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Report of the PSARC Pelagic Subcommittee Meeting, November 19-20, 2001

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Pacific Scientific Advice Review Committee
Pacific Biological Station
Nanaimo, British Columbia V9R 5K6

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Canada

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PELAGIC

SUMMARY

The PSARC Pelagic Subcommittee met November 19 - 20, 2001 at the Pacific Biological Station in Nanaimo. External participants from First Nations and the fishing industry attended the meeting.

Working Paper P2001-01: Comparative analysis of herring biosamples from an alternative harvest method.
The paper was accepted subject to revisions. The Subcommittee recommends that this be viewed as a summary of the available data and that until further statistical analyses are conducted that this alternative sampling method should not be used to provide biological data for stock assessment purposes.

Working Paper P2001-04: Metapopulation structure and dynamics of British Columbia herring.
The paper was accepted subject to revisions. The Subcommittee agreed with the authors that the current cutoff reference point (25% of the unfished equilibrium biomass) should be continued as a precautionary approach until further research can be completed. This research should focus on quantifying dispersal rates and estimating unfished equilibrium biomass for a 'cool water regime' period.

Working Paper P2001-05: Stock assessment and recommended harvest for Pacific sardine in 2002.
The paper was accepted subject to revisions. The Subcommittee noted that the United States' sardine assessment concludes that the California sardine stock has fully recovered and returned to high levels of abundance (approximately 1 million tonnes). The Subcommittee endorses a harvest ceiling for sardines in 2002 calculated from the pre-fishery biomass estimated by the United States' sardine assessment, a 10% annual migration rate into BC waters and a harvest rate of 15%.

Working Paper P2001-06: Population structure of herring (*Clupea pallasi*) in British Columbia: an analysis using microsatellite loci.
The paper was accepted subject to revisions. The Subcommittee noted that preliminary results suggested that Secret Cove and Esquimalt Harbour/Portage Inlet within the Strait of Georgia may be genetically distinct spawning populations. The Subcommittee recommended that management decisions regarding these spawning populations should be cautious until the genetic distinctiveness of these fish is confirmed by additional research. Although there were no consistent genetic differences among the five defined stocks of herring in British Columbia, the Subcommittee recommends that under prudent management action, that herring continue to be assessed and managed on a five-stock basis.

SOMMAIRE

Compte rendu de la réunion du Sous-comité sur les poissons pélagiques tenue les 19 et 20 novembre 2001

Le Sous-comité du CEESP sur les poissons pélagiques s'est réuni les 19 et 20 novembre 2001, à la Station biologique du Pacifique, située à Nanaimo. Des représentants de Premières nations et de l'industrie halieutique ont assisté à la réunion à titre de participants externes.

Document de travail P2001-01 : Analyse comparative d'échantillons de hareng obtenus par une nouvelle méthode de récolte.
Ce document a été accepté pourvu que certaines modifications y soient apportées. Le Sous-comité recommande de considérer le document comme un résumé des données disponibles et, d'ici à ce que d'autres analyses statistiques soient effectuées, de ne pas utiliser cette nouvelle méthode d'échantillonnage pour obtenir des données biologiques à des fins d'évaluation des stocks.

Document de travail P2001-04 : Structure et dynamique des métapopulations de hareng de la Colombie-Britannique.
Ce document a été accepté pourvu que certaines modifications y soient apportées. Le Sous-comité est d'accord avec les auteurs qu'il faudrait continuer d'appliquer le seuil de référence actuel (25 % de la biomasse à l'équilibre non pêchée) en guise de mesure de précaution jusqu'à ce que des recherches approfondies soient réalisées. Ces études devront mettre l'accent sur l'estimation des taux de dispersion et de la biomasse à l'équilibre non pêchée pendant une période d'eau tempérée.

Document de travail P2001-05 : Évaluation du stock de sardines du Pacifique et récolte recommandée en 2002.
Ce document a été accepté pourvu que certaines modifications y soient apportées. Le Sous-comité a noté que l'évaluation américaine conclut que le stock de sardine de la Californie s'est pleinement rétabli et qu'il a atteint une forte abondance, soit environ un million de tonnes. Le Sous-comité approuve le calcul d'un plafond de prises de sardines pour 2002 à partir de la biomasse pré-saison estimée dans le cadre de l'évaluation américaine, d'un taux annuel de migration vers les eaux de la C.-B. de 10 % et d'un taux de capture de 15 %.

