

## REPORT OF BIOLOGICAL OCEANOGRAPHY COMMITTEE



The Committee thanked Drs. D. Mackas and T. Ikeda for convening a stimulating topic session on “Regional and interannual variants in life histories of key species”.

After Committee members were introduced the proposed agenda was presented and several new items added.

Dr. Tsutomu Ikeda (Japan) commented on his replacement on the BIO Committee by Dr. Atsushi Tsuda after Dr. Ikeda's move to an academic position. We are pleased to have Dr. Tsuda on the committee, but since we only have two Japanese members at present we encourage Dr. Ikeda to investigate being reappointed to our Committee and urge PICES to support this recommendation. Dr. Timothy R. Parsons is considering withdrawing from the Committee due to difficulty in obtaining travel funds to attend PICES meetings. Dr. Parsons has been an active and important academic contributor to BIO activities and we urge that he be retained on the Committee.

The Committee and our guests discussed the new procedures for requesting extended abstracts for PICES presentations. All participants were enthusiastically in favor of continuing this procedure. Suggestions for changes include: marking extended abstracts with “not for citation without authors permission”, including an e-mail address or fax number for first author, requesting the Secretariat to make copies of extended abstracts if abstracts were submitted well in advance of the meeting, and having the Secretariat maintain a permanent file of the extended abstracts with identification (reference numbers).

Special topics for PICES VI and VII were discussed. Two topics were discussed for PICES VI: the role of micronekton and harmful algal blooms. The Committee voted in favour of “Harmful Algal Blooms: Causes and

Consequences” with a Korean and eastern Pacific co-convenor. This will be co-sponsored with MEQ and the two Committees will work together to choose conveners. Possible conveners include Wekell, Trainer, or Paul Harrison. The Committee would also like to sponsor a special session topic on “Micronekton and their predators: Distributions, dynamics, and sampling problems” for PICES VI with possible co-sponsoring by FIS. Possible conveners are Brodeur or McKinnell, and Kawaguchi, Sakurai, or Fukuyo. We proposed to consolidate the Committee meeting to one afternoon session and to use the other afternoon for a paper session. Other topics discussed for future meetings include controlling factors for lower trophic levels, higher trophic level models, marine birds and mammals, environmental effects of fishing, the role of under-appreciated (missing link) fauna, effects of timing of production, the role of micronekton, the hunger state of zooplankton, factors controlling phytoplankton stocks, and comparison of various modeling approaches applied to a common data set.

Dr. George L. Hunt gave a report on the first meeting of WG 11 (The consumption of marine resources by marine birds and mammals). The WG met on October 11-12 and assessed the quantity and quality of data available for estimating the size of populations, food habits and consumption. The data available differ greatly in quality and quantity for marine birds and mammals and for various PICES areas. The WG agreed to construct for each area, a tabulation of populations, dates of residency, energy demand, food habits and consumption. Not all cells in the table will be filled. Time periods for aggregating data will vary with species and data availability. The WG defined a set of regions within the PICES area and requests feedback from the PICES community as to the usefulness of the boundaries chosen. A number of individuals with expertise in the western Pacific were not able to attend, and

efforts should be made to ensure their future participation.

Working Group 11 will be requesting a 5-day workshop to assemble this table, discuss and revise the tabulation and to prepare their report. The Committee endorses this request as the most efficient way for WG 11 to complete their work over the following year.

Mr. Robin Brown presented an overview of the times series inventory being developed for the PICES Home Page.

BIO representation of the CCCC-IP and Task Teams was discussed. The Committee recommends that Dr. George Hunt be appointed to REX to represent WG 11 and that Dr. Linda Jones be appointed to MODEL.

Regarding the recommendations of WG 9 (Subarctic Pacific Monitoring) the Committee endorses the implementation of ecological moorings in the Alaskan and western gyres but is concerned that Station P be maintained as a site in order to have continued comparisons with the historical records. Any funding from Canada will be unlikely if the site is changed. The Committee strongly endorses the WG 9 suggestion of SB sponsoring an annual session of "Assessing the state of the subarctic Pacific".

Regarding SCOR-WG 105, the Committee recommends that Prof. Qi-Sheng Tang be appointed as the PICES representative and serve as rapporteur to BIO and FIS regarding SCOR-WG 105 activities.

