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Proceedings of the PSARC Invertebrate Subcommittee Meeting

June 24, 2004
Nanaimo, B.C.

J. Boutillier
Invertebrate Subcommittee Chair

Fisheries & Oceans Canada
Pacific Scientific Advice Review Committee
Pacific Biological Station
Nanaimo, B.C. V9T 6N7

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http://www.dfo-mpo.gc.ca/csas/

CSAS@DFO-MPO.GC.CA

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PACIFIC SCIENTIFIC ADVICE REVIEW COMMITTEE (PSARC)

INVERTEBRATE SUBCOMMITTEE MEETING

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SUMMARY

The Pacific Scientific Advice Review Committee (PSARC) Invertebrate Subcommittee met June 24, 2004 at the Pacific Biological Station in Nanaimo, B.C. The Subcommittee reviewed one working paper.

Working Paper I2004-01: Update on effort standardization for the in-season monitoring of the prawn by trap fishery.
D.T. Rutherford, H. Nguyen

The paper reviewed two experiments designed to evaluate trap designs and baiting practices to test the significance of these changes and to develop correction factors to be incorporated into the in-season assessments of the spawner escapement for the B.C. prawn fishery. Both the trap changes and the change to pellet bait have been widely accepted in the commercial fishing practices. The trap comparison is part of an ongoing set of studies that are used to constantly update the effective fishing effort correction factors that are utilized each year in the in-season assessment and management of this fishery. Incorporation of baiting practices in the effort standardization is a new element to effort standardization procedures although the different baiting practice has been adopted by industry for a number of years.

The paper was accepted subject to revisions. The Subcommittee made the following recommendations:

- Review the effect of including the Saanich Inlet experiment when estimating the correction factor for double ring traps. The experiment was conducted with non-standard bait that may bias the overall comparison between experiments. As such the correction factor for double ring traps should reflect the Howe Sound results at this time.
- Accept the correction factor for bait but note the need for a better explanation of how this correction factor would be used in combination with trap correction factors as well as an explanation of why this method was chosen.
- Effort standardization studies should continue, with priority given to validating the trap spacing used in the experiments and to determine the best way of combining trap and bait correction factors.
- A future PSARC paper should be written to discuss how uncertainty could be incorporated into the assessment and management frameworks of this fishery.

SOMMAIRE

Le sous-comité des invertébrés du Comité d'examen des évaluations scientifiques du Pacifique (CEESP) s'est réuni le 24 juin 2004 à la Station biologique du Pacifique, située à Nanaimo, en Colombie-Britannique, pour passer en revue un document de travail.

Document de travail I2004-01 : Le point sur la normalisation de l'effort pour la surveillance en saison de la pêche de la crevette au casier
D.T. Rutherford et H. Nguyen

Ce document porte sur deux expériences visant à évaluer la conception des casiers et les pratiques d'appâtage pour vérifier l'effet des modifications qui leur ont été apportées et établir les facteurs de correction qui seront intégrés aux évaluations en saison de l'échappée de géniteurs dans la pêche à la crevette de la C.-B. Les pêcheurs commerciaux ont largement accepté les modifications apportées aux casiers et aux appâts en granulé. La comparaison des casiers s'inscrit dans une série d'études servant à constamment mettre à jour les facteurs de correction de l'effort de pêche utilisés chaque année dans l'évaluation et la gestion en saison de cette pêche. L'intégration des pratiques d'appâtage constitue un élément nouveau des procédures de normalisation de l'effort, malgré le fait que l'industrie a adopté la nouvelle pratique d'appâtage depuis un certain nombre d'années.

Le sous-comité accepte le document sous réserve de révisions et fait les recommandations suivantes :

- Examiner l'effet de l'inclusion des résultats de l'expérience de l'inlet Saanich dans l'estimation du facteur de correction pour les casiers à anneaux doubles. L'expérience a été réalisée à l'aide d'appâts non standard qui pourraient biaiser la comparaison globale entre les expériences. Ainsi, le facteur de correction pour les casiers à anneaux doubles devrait correspondre aux résultats pour la baie Howe.
- Accepter le facteur de correction pour les appâts, mais prendre note du besoin de mieux expliquer comment ce facteur de correction serait utilisé de concert avec les facteurs de correction pour les casiers et d'expliquer pourquoi cette méthode a été choisie.
- Poursuivre les études sur la normalisation de l'effort, en accordant la priorité à la validation de l'espacement des casiers lors des expériences et à la détermination de la meilleure façon de combiner les facteurs de correction pour les casiers et pour les appâts.
- Il faudrait rédiger un autre document du CEESP pour discuter de la façon de tenir compte des incertitudes dans les cadres d'évaluation et de gestion de cette pêche.