Document de travail P2001-06 : Structure des populations de hareng (*Clupea pallasi*) de la Colombie-Britannique : analyse de loci de microsatellites.
Ce document a été accepté pourvu que certaines modifications y soient apportées. Le Sous-comité a relevé que des résultats préliminaires laissaient croire que les populations de l'anse Secret et du port d'Esquimalt Harbour/de l'inlet Portage dans le détroit de Georgie pourraient être génétiquement distinctes. Le Sous-comité a recommandé d'user de prudence pour prendre des décisions sur la gestion de ces

populations en attendant que des études approfondies confirment qu'elles sont bien génétiquement distinctes. Bien que les cinq stocks de hareng définis pour la Colombie-Britannique ne présentent aucune différence génétique constante, le Sous-comité recommande, dans le cadre d'une gestion prudente, de continuer d'évaluer et de gérer les harengs comme s'ils constituaient cinq stocks.

INTRODUCTION

The Subcommittee Chair opened the meeting welcoming the participants. During the introductory remarks the objectives of the meeting were reviewed, and the Subcommittee accepted the meeting agenda (Appendix 1).

The Subcommittee reviewed four Working Papers. Working Paper titles and authors and reviewers are listed in Appendix 2. Updates on ongoing herring research programs and information on the 2001 experimental floating long-line tuna fishery were presented to the Subcommittee. A list of meeting participants and observers is included as Appendix 3.

GENERAL SUBCOMMITTEE DISCUSSION

The Subcommittee discussed the date and content of the next Subcommittee meeting. The next meeting is anticipated for August 2002. Requests for management advice and working papers for the upcoming meeting will be submitted to stock assessment staff in March 2002 in order to be accommodated in the upcoming year's workplans.

WORKING PAPER SUMMARIES, REVIEWS AND DISCUSSION

P2001-01: Comparative analysis of herring biosamples from an alternative harvest method.

J. Osborne, G. Brown, D. Hall **Accepted subject to revisions**

Summary

Since the inception of roe herring fisheries, Fisheries and Oceans Canada (DFO) has conducted an extensive test fishing program using commercial seine boats to provide critical information for the management of Pacific herring stocks. To examine whether data for stock assessment purposes could be collected by an alternative method to charter vessels that is less expensive in dollars and herring, the Nuu-chah-nulth Tribal Council (NTC) initiated the "Alternative Herring Biosampling Program" in 1995 for the West Coast of Vancouver Island. We describe the three different sampling methods (pre-fishery, fishery, and hand purse seine) and compare the population characteristics of the herring sampled by each method. We conclude that data collected by the hand purse seine are no less variable than data collected by the other two methods, but the hand purse seine does capture more mature fish and more males due to the timing of its use during spawning. The hand purse seine is relatively inexpensive and simple to operate compared to commercial herring vessels, and can be used to collect relevant herring biosample

data. Its use in appropriate circumstances (e.g., minor stock areas, major stock areas in years without commercial herring fisheries) could reduce the herring allocation to the test fishing program. We also found that differences exist between data collected far in advance of the fishery (prior to March 1st) and data collected near or during the fishery, which may have implications for post-season assessment that relies on data that is representative of catch. This should be further investigated.

Reviewers' Comments

Reviewer #1

The reviewer thought that the statistical approaches used in the working paper were inappropriate given the nature of the data and as such did not support the conclusions. Given the extent of additional and appropriate analyses required, the reviewer recommended that the paper be withdrawn and re-considered at a later date. The majority of the data are categorical and as such will not be normally distributed. The reviewer suggested that log-linear models would be most appropriate for interpretation of these data in order to test the effects of sampling time, location and method but these were not used in the paper. Additionally, for some of the biological relationships examined, analysis of covariance should be used to evaluate the effects of sampling time, location and method. The reviewer suggested that biological data obtained from hand purse-seining will not be equivalent to pre-fishery test seine data since hand purse-seining samples spawning and spawned fish. The reviewer felt that this bias was evident in the stage of maturity, sex ratio and mean weight data.

Reviewer #2

The reviewer recognized that the working paper did a good job of summarizing a wide range of biological data available from several different collection methods. However, the reviewer noted that the paper did not provide statistical analyses that definitively compared sampling methods and were able to elucidate statistical differences between sampling gears. The reviewer felt that the discriminant function analyses presented was inappropriate and therefore conclusions provided by the authors were erroneous. The reviewer suggested that generalized linear models or log-linear models would be more robust procedures for analysing the data and should be undertaken in any future analyses. The reviewer noted that the biological data required for a catch-age analysis used in herring stock assessment should be sampled from the population which is being targeted by the fishery. As such, the reviewer did not support the authors' conclusions that hand purse-seining would be an appropriate biological sampling method for stock assessment purposes.