The Committee received and discussed 13 nominations (7 nominees) for best BIO presentation. Two semi-finalists were selected and the Committee voted to give the award to Dr. Kaoru Nakata (National Research Institute of Fisheries Science, Yokohama, Japan) for her presentation on "Long-term fluctuations in the food availability for Japanese sardine larvae on the coastal side of the Kuroshio".

The Committee discussed two recommendations made in the Vladivostok Report. First, we strongly urge PICES to actively pursue facilitating access to EEZ zones for scientific investigations. The second recommendation was for preparation of a report on biological and fisheries aspects for the Okhotsk Sea and adjacent areas. According to our Russian committee members, preparation of this report is already in progress and should be published in 1997 in Russian with abstracts also in English. For maximum utility of the Russian publication, the Committee asks PICES to support translation of the figure legends and table headings.

PICES Perspectives were discussed. The main comment was that we should have more scientific presentations (and fewer Committee meetings) at PICES meetings.

A new Working Group on micronekton was suggested by Napp and Brodeur. A brief written description will be distributed to Committee members. The Committee is in favour of such a Working Group if it addresses the distribution and abundance of micronekton in addition to the initial suggestion which focussed on sampling protocols which permit assessment of both predators and prey. Discussion will continue by e-mail to refine the goals of the Working Group and develop terms of reference.

Written comments on the CCCC-IP report and recommendations will be passed on to chairmen of the appropriate Task Team.

### **Scientific Program**

The following scientific papers were presented from the BIO Committee sponsored part of the program.

*Regional and interannual variants in life histories of key species.* Co-convenors: David L. Mackas (Canada) & Tsutomu Ikeda (Japan).

- D.E. Hay & P.B. McCarter  
Effects of annual temperature variation the timing and geographic distribution of herring spawning locations in British Columbia
- L. Huato  
Climate and the life history of sockeye salmon
- T. Ikeda  
Life history of major zooplankton species in the southern Japan Sea (East Sea): a review
- H. Kasai, T. Kono, A. Tsuda & H. Saito  
Short period variability of primary production in early summer in the Oyashio region
- K. Kawaguchi, H. Watanabe, M. Moku & A. Hayashi  
The community structure of myctophid fishes and warm core ring in the transitional waters of the western North Pacific
- T. Kono, M. Kawamiya, H. Kasai & H. Saito  
Influence of the stratification to the primary production of the Oyashio region using a one-dimensional model
- G.V. Khen, V.A. Snytko & E.P. Karedin  
Interdecadal ice cover variations in the far eastern seas during current century and observed responses in ichthyocenosis
- K. Matsushita  
How do eggs and larvae come to nursery beyond front?
- K. Nakata  
Long-term fluctuations in the food availability for Japanese sardine larvae on the coastal side of the Kuroshio
- J.M. Napp, K.M. Bailey & M.K. Cohen  
Adaptations of spring-spawning walleye pollock, *Theragra chalcogramma*, to the inherent environmental variability of three regions
- V.I. Radchenko  
Interannual variability of Dolly varden *Salvelinus malma* (Walbaum) distribution in the deep-water zone of the Bering Sea in relation with oceanological conditions
- P.S. Rand & S.G. Hinch  
Spatial patterns of salmon prey, feeding and growth in the Northeast Pacific Ocean
- A. Shiimoto  
East and west changes of standing stock and size composition of phytoplankton chlorophyll-*a* in the transition domain in the North Pacific, spring and summer
- K. Taki & T. Ogishima  
Distribution of *Euphausia pacifica* in the northwestern Pacific Ocean in summer
- K. Takokoro & T. Sugimoto  
Role of top-down and bottom-up control on variations in plankton biomass in the subarctic Pacific
- M. Terazaki  
Life history, distribution, seasonal variability and feeding of the pelagic chaetognath, *Sagitta elegans* in the subarctic Pacific
- S. Uye  
Characteristics of the life history of key copepod species along a eutrophic-mesotrophic-oligotrophic transect in Japanese coastal waters
- Y.I. Zuenko, Y.U. Novikov, S.Y. Glebova, L.N. Bokhan, A.A. Batyaluk & V.N. Filatov.  
Empirical prognostic model of environments development and saury migration off southern Kuril Islands