INTRODUCTION

The PSARC Invertebrate Subcommittee met June 24, 2004, at the Pacific Biological Station in Nanaimo, British Columbia. External participants from industry and First Nations attended the meeting. The Subcommittee Chair, J. Boutillier, opened the meeting by welcoming the participants. During the introductory remarks the objectives of the meeting were reviewed, and the Subcommittee accepted the meeting agenda.

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

DETAILED COMMENTS FROM THE REVIEWS

I2004-01: Update on effort standardization for the in-season monitoring of the prawn by trap fishery.

D.T. Rutherford, H. Nguyen

Subcommittee Discussion

The paper reviewed two experiments designed to evaluate trap designs and baiting practices to test the significance of these changes and to develop correction factors to be incorporated into the in-season assessments of the spawner escapement for the B.C. prawn fishery. Both the trap changes and the change to pellet bait have been widely accepted in the commercial fishing practices. The trap comparison is part of an ongoing set of studies that are used to constantly update the effective fishing effort correction factors that are utilized each year in the in-season assessment and management of this fishery. Incorporation of baiting practices in the effort standardization is a new element to effort standardization procedures although the different baiting practice has been adopted by industry for a number of years.

Both reviewers were complimentary of the authors' efforts in preparing this paper and recognized the importance of this contribution to conservation, assessment and management of prawn stocks. One reviewer had the following concerns and questions with respect to the experimental procedures and analytical processes.

1. The testing of significance when using averages of averages.
2. The use of counts of legal sized prawns rather than counts of spawners.
3. The reported use of different size web.
4. Trap spacing and the spatial limits on attraction.
5. How to combine trap and bait correction factors in the assessment process.
6. Uncertainty about the estimates.

The other reviewer noted a number of concerns which needed to be clarified in the paper. In particular the reviewer was concerned with the following.

1. The validity of the paired t-tests and the need to test for normality.
2. The accuracy of the correction factors and the possibility of bias due to competition between traps.
3. The implications of using pellet bait in the trap experiment in Saanich Inlet.
4. The uncertainty or precision of the correction factors.
5. The use of an additive rather than a multiplicative process when calculating an interaction correction factor.

In addition, both reviewers made a number of suggestions on areas that need editing and clarification to improve the usefulness of the paper. These suggestions include:

1. More detail on the history of the assessment and management framework.
2. More detail on the adoption of these trap and bait changes by the industry.
3. More details on how the soak times and bait preparations compare to methods typically used by the industry.
4. The use of consistent terms throughout the paper e.g., “bait efficiency experiment” that was referred to five different ways.
5. The use of the term “spawning cohort”.
6. More detail on the number of year classes the fishery impacts.

The focus of the Subcommittee discussion touched on five main themes.

The first theme was lack of an uncertainty estimate around the correction factor estimates as identified by one reviewer. There was a discussion about the most appropriate method of calculating a correction factor that incorporated the uncertainty. This culminated in a discussion on how the management system works and how uncertainty estimates are not incorporated into the present management decision framework.

The second theme was about how the bait and trap correction should be applied in the assessment framework and whether it was more appropriate to use the combined results in an additive or multiplicative way as stated by a reviewer. A new experiment will need to be designed in the future to evaluate the most appropriate mechanism. A suggested 2-stage sampling approach may also be considered further, as it may better calculate uncertainties for experiments and may provide better precision.

The third theme focused on clarifying what requires standardization. It was pointed out that the Minimum Monthly Spawner CPUE (MMI) is an index for cohort abundance and as such the in-season sampled spawner index must be standardized to the effort used in the setting of the MMI.

The fourth theme was on the biases that could occur both in the data collection process and in the analytical process.