Subcommittee Discussion

The Subcommittee agreed with the reviewers that further analyses of the data are warranted. Specifically, the Subcommittee felt that the discriminant function analysis used in the paper was not appropriate. A spatial component was missing from the analyses presented. In future analyses of the data, specific questions regarding sampling location and date need to be addressed. As such, the paper should be viewed as a platform for further statistical analyses. The Subcommittee agreed that the paper should be seen to provide only a preliminary overview and summary of the data. The authors agreed that the analyses suggested by both reviewers could be more appropriate than those presented in the paper. The authors therefore conceded that conclusions regarding the utility of hand purse-seining as an appropriate biological sampling method for stock assessment purposes are premature.

Given that the results should be viewed as preliminary, the data are useful but not definitive. The Subcommittee suggested that this harvesting method not be used to collect data for stock assessment purposes at this time. The existing methods of data collection should remain in place.

There exists a bias in the sampling method that could be due to the limits of sampling depth and time of collection of the proposed sampling method. This may explain the preponderance of males and smaller size at age in the sampling results. The authors acknowledged this observation as a limitation but still adhered to suggestions of possible applications i.e., where no fisheries are planned but sampling is still required, or when sampling is required where it is too shallow for the current method to be effective.

The Subcommittee agreed with the authors that data collected from this sampling method might have potential to be used as supplemental sampling, especially in areas where there are no test fisheries or fisheries conducted, but this would require further refinement of the analyses. However, it was noted that the data required for the age structured model in the stock assessment relies on fisheries data. The Subcommittee cautioned that future analyses need to be conducted before this method of data collection is viewed as providing supplemental data.

Subcommittee Recommendations

The Subcommittee recommends that hand purse-seining not be used as an alternative or supplemental method of data collection for herring stock assessment purposes.

P2001-04 Metapopulation structure and dynamics of British Columbia herring.

D.M. Ware and J. Schweigert **Accepted subject to revisions**

Summary

This exploratory paper integrates existing knowledge about dispersal and population dynamics of the five major BC herring stocks into a structured metapopulation model (SMP). The model to quantifies straying rates during the 1977-97 period. Tagging studies indicate that dispersal rates for the five major BC herring populations ranged from 14% to 36% per year, and increased as a function of spawning stock biomass in each population. The tagging studies results also support an isolation by distance model: most herring disperse to nearby populations, but few stray to the most distant ones. Consequently, all major BC herring populations are linked by dispersal, and dispersal rates are sufficiently high to preclude genetic differentiation among major populations. During the warm ocean climate regime, which prevailed during the base period, the SMP model suggests that about 25 kt/yr of adult herring migrated between the five major herring populations. The most productive Georgia Strait population exported about 12 kt of adults per year to the other four, less productive populations. SMP model estimates of the theoretical unfished equilibrium biomass during the base period, indicated that dispersal enables the Central Coast and Queen Charlotte Islands (QCI) populations to maintain larger equilibrium biomasses than they could without dispersal.

A density-dependent straying response could increase the fidelity rate when a population is declining, and immigration would exceed emigration in declining populations .

Year-class strength synchrony in several nearby BC herring populations in 1977, 1985 and perhaps other years may have been caused by high juvenile herring survival rates over a large geographical area. However, it might also reflect significant straying by juvenile herring from a source population, which had a locally high juvenile survival rate, to nearby populations. More research needs to be done to measure juvenile herring dispersal rates, and their impact on recruitment in adjacent populations. We stress that the foregoing conclusions only apply to the warm climate regime, which prevailed during the base period analyzed here. The straying dynamics and productivity of BC herring populations during cool climate regimes will be examined in a future PSARC paper.

Reviewers' Comments

Reviewer #1

The reviewer thought that the purpose of the paper was clearly stated and that overall the data and methods supported the conclusions. The reviewer had some concern that different stock-recruitment relationships were fit to different BC herring

subpopulations. Specifically that a Ricker curve was used for the Prince Rupert District herring, while a 'hockey stick' model was used for all other BC herring. The reviewer felt that biological consistency should override statistical fitting algorithms. The reviewer suggested that the results presented will eventually lead to a more integrated assessment analysis where an age-structured model uses a metapopulation approach with tagging data included. Overall the reviewer thought that the paper correctly focused on a broad view of population structuring since it incorporated a broader view of oceanic conditions. The reviewer suggested that with further analyses under different oceanic conditions, the underlying population structuring might reverse.