## Endnote 1

### Participants and Observers

#### Canada

Timothy R. Parsons  
Kenneth L. Denman  
David L. Mackas

#### Japan

Takashige Sugimoto  
Atsushi Tsuda

#### Korea

Sung Yun Hong  
Jang-Uk Lee

#### Russia

Boris N. Kotenev (17<sup>th</sup> only)

#### U.S.A.

Patricia A. Wheeler (Chairman)  
Michael M. Mullin  
Linda Jones

#### Observers

Ken Morgan (Canada)  
Skip McKinnell (Canada)(16<sup>th</sup> only)  
Hidehiro Kato (Japan) (16<sup>th</sup> only)  
Tsutomu Ikeda (Japan)  
Kouichi Kawaguchi (Japan) (16<sup>th</sup> only)  
Akira Taniguchi (Japan) (16<sup>th</sup> only)  
Shin'ichi Uye (Japan) (16<sup>th</sup> only)  
Suam Kim (Korea) (16<sup>th</sup> only)  
Yury I. Zuenko (Russia)  
Jeffrey M. Napp (U.S.A.) (16<sup>th</sup> only)  
George L. Hunt (U.S.A.)  
Karl Banse (U.S.A.) (16<sup>th</sup> only)  
Bruce W. Frost (U.S.A.) (16<sup>th</sup> only)  
Michael R. Reeve (U.S.A.) (16<sup>th</sup> only)  
Patrick J. Gould (U.S.A.)  
Ken Holland (U.S.A.) (16<sup>th</sup> only)  
John E. Stein (U.S.A.) (17<sup>th</sup> only)

## Endnote 2

### Report of Working Group 11

#### Consumption of Marine Resources by Marine Birds and Mammals in the PICES Region

#### Summary

PICES Working Group 11 met on October 11 and 12, 1996, in Nanaimo, British Columbia, Canada, to develop strategies for meeting its Terms of Reference. The Working Group assessed the quantity and quality of data available for estimating the size of marine bird and mammal populations, food habits and consumption. The data available differ greatly in quality and quantity for marine birds and mammals, and for the various PICES areas. The Working Group agreed to construct, for each PICES area, a tabulation of the populations of marine birds and mammals found in that area, dates of residency, energy demand, food habits and food consumption. The Working Group recognized that the extent to which we would be able to fill cells in the tables would depend on the data available, and would vary between regions and also between predator species and

species groups. Time periods in which to aggregate the data will vary depending on the biology of the species and the data available. The Working Group defined a set of regions within the PICES area, within which marine bird and mammal populations would be assessed. The Working Group requests feedback from the PICES community as to the usefulness of the boundaries chosen and whether we should modify the boundaries of these regions prior to developing our Tables on prey consumption by region. The Working Group requests that a five day meeting be held before the 1997 PICES meeting so that the Working Group can assemble its data and draft a Final Report. The Working Group was concerned that a number of individuals with expertise in the western Pacific Ocean were not able to attend, and that efforts should be made to ensure their future participation.

## Introduction

The first meeting of PICES Working Group 11 was held on October 11 and 12, 1996 in Nanaimo, British Columbia, Canada. The purpose of the meeting was to develop approaches for estimating the consumption of marine resources by marine birds and mammals in the PICES area. Marine birds and mammals are important aspects of the marine environment for many reasons: they are the object of considerable public interest, they are important and often highly visible consumers and transferors of organic material, and they may be used to provide an indication of changes in marine ecosystems. The Terms of Reference given to Working Group 11 referred explicitly to the need to assess the role of marine birds and mammals in the consumption of marine resources. Additionally, by referring to the importance of our work for the CCCC/IP group, we understood that it would also be desirable for Working Group 11 to address issues concerning the use of marine birds and mammals as indicators of the effects of climate change on marine ecosystems.

For the agenda for the first meeting of Working Group 11, see Appendix 1.

