1923), because of the development of food markets for this species (previously it had mainly been a bait fishery). However, there was

relatively little increase in effort in 2000 compared with 1999. Standardised surveys began in 1994. The 1994 data have been analysed, and M was estimated to be 26% and MSY to be 118 t (19% of the harvestable biomass). A preliminary analysis of data from 1995 to 2000 indicates that biomass approximately doubled from 1994 to 2000 and that the high landings in 2000 (237 t) represents less than 14% of the harvestable biomass (1707 t). A stock status evaluation of razor clams is scheduled for presentation to PSARC in 2001, although a new management plan will need to be prepared before this paper is reviewed. This management plan is expected to anticipate the results from this stock analysis paper. There was concern in the Subcommittee that high landings and market development in a time of relatively high biomass might lead to expectations of high yields that could not be sustained in periods when biomass is considerably lower than it is at present.

Red sea urchin

Currently, the main management tools of the red sea urchin fishery include: limited entry licensing, area licensing, a minimum size limit to allow several spawning years prior to harvest, a precautionary fixed exploitation rate of two to three percent of estimated biomass, area quotas and an Individual Quota (IQ) program in which total quota is divided equally amongst licences.

The commercial red sea urchin total allowable catch (TAC) for the 1999/2000 season was 5,601 tonnes (12,349,150 lb.). IQs were 50.9 tonnes (112,265 lb.). Preliminary harvest log and fish slip records show total landings of 5,282.6 tonnes (11,646,019 lb.), for a value of $6.6M. It is anticipated that the recorded value of the fishery will increase as fish slip records are finalized. The coast-wide commercial TAC for the ongoing 2000/2001 season is 4,885.0 tonnes (10,771,533 lb.). IQs are 44.4 tonnes (97,923 lb.). This reduction of 12% of the coast-wide TAC accompanies the reduction in size limit implemented for the 2000/2001 season.

Recent management issues include, but are not restricted to:

- Need to increase monitoring of the commercially harvested populations, both through surveys and port monitoring in order to provide appropriate focus for assessment papers. Broadbrush density surveys should continue in collaboration with commercial industry and First Nations; processing plant-based monitoring of size frequency of commercial catch will be used to assess change in size limit at the end of the 2000/2001 fishing season.
- Need to address and evaluate the impacts of commercial red sea urchin fisheries on the ability of First Nations to harvest for food, social and ceremonial purposes. A preliminary assessment should be conducted in the Juan Perez Sound area of the Queen Charlotte Islands.
- Long term strategy for collection of basic biological information, assessment techniques and management regimes required. This was addressed by PSARC working paper I99-15, June 1999.

- Commercial markets require smaller urchins. Need to address Industry request for lower size limit. This was addressed by PSARC working paper I99-23, December 1999; pilot reduction in size limit for the 2000/2001 fishing season.

Scallops

The commercial scallop dive fishery continued in 1999 with no management changes. The fishery data to 1999 raise concerns about overfishing. Total landings have declined since 1996. In 1999, the total landings were 36.7 t, the lowest in 10 years, and the diver CPUE from harvest logbooks was the lowest in 16 years. The areas of fishing shifted from traditional to new areas.

The trawl fishery is a "low level" fishery, with 16 licences issued but only 3 reported catches in 1999.

Management and assessment changes were implemented in both these fisheries in 2000, as a result of PSARC advice and as directed by RMEC. These changes have lead to the creation of harvesters associations in both the dive and trawl fisheries, which has resulted in two small but committed groups of harvesters. This has improved reporting of harvest locations, bycatch, and environmental impacts. Fishery-independent surveys conducted in collaboration with harvesters are in progress. The Subcommittee noted the likely need for new survey designs to be developed for the dive fishery rather than traditional dive surveys because of the deep locations of these scallops and the limited bottom dive time available.

The Subcommittee was encouraged at the changes that have taken place in 2000, but noted that the results of the 2000 fishery and the surveys need to be analysed to be certain that the declining situation up to 1999 has been arrested.

APPENDIX 1. PSARC INVERTEBRATE SUBCOMMITTEE MEETING AGENDA, NOVEMBER 28-29, 2000

PSARC Invertebrate Subcommittee Meeting

28– 29 November 2000

Seminar Room, Pacific Biological Station, Nanaimo, B.C.

	28 November Tuesday **Start 0900**	29 November Wednesday **Start 0900**
AM 1	Introduction and Procedures Prawn Fishery Update	Review of Tuesday's Rapporteur's Report Discussion of assessment timetable for 2001 and potential papers for next meeting
Break		
AM 2	I2000-09 (Abalone rebuilding framework)	Emerging Issues Closure
Lunch		
PM 1	I2000-08 (Shrimp Trawl by-catch) – held over from June 2000	
Break		
PM 2	Euphausiid; Scallop; Red sea urchin Fishery Updates Emerging Issues	

APPENDIX 2: PSARC INVERTEBRATE WORKING PAPERS AND REVIEWERSFOR NOVEMBER 2000.

No.	Title	Authors
I00-08	Estimated bycatch in the British Columbia shrimp trawl fishery	N. Olsen J.A. Boutillier L. Convey
I00-09	Discussion on a framework for implementing northern abalone stock rebuilding experiments in British Columbia	A. Campbell B. Lucas G. Parker

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.

G. Gillespie	DFO, Pacific Region
D. Kulka	DFO, Atlantic Region
N. Sloan	Parks Canada
M. Tegner	Scripps Institution of Oceanography, San Diego, CA

APPENDIX 3: PARTICIPANTS AT INVERTEBRATE SUBCOMMITTEE MEETING, NOVEMBER 2000

Subcommittee Chair: Ian Perry
PSARC Chair: Max Stocker

DFO Participants	Tues	Wed
* Subcommittee Members		
B. Adkins*	✔	
J. Boutillier*	✔	✔
A. Campbell*	✔	✔
D. Clark	✔	✔
L. Convey	✔	
C. Crossley	✔	✔
G. Gillespie*	✔	✔
W. Hajas	✔	
C. Hand*	✔	✔
R. Harbo*	✔	
D. Hay	✔	
G. Jamieson*	✔	✔
B. Koke	✔	✔
R. Lauzier*	✔	✔
J. Lessard	✔	
B. Lucas	✔	✔
J. Moores*		
J. Morrison	✔	
R. Mylchreest*		
N. Olsen	✔	✔
G. Parker*	✔	
I. Perry	✔	✔
T. Perry	✔	
A. Phillips	✔	✔
J. Rogers*	✔	✔
F. Scurrah	✔	✔
M. Stocker	✔	✔
B. Waddell	✔	✔
K. West*	✔	✔
I. Winther*	telephone	
G. Workman	✔	✔
Z. Zhang	✔	✔

External Participants:	Tues	Wed
S. Pilchard (for B. Heath* B.C. Ministry of Fisheries)	✔	✔
R. Jones (Haida Fisheries Program)	✔	✔
L. Clayton (P.C.S.C.A., Victoria)	✔	