Reviewer #2

The reviewer thought that the purpose of the paper was clearly stated and that the conclusions were supported by the data and methods. The reviewer suggested that for future research, the parameter uncertainty in the model could be addressed by using stochastic analysis which incorporates variability in straying rates and substock dispersal. The reviewer expressed concern that the population dispersal pattern matrix was asymmetrical, since pairwise distances between substock locations should be equal. The reviewer suggested that future research should investigate alternate oceanic conditions ('cool water regime') to empirically compare recruitment and dispersal rates to the 'warm water regime' presented in the paper.

Subcommittee Discussion

The Subcommittee acknowledged the contribution that this research may provide in understanding the dispersal process of BC herring populations. The work was conducted for data based on a warm water period (after 1977). The authors and Subcommittee members decided that analyses should be conducted for data for a cool based period (before 1977) in order to determine the dispersal rates and the unfished equilibrium biomass under alternate oceanic conditions.

The Subcommittee noted that the data for the current report and the model are too limited for immediate application for fishery management purposes. A considerable amount of work needs to be done before the metapopulation modeling can be integrated with the existing stock assessment models. The Subcommittee recognized that this is a long-term objective and would not be implemented in the near future. The eventual application of this analysis could be the refinement of harvest strategies, such as regional cut-offs, harvest rates and limit reference points.

Data are currently not available to determine to what extent straying rates and spawner biomass may be independent for individual regions. Also, there are not enough data to produce confidence intervals or straying rate error estimates into the model. It is anticipated that data from the herring coded-wire tag program will be helpful in estimating straying rate variability.

The authors have applied pre-fishery biomass estimates from an Age-structured model (2q) to parameterize the local dynamics of each of the populations and to estimate the amount of biomass straying between the five major populations. Discussion on formulating straying rate and stock density relationships for individual regions indicated that variation in inter-annual spawning habitat would introduce a high degree of error. The Subcommittee agreed with the authors that a useful application of this metapopulation model will be as a diagnostic tool for identifying time periods when the annual assessment under or overestimates the spawning stock biomass.

It was noted that cutoff reference points should be estimated during climate regimes when the populations are most productive. The productivity of the three southern subpopulations was lower during the warm base period. The Subcommittee agreed with the authors that the current cutoff reference point (25% of the unfished equilibrium biomass) should be continued as a precautionary approach until further research can be completed.

Subcommittee Recommendations

1. The Subcommittee recommends that research be presented in the future which quantifies the dispersal rates and estimates the unfished equilibrium biomass during a 'cool water regime'.

2. The Subcommittee recommends the continuation of current cutoff rates as a precautionary approach until further research can be completed.

3. The Subcommittee recommends that the dispersal mechanisms be incorporated in the age structured model analyses.

P2001-05: Stock assessment and recommended harvest for Pacific sardine in 2002.

J. Schweigert and S. McFarlane **Accepted subject to revisions**

Summary

The Canadian commercial fishery for Pacific sardine ended in the late 1940s as a result of declining abundance off California. After an absence of almost 50 years sardine re-appeared in British Columbia in the early 1990s and an experimental fishery commenced in 1995. As interest in re-establishing a commercial fishery has grown, small increments in the experimental fishery have occurred to present with 10 licensees (7 seine, 2 trap, 1 gillnet) harvesting a quota of 1600 tons in 2001. Ongoing summer trawl surveys provide an index of relative abundance in the offshore waters and indications for 2001 are that sardines were distributed further south and were less abundant than in 1997 and 1999 surveys. These results are

consistent with the U.S. assessment which indicates a slight decline in abundance in 2001. Canada has also adopted the U.S. harvest rate of 15% which is based on recent water temperature at Scripps and is related to sardine productivity. The Canadian stock assessment is based on the U.S. abundance forecast and assumes that on average about 10% of the stock migrates into BC waters. Therefore, it is expected that 105,760 tonnes could migrate into BC waters in 2002. However, declining water temperature and variation in other environmental factors may impact the annual northward migration rate to reduce the available sardine biomass in British Columbia next year.

Reviewers' Comments

Reviewer #1
The reviewer found the working paper to be clear and well organized; the data and methods were well presented and are in a useful form for management advice. The reviewer thought that the harvest rate is very conservative and falls within the guidelines of precautionary management.