Participation:

### Canada

K. Morgan  
A. Trites

### Japan

N. Baba  
H. Kato, Co-Chairman

### U.S.A.

J. Bengston  
P. Gould  
G. Hunt, Co-Chairman  
C. Jay  
L. Lowry

### Other

L. Jones, liaison with the BIO Committee

To evaluate the effects of predation by marine birds and mammals on intermediate and lower trophic levels of subarctic Pacific marine ecosystems, Working Group 11 will:

1. Obtain and tabulate available data on population sizes and prey consumption by marine birds and mammals.
2. Calculate seasonal and annual consumption, expressed as numbers and biomass, of particular marine resource species by particular bird and mammal populations.
3. Where possible, stratify the calculation as to age classes of prey and locality (local stock impacted).
4. Prepare a report for PICES describing data sources and methods of calculation, and the results, and identifying major lacunae in knowledge.

This WG is proposed by BIO Committee and BIO believes that this WG activity will contribute to the ecosystem studies contemplated in CCCC. Dr. Linda Jones will be the point of contact for BIO. It is the intent of BIO that this WG encourage communication with CCCC/IP, with overlapping membership where possible.

## Decisions and Actions by Working Group 11

### A. Discussion of Terms of Reference

Members of the Working Group examined the feasibility of implementing the Terms of Reference within the time-frame suggested. It was agreed that the amount of work required to address the Terms of Reference in their entirety was greater than could be completed within the time available. It was agreed that we could meet the objectives required in the first Term of Reference and that progress could be made in meeting the second and forth Terms of Reference, at least for some species or groups of species. To this end, we developed a framework for meeting the major thrust of the Terms of Reference within a two-year time period, with

the presentation of our report at the 1998 PICES meeting.

The Working Group decided that predator populations would be identified at the species level, and that consumption would be calculated, where possible, at a regional scale. Within regions, we agreed to develop estimates of predator numbers, dates of residence, and where possible, to estimate energy demands and prey consumption by prey species and by prey types (e.g., zooplankton, small fish, squid). For marine birds, if abundances are known, it will be possible to calculate energetic demands. Additionally, for many species of marine birds, prey type is known, and for some marine birds, the proportion of different prey species in the diet is also available. The Working Group recognized that for many species of marine mammals, the size distribution of individuals in the population, and in particular regions, is unknown, and that without these data, it may not be possible to calculate energetic demands with a high level of reliability.

The Working Group also recognized that for many predator species and in many regions there are insufficient diet data to permit the calculation of prey demand by prey species. However, in some cases where prey species data are lacking, it may be possible to provide information on the consumption by classes of prey type. For most prey species, size classes will be limited to broad categories, and our ability to identify age classes will be limited to categorization of fish as juveniles or adults.

The Working Group was excited about the possibility of contributing to the CCCC program by using marine birds and mammals as indicators of changes in marine ecosystems driven by climate. It was also suggested that where physical processes were responsible for controlling the flux of energy to marine birds or mammals, there was the possibility of developing predictions as to how climate change would be expected to influence marine bird and mammal populations.

## B. Proposed Structure for the Working Group Report

The Working Group agreed that the core of its report will be a set of Tables detailing our knowledge of the population sizes, dominant prey species, and, where possible energy demand and prey consumption, by region, for species of marine birds and mammals in the PICES area. A draft of the proposed format and definition of terms for these tables is presented in Appendix 2. The Working Group noted that there were on the order of 100 species each of marine birds and mammals that occur in the PICES region, and that for many of these species relatively little information is available. However, in general, our knowledge of numbers, distribution and prey habits are most complete for the most abundant species, particularly in the case of marine birds, and that this bias in our knowledge will help in the development of estimates of regional flux of energy and prey to predators. Because there may be significant differences in the reliability of existing population estimates for marine birds and mammals, the Working Group agreed that it would be desirable to provide information on the quality of data and estimation techniques used to develop the report.

The Working Group spent considerable time attempting to identify sub-regions within the PICES area within which to aggregate estimates of energy demand and prey consumption (Figure 1). The Working Group chose to define areas by oceanographic features because this may provide the most ecologically meaningful framework for the comparison of regions. The Working Group seeks comment from others in the PICES community as to the appropriateness of the proposed sub-regions and on the delineation of boundaries, especially of the Oyashio/Kuroshio Current region, whose boundaries are provisionally set at 60 nautical miles offshore and the California Current, whose boundary is provisionally set at 100 km beyond the shelf break.