1. Of particular concern for the Subcommittee and one reviewer was the potential for trap interaction in a paired experiment if the traps were too close together.
2. The use of different web sizes in the traps. This however was pointed out to be a typo and would be corrected in the final version of the paper.
3. The Subcommittee agreed with a reviewer's concern that it may have been preferable to use spawners rather than legal size prawns to determine a correction factor, but insufficient data is available from the experiments to use that method. Since the goal of the experiment was to develop a correction factor, the Subcommittee concluded that the use of legal-sized prawns should be sufficient. A problem would only arise if there was size specific attraction to the bait or the trap, which is unlikely. This problem could be overcome by carrying out the experiment prior to the opening of the fishery. It was noted, however, that for logistical reasons, this work is always carried out in conjunction with other time sensitive studies. There was some confusion as to the units the analyses were based on, counts or weights, since the tables were all marked as Catch. This needs correcting in the final version.
4. Another area of particular concern was the fact that the Saanich trap experiment was not done in a consistent manner with the two Howe Sound experiments. As a result, the combined results may have biased the trap experiment conclusions and the resulting conversion factor.
5. It was also pointed out that the strength in a paired-t-test designed experiment is that it informs you when there is a difference but it may not be good in determining the magnitude of the difference especially if there are potential competitive interactions. The Subcommittee noted that incremental improvements in design will occur with time, depending on logistical concerns.

The final theme focused on further areas for standardization studies including suggestions from the industry, such as freshness of bait, bait cup color, and the use of additive oils. In addition, it was noted that a more formal process needs to be developed to ensure industry and observer input.

The Subcommittee noted that results obtained in the study seem consistent with those of fishers in general.

The Subcommittee then went on to discuss the three recommendations presented in the paper:

- When determining spawner index levels using sampling results from double-ring traps, the sample index should be divided by 1.16 to ensure standardized application of the spawner index model.
- When determining spawner index levels using sampling results from traps using pellet bait, the sample index should be divided by 1.27 to ensure standardized application of the spawner index model.
- Effort standardization studies should continue to be incorporated into the overall prawn assessment program.

The Subcommittee complimented the two reviewers for their very thorough and constructive reviews.

Subcommittee Conclusions

The paper was accepted subject to revisions outlined by the reviewers and agreed upon by the Subcommittee. The Subcommittee reached the following conclusions.

- How uncertainty could be incorporated into the assessment and management frameworks of this fishery should be evaluated. The Subcommittee recognized that this is beyond the scope of the present paper.
- Clarification is required in the paper on how the combined estimates of correction factors are incorporated into the assessment framework and why (noting that a multiplicative combination is a more conservative approach than an additive combination). A carefully designed experiment should be considered to assess how these factors should be combined.
- The three trap efficiency experiments were not conducted in a consistent manner and suggested that it is important to redo this analysis and test for the potential bias of this inconsistency and its potential to modify the conclusion and/or the resulting correction factor.
- Incorporating a bait correction into the effort standardization algorithms is important. The Subcommittee noted that this is the first time that a bait correction has been estimated, results a large correction factor, and has been widely adopted by industry.
- Ongoing effort standardization experiments are critical in the overall assessment framework for the commercial prawn fishery. The Subcommittee also appreciated and recognized that this work could not be done without the on-going support of the commercial industry. However they note that the critical nature of effort standardization experiments in the overall assessment framework needs to be clarified in the paper.

- There were a number of areas of effort standardization that needed to be addressed. In particular the Subcommittee noted a need to study the trap spacing used in the pair-wise experimental design. They felt that this was critical to insure the validity of the correction factor. In addition they did note that there were a number of factors that the industry has been changing and suggested that the authors work with industry to lay out a schedule of priority experiments.

Subcommittee Recommendations

1. Review the effect of including the Saanich Inlet experiment when estimating the correction factor for double ring traps. The experiment was conducted with non-standard bait that may bias the overall comparison between experiments. As such the correction factor for double ring traps should reflect the Howe Sound results at this time.
2. Accept the correction factor for bait but note the need for a better explanation of how this correction factor would be used in combination with trap correction factors as well as an explanation of why this method was chosen.
3. Effort standardization studies should continue, with priority given to validating the trap spacing used in the experiments and to determine the best way of combining trap and bait correction factors.
4. A future PSARC paper should be written to discuss how uncertainty could be incorporated into the assessment and management frameworks of this fishery.

APPENDIX 1: Working Paper Summary

Working Paper I2004-01: Update on effort standardization for the in-season monitoring of the prawn by trap fishery.