Reviewer #2
The reviewer reported that the purpose of the paper is clearly stated and that the paper incorporates recent data. The reviewer suggested that the estimate of pre-season biomass requires revision. Specifically, that it should be based on the biomass of 2+ and older fish since these are the sardines entering BC waters. With this revision, the reviewer thought that the harvest ceiling calculated would provide appropriate management advice. The reviewer felt that more flexibility in selecting a harvest rate was warranted. The reviewer suggested that the harvest rate should not exceed the current United States rate (15%), but that it could be the same or lower. The reviewer suggested that the estimated annual migration rate (10%) should be verified with current Canadian offshore trawl survey data.

Subcommittee Discussion

The Subcommittee noted that the US assessment considers that the California sardine stock has fully recovered and returned to high levels of abundance (approximately 1 million tonnes). The Subcommittee felt that the sardine biomass entering BC waters could be harvested at the same rate as currently used by the US (15%) with no risk to the well being of the stock.

In previous years, the Subcommittee recommended that a low harvest level (5%) be used in consideration of unknown bycatch. In the 2000 fishery, the total bycatch was only 0.28% of the total catch (tonnes). Preliminary review of the 2001 data also indicates that bycatch is very low (less 1% of the total catch). It was suggested that the section on bycatch be expanded in the paper in order to document the bycatch information that is available. Based on the information presented at the meeting, the Subcommittee felt that bycatch in this fishery was not a substantial issue that warranted a low harvest rate.

The Subcommittee endorses the harvest rate presently used by the US (15%) for the 2002 fishery. The Subcommittee notes that the US has a history of successful sardine assessments that includes an environmental component that relates water temperature to changing productivity when selecting an appropriate harvest rate.

The Subcommittee agreed with a reviewer and supported the authors' presentation of the existing offshore trawl survey estimates of sardine biomass to estimate annual migration rate into BC waters. The Subcommittee noted that a large portion of sardines are distributed in inlets, therefore the Subcommittee supported the use of the upper confidence limits of biomass estimates from the survey. The biomass estimate from the offshore survey should be viewed as a minimum estimate of sardines in BC waters. Data provided at the meeting verified that a 10% annual migration rate was appropriate. The Subcommittee agreed with the authors in cautioning that water temperature and other environmental factors may impact the annual northward migration rate to reduce the available sardine biomass in British Columbia next year.

Subcommittee Recommendations

1. The Subcommittee endorses the continued use of offshore trawl surveys to improve our biological knowledge of this species, including updating estimates of annual migration rates into Canadian waters. At present, trawl survey information indicates that a migration rate of 10% is applicable for the upcoming fishery and is endorsed by the Subcommittee.

2. The Subcommittee recommends that a 15% harvest rate be used for 2002 as a ceiling, not a target harvest rate (or catch).

3. The Subcommittee recommends the calculation of harvestable biomass in Canadian waters should be based on the use of the US pre-season estimate of biomass.

4. The Subcommittee recommends that the use of onboard observers should continue in order to continue monitoring of bycatch.

P2001-06: Population structure of herring (*Clupea pallasi*) in British Columbia: an analysis using microsatellite loci.

T. Beacham, J. Schweigert, C. MacConnachie, K.D. Le, K. Labaree and K.M. Miller
Accepted subject to revisions

Summary

The purpose of this study was to determine population structure of herring (*Clupea pallasi*) in British Columbia. Variation at 15 microsatellite loci (Cpa4, Cpa6, Cpa8,

Cpa27, Cpa63, Cpa100, Cpa103, Cpa104, Cpa107, Cpa107a, Cpa113, Cpa114, Cpa115, Cpa125, Cpa134) was surveyed in approximately 11,000 herring from 65 sampling locations. The coancestry coefficient (F_{ST}) measures the correlation of genes of different individuals in the same population and can range from 0 to 1. F_{ST} estimates by locus varied between 0.0005 and 0.0073, with the mean over all loci of 0.0023. Other than for herring spawning in Skidegate Inlet, there was no evidence of substructure for herring along the east coast of the Queen Charlotte Islands. In the Strait of Georgia, there was no evidence of substructure within the stock except possibly for herring spawning in Secret Cove along the mainland coast and Esquimalt Harbour (Portage Inlet) at Victoria. Strait of Georgia herring were distinct from those spawning at Cherry Point in Puget Sound, Washington. No evidence of substructure was observed in the west coast of Vancouver Island stock, although herring spawning in Winter Harbour may be distinct from those spawning further south along the coast. No evidence of substructure was observed in either the North Coast or Central Coast stocks. Annual variation in allele frequencies within the five stocks of herring in British Columbia defined for assessment and management was larger than any differences among stocks, and thus, on average, there is no genetic differentiation among the five defined stocks. The lack of genetic differentiation among herring stocks in British Columbia is consistent with straying rates among stocks that is sufficient to homogenize allele frequencies over broad areas. Herring spawning in southeast Alaska may be distinct from those spawning further south on the Queen Charlotte Islands and in the north coast of British Columbia. For locations where genetically distinct populations occur, differences in timing of spawning are the main isolating mechanisms, although geographic isolation of the spawning population may also have some effect in maintaining genetic distinctiveness of the spawning population.