The Working Group also discussed the selection of an appropriate time unit in which to report the data. This issue was identified as important because some predator species are highly migratory, and may only feed in certain parts of their range. In addition, both the numbers of organisms in a region and the food habits of a predator may change over periods of weeks to months. The Working Group agreed that a monthly resolution of population distributions and consumption would be the finest scale of resolution sought, but that the final scale of resolution used in the report would be dictated by the quality of data available.

The Working Group recognized that there were several other aspects to the assessment of consumption by marine birds and mammals that were of importance, but were outside the framework of the report as presently planned. These areas include, but are not limited to, the consumption of discards and offal and the effect of these sources of food on the populations of scavenging species, nearshore consumption of prey by seabirds and other inshore foragers, and the influence of shorebirds and other intertidal and sub-tidal benthic and epibenthic foragers on the ecosystems that they exploit.

The Working Group expressed considerable interest in examining how climate change might influence marine bird and mammal populations in the PICES area. It was recognized that there was insufficient time available to explore this area fully, and it was agreed that as a first step, the Working Group would tabulate the species or populations of marine birds and mammals for which time series data are available. This tabulation would permit assessment of the species and regions in which data are sufficient for examination of responses of marine birds and mammals to the short-term climate changes that have been documented in recent decades.

### C. Time Line for Completion of Tasks

The Working Group agreed to the following schedule as realistic for the production of its report:

April 1, 1997 Circulation of preliminary drafts of tabulations of predator numbers, energy demand and prey consumption by sub-region

October 1997 Meet for five days prior to the PICES Scientific Meeting in Pusan, Republic of Korea, to develop a working draft of the report

October 1998 Presentation of the final report to the Biological Oceanography Committee

### D. Closing Remarks

Members of Working Group 11 were excited by the prospect of contributing to the PICES community a top-down view of ocean ecosystems. The Working Group was also encouraged by the interest of the PICES community in incorporating into studies of ocean ecosystems information concerning the ecological role of marine birds and mammals. The Working Group recognizes that marine birds and mammals integrate information over wide sections of the ocean, and often provide evidence of changes in marine ecosystems that may otherwise be difficult to detect. Thus, the members of Working Group 11 felt that it was extremely important that the PICES community include experts on marine birds and mammals when developing future interdisciplinary work within the context of PICES-GLOBEC and the CCCC initiatives. Within this context, the Working Group recognized the desirability of having closer integration with biological and physical oceanographers in the process of developing our report.

The Working Group was disappointed that a number of its members with expertise on the marine birds and mammals of the western

portion of the PICES area were unable to attend the Working Group meeting. Without their participation, it will be extremely difficult to discharge our responsibilities to PICES. The Members of Working Group 11 are concerned

about the lack of mechanisms for the support of travel for its members, particularly for individuals not associated with governmental agencies.

## Appendix 1

### **Preliminary Working Agenda**

#### *Friday:*

1. Opening remarks and background
2. Terms of Reference
3. Participants introduce themselves
4. Adoption of agenda

#### *Saturday:*

5. Review of current topics relevant to seabirds and marine mammals in respective regions or countries
6. Initial discussion on direction of WG 11
7. Data inventory and its availability
8. Assignments of tasks for the second year and inter-sessional work.
9. Other matters
10. Adoption of report

## Appendix 2

### **Outline of Data Tables for the Report**

Column Headings and the definitions:

1. Species:
2. Number of Animals in Region: Use latest reliable estimate. If population size is in flux, note information on population changes in text.
3. Residency Period: The inclusive dates within which organisms are present. The intention is to calculate bird- or mammal-days of occupancy of the region.
4. Occupancy: The bird-days or mammal-days of use of the region.
5. Body Mass (Kg): Mass should reflect the average mass of individuals present in the population occupying the region.
6. Energy Consumption: Joules individual<sup>-1</sup> day<sup>-1</sup>
7. Energy demand per period: (6) x (4)
8. Major Prey Species
9. Major Prey Groups
10. Relative Importance of prey Species: Proportion by Occurrence, by number and by Mass or Volume.
11. Prey Consumption by Species: This term will require calculating the proportion of energy supplied by each prey species and then multiplying that by the total energy demand per period.