D.T. Rutherford, H. Nguyen

The prawn by trap fishery is managed using an escapement index, referred to as the Spawner Index (SI). The SI ensures escapement of a minimum number of spawners at the time of egg hatch in late March. Mean Monthly Indices (MMI) are back-calculated using mortality rates and are used along with fishery dependent sampling to manage the commercial fishery coast wide and recreational fisheries in selected high-effort areas. The SI was historically developed using standard trap and bait types. Development and widespread acceptance of alternative trap and bait types have increased efficiency in the commercial fishery, and require that correction factors be developed to ensure that the SI is applied correctly.

This paper documents experiments to determine catch efficiency of double-ring traps and pellet bait. The paper also proposes correction factors that should be applied when SI data come from commercial fishing using these trap or bait types.

Experiments to asses the effect of pellet bait compared to standard tuna bait were carried out in Howe Sound in 2003 and 2004. Ten standard traps baited with pellets and ten baited with tuna were alternated on a single groundline, spaced 20 m apart. Each groundline was fished overnight, resulting in 15-24 hour soak times. Fifteen sets were completed for the bait experiment.

Experiments to assess trap types were carried out in Saanich Inlet in 1997 and in Howe Sound in 2002 and 2003. Double-ring and standard traps were alternated on single groundlines, and fished in a similar manner to the bait experiment. Twenty-eight sets were completed for the trap experiments.

Pair-wise comparisons of catch of legal-size prawns were examined using t-tests, and simple ratio correction factors calculated using mean catch per trap by string.

Catches of legal-size prawns were significantly greater ($p<0.005$) for pellets than standard tuna bait. Overall mean catch per trap was 26.79 for pellets and 21.95 for standard tuna. On average, pellet bait caught 1.27 times more legal-size prawns than standard tuna.

Catches of legal-size prawns were significantly greater ($p<0.05$) in double-ring traps than standard traps. Overall mean catch per trap was 20.95 for double-ring traps and 18.08 for standard traps. On average, double-ring traps caught 1.16 times more legal-size prawns than standard traps.

The paper presents three recommendations:

- When determining spawner index levels using sampling results from double-ring traps, the sample index should be divided by 1.16 to ensure standardized application of the spawner index model.
- When determining spawner index levels using sampling results from traps using pellet bait, the sample index should be divided by 1.27 to ensure standardized application of the spawner index model.
- Effort standardization studies should continue to be incorporated into the overall prawn assessment program.

APPENDIX 2: PSARC Invertebrate Subcommittee Meeting Agenda

AGENDA
PSARC INVERTEBRATE SUBCOMMITTEE MEETING
June 24, 2004
Seminar Room - Pacific Biological Station

Nanaimo, BC

Thursday, June 24, 2004

9:00	Introductions and Opening Remarks.
9:00-12:00	Update on effort standardization for the in-season monitoring of the prawn by trap fishery.,(D. T. Rutherford, H. Nguyen)
12:00	Lunch
1:00-2:00	Continued discussion of paper as required.
2:00-4:00	Formulation of Subcommittee Conclusions and Recommendations

APPENDIX 3: List of Attendees & Reviewers

Subcommittee Chair: J. Boutillier
PSARC Chair: Al Cass

DFO Participants	
* Subcommittee Members	
J. Boutillier* (Chair)	X
L. Barton	X
B. Bornhold*	X
D. Bureau	X
A. Campbell*	X
A. Cass (PSARC Chair)	X
D. Clark	X
B. Ennevor	X
G. Gillespie	X
W. Hajas	X
C. Hand	X
R. Harbo*	X
R. Houtman	X
B. Koke	X
G. Jorgensen	X
J. Kristmanson	X
R. Lauzier*	X
B. Lucas (rapporteur)	X
J. Morrison	X
R. Mylchreest*	X
H. Nguyen	X
G. Parker	X
I. Perry*	X
J. Rogers*	X
Z. Zhang	X
A. Phillips	X

External Participants:	
Marion Campbell – Ahousat Fishing Corporation	X
Sidney Sam, Sr. – Ahousat Fishing Corporation	X
Chris Sporer – Pacific Prawn Fishermen's Association	X
Rochelle Fairfield – President, Pacific Prawn Fishermen's Association; Fisher	X

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

J. Morrison	DFO
R. Houtman	DFO