Reviewers' Comments

Reviewer #1

The purpose of the paper was stated clearly. The data and methods were adequate to support some of the conclusions but the methodology was too brief. The reviewer felt that some observations and conclusions were useful. However, the reviewer thought that overall, the recommendations were not supported by the methods and results. Uncertainty was noted in the paper but was not incorporated in the advice to managers. The overall recommendation was to accept the paper with major revisions, or to consider the paper as a report of work in progress. The reviewer felt that the key objectives of the paper had not been addressed, particularly since there were no samples from some key spawning areas within major stock assessment regions. Also, the paper did not report on many fjord stocks outside assessment areas or from Johnstone Strait. The reviewer thought that the recommendation which suggested that there is no genetic basis for managing and assessing stocks on a finer scale than is currently used was incorrect, as stated. The reviewer felt that this could endanger potentially genetically distinct populations in Secret Cove and Esquimalt Harbour herring. Finally, the reviewer thought that the results were weakened by samples not being

stratified by age and sex. It was possible that the results presented could be influenced by a strong yearclass since herring pre-spawning aggregations can be dominated by one or two yearclasses.

Reviewer #2
This reviewer felt that the paper was well-written with the purpose of the paper being clearly stated. There were no major criticisms of the methodology or conclusions. As such, no further analyses were recommended. The reviewer noted that failure to reject the null hypothesis of no population structure does not provide evidence of absence of population structure (Type II error). The reviewer stated that fine-scale management may be warranted if other (non-genetic) data provide strong evidence of fine scale population structure. The reviewer agreed with Recommendation 2 which advocates maintaining the current stock concept for management. Finally, the reviewer recommended that additional work be done focussing on how genetically distinct the fish from Secret Cove and Esquimalt Harbour are from the rest of the Strait of Georgia. Such work is also required for Winter Harbour and Skidegate.

Subcommittee Discussion

The Subcommittee noted that the objective of the herring genetic research presented was to investigate the population structure of BC herring within and between the present five assessment areas. As such, they agreed with reviewer 1 that fjord populations should be analysed in the future. The senior author responded that he is interested in evaluating other questions, but that samples from these areas are not available. The Subcommittee discussed additional sampling locations within the existing assessment areas (section) that should be included in future analyses. A preliminary list includes: Cumshewa Inlet (023) and Louscoone Inlet (006) from the Queen Charlotte Island assessment area; North Porcher Island (043) and Portland Inlet (032) from the Prince Rupert District assessment area; Bamfield (231) from the west coast of Vancouver Island assessment area; Quathiaski Cove or east side of Quadra Island (135), Powell River (152), Yellow Point (173), Ganges Harbour (181) and Saanich Inlet (191) from the Strait of Georgia assessment area. Further samples from the Gorge (193) are recommended.

The Subcommittee noted that areas such as Johnstone Strait that are outside of the five assessment areas were not the intended focus of the present research. They did endorse future research in this area. The senior author also noted that only one year of sampling is available for Johnstone Strait which does not allow for the assessment of interannual variability.

The Subcommittee discussed the preliminary results that suggested that Secret Cove and Esquimalt Harbour/Portage Inlet within the Strait of Georgia may be genetically distinct spawning populations. The senior author noted that sampling over several years is required to compare within and between putative population variability over time. He would be uncomfortable with forming conclusions regarding

population structure based on one year of sampling. The Subcommittee agreed that the results should be viewed as preliminary and that further analyses are required. The Subcommittee agreed that management decisions regarding these spawning populations, such as opening major roe fisheries, should be cautious until the genetic distinctiveness of these fish is defined with additional research. There was discussion regarding Recommendation 2 "Although there was no consistent genetic differentiation among the five defined stock of herring in British Columbia, prudent management action suggests that herring continue to be assessed and managed on a five-stock basis…". An external participant noted that this also applied at the within stock assessment region level; in other words, there should be effort put into fishing away from smaller pre-spawning aggregations but that the stock concept not change. However, the Subcommittee noted that this was already a working principle of herring in-season management.

Subcommittee Recommendations

1. Although there were no consistent genetic differences among the five defined stocks of herring in British Columbia, the Subcommittee recommends that under prudent management action, that herring continue to be assessed and managed on a five-stock basis.

2. As no population structure was observed within any of the five currently defined stocks (except for two locations in the Strait of Georgia), the Subcommittee endorses the authors' conclusion that there is currently no genetic basis for management and assessment on a finer scale than is currently conducted.

3. In the Strait of Georgia, the possible genetic distinctiveness of herring spawning in Secret Cove and Esquimalt Harbour/Portage Inlet warrants caution in any management decisions until the genetic distinctiveness of these fish is defined with additional research. If they are genetically distinct, the Strait of Georgia fishery should be conducted in a manner to conserve the diversity of these populations.

4. The Subcommittee noted that there are some stock within the current assessment areas that have not been examined. The Subcommittee endorses the preliminary list outlined in the discussion for future genetic research.

UPDATE ON CODED WIRE TAGGING TECHNOLOGY IN PACIFIC HERRING

Jake Schweigert and Linnea Flostrand

From 1999 to 2001, a new tagging program was initiated employing coded wire microtags to mark Pacific herring on the spawning grounds to monitor the movement and mixture of fish interannually. Methodologies for capturing, holding, tagging and releasing tagged herring were developed. Tag detection tubes designed for recovery of tagged Pacific salmon were adapted to detect and recover Pacific herring in fish

plants during roe extraction processing. Out of 461 one year at large tag returns there were four remarkable strays, whereas out of 97 two year at large tag returns no strays were observed. From 2000 and 2001 tag returns, one year at large recovery rates were 0.07 to 0.3% (adjusted to 0.3 to 1.1% for screening coverage considerations) and two year at large tag return recovery rates were approximately 0.2% (adjusted to 0.7 to 0.8% for screening coverage considerations). Recovery rate comparisons with data from two other herring tagging studies suggest that the Pacific herring CWT program was efficient in collecting tag returns. Coded wire tagging technology may provide a useful tool for large scale marking experiments on smaller pelagic species and might have broad application for stock structure and mark-recapture studies.

UPDATE ON THE USE OF VIDEO ASSESSMENT FOR DEEP WATER HERRING SPAWN

Charles Fort

A shift was observed in herring spawning behavior in Barkley Sound in the late 1990's and steps were taken to develop and evaluate techniques for adequately surveying deep spawn beds without exposing SCUBA divers to undue risk. A towed video camera with integrated Differential GPS system was found to be suitable for identifying spawn beds. The system confirmed that Barkley Sound herring have shifted back into normal spawn patterns in shallow water during the 2000 and 2001 spawn seasons. Video footage collected during these two seasons was used to map out key underwater features, which will improve the efficiency of future SCUBA spawn surveys in Barkley Sound.

REPORT ON THE 2001 EXPERIMENTAL FLOATING LONGLINE TUNA FISHERY

Bill Shaw

Bill Shaw provided information to the Subcommittee regarding the experimental floating longline fishery for tuna that was conducted in 2001. The report was provided in response to a request for information regarding the nature and extent of the fishery from Subcommittee members.

Industry received funding from Fisheries Renewal to conduct this fishery. The funding was used to provide onboard observers in order to collect data similar to that collected in floating longline tuna fisheries elsewhere. The fishermen held Schedule II licences which allows them to harvest albacore using hook and line gear. The fishermen conducted the experimental fishery in the midst of their regular surface troll jig fishing operations. Since the longline catch results were poor they terminated the project. A total of three vessels (approximately 45 ft in length) fished for a total of 5 days each in September 2001. Fishing occurred from Barkley Canyon, off south west Vancouver Island, to Cobb Seamount. Preliminary results

on catch estimate that 104 albacore, 160 blue shark , and 1 albatross were caught. It is important to note that the albatross was caught at the beginning of a trip on the second set. Bird avoidance gear and techniques were being employed, however the crew were still working out the logistics when the bird was caught. Once the technique was worked out, no more birds were captured. The observer measured the forklength of all albacore. Sex could not be determined since delivery of whole fish precluded the internal examination of gonads. The total length of blue sharks was estimated in the water as all sharks were released at the waterline in good shape. The biological data is still in the process of being compiled for a report. Given the poor catch rate results it is unlikely that an experimental floating longline fishery will be conducted in 2002.

APPENDIX 1: PSARC PELAGIC SUBCOMMITTEE MEETING AGENDA, NOVEMBER 19 – 20, 2001

PSARC Pelagic Subcommittee Meeting
November 19 - 20, 2001
Seminar Room, PBS, Nanaimo

AGENDA

Monday, November 19

8:30am	Introductions and Opening Remarks
9:00-11:00	P2001-01: Comparative Analysis of Herring Biosamples from an Alternative Harvest Method (Josie Osborne, Gayle Brown, and Don Hall)
11:00-12:00	P2001-04: Metapopulation structure and dynamics of British Columbia herring (Dan Ware and Jake Schweigert)
12:00-1:00	Lunch
1:00-2:00	P2001-04 Continued
2:00-4:00	P2001-05: Stock Assessment and Recommended Harvest for Pacific Sardine in 2002 (Jake Schweigert and Sandy McFarlane)

Tuesday, November 20

9:00am-11:00	P2001-06: Population structure of herring *(Clupea pallasi*) in British Columbia: an analysis using microsatellite loci (Terry Beacham, J. Schweigert, C. MacConnachie, K. Le, K. Labaree, and K. Miller)
11:00-11:20	Update on Spring 2001 results of herring coded wire tagging (Linnea Flostrand and Jake Schweigert)
11:20-11:40	Video surveying of deep herring spawn in Barkley Sound (Chuck Fort)
11:40-12:00	Discussion on 2001 Experimental Long-line Fishery for Tuna (Bill Shaw)
12:00-1:00	Lunch
1:00-4:00	Subcommittee Report and Recommendations

APPENDIX 2: PSARC PELAGIC WORKING PAPERS FOR NOVEMBER 2001

P2001-01	Comparative analysis of herring biosamples from an alternative harvest method	J. Osborne G. Brown D. Hall
P2001-04	Metapopulation structure and dynamics of British Columbia herring	D.M. Ware J. Schweigert
P2001-05	Stock assessment and recommended harvest for Pacific sardine In 2002	J. Schweigert S. McFarlane
P2001-06	Population structure of herring (Clupea pallasi) in British Columbia: an analysis using microsatellite loci	T. Beacham J. Schweigert C. MacConnachie K.D. Le K. Labaree K.M. Miller

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.

Bargmann, Greg	Washington State Department of Fish and Wildlife
Hay, Doug	DFO, Pacific Biological Station
Ianelli, Jim	Alaska Fisheries Science Center
Lane, Dan	University of Ottawa
Olsen, Jeff	Alaska Department of Fish and Game
Schweigert, Jake	DFO, Pacific Biological Station
Tanasichuk, Ron	DFO, Pacific Biological Station
Ware, Dan	Marine Resource Consulting, Nanaimo

APPENDIX 3: PARTICIPANTS AT PELAGIC SUBCOMMITTEE MEETING, NOVEMBER 19 – 20, 2001

Subcommittee Chair: Jackie King
PSARC Chair: Max Stocker

DFO Participants	**Mon**	**Tues**
* Subcommittee Members		
Beacham, Terry		✓
Brown, Gayle	✓	
Chalmers, Dennis*	✓	✓
Clark, Dan	✓	
Daniel, Kristin	✓	✓
Flostrend, Linnea	✓	
Fort, Chuck*	✓	✓
Hamer, Lorena*	✓	✓
Hrabok, Christa	✓	✓
Hay, Doug*	✓	✓
King, Jackie*	✓	✓
McCarter, Bruce*	✓	✓
McFarlane, Sandy*	✓	
Midgley, Peter*	✓	✓
Potyrala, Mark*	✓	✓
Schweigert, Jake*	✓	✓
Smith, David	✓	
Tanasichuk, Ron*	✓	✓
Thomas, Greg*	✓	✓
Thompson, Matt	✓	✓
Trager, Diana*	✓	✓
External Participants:		
Dixon, W.	✓	✓
Gladstone, W.	✓	✓
Hall, Don	✓	
Jones, Russ	✓	✓
Lenic, John	✓	
Osborne, Josie	✓	
Pepper, Don	✓	✓
Ware, Dan	✓	✓
Webb, Lloyd	✓	✓
Wilson, Bill	✓	