Report of the Advisory Panel on *Marine Birds and Mammals*

The meeting of the Advisory Panel for *Marine Birds and Mammals* (AP-MBM; under the auspices of BIO Committee) was held from 09:00–17:00 hours on October 16, 2015 in Qingdao, China. The business meeting focused on the current activities of AP-MBM at the Annual Meeting, and on preparations for associated projects to begin in 2016.

AGENDA ITEM 1
Welcome

Dr. Yutaka Watanuki, Co-Chair of AP-MBM, called the meeting to order and welcomed members and observers (*AP-MBM Endnote 1*). AP-MBM members representing Canada, China, Japan, Russia, and USA were present. Dr. Elliott Hazen, representing USA, was welcomed as a new member of AP-MBM. AP-MBM members from Korea did not attend.

AGENDA ITEM 2
Adoption of agenda

The agenda was reviewed and approved (*AP-MBM Endnote 2*).

AGENDA ITEM 3
Reports

a) Dr. Watanuki reported that the PICES Scientific Report of AP-MBM's work from 2012–2014 on spatial ecology of top predators is near finalization. The report was submitted to the BIO Committee for approval. Dr. Patrick O'Hara has offered to provide copy-editing.

b) Dr. Patrick O'Hara announced that the 2nd World Seabird Conference will be held in Cape Town, South Africa from October 26–30, 2015.

c) Dr. Elliot Hazen summarized SP-MBM's activities at the PICES FUTURE Open Science Meeting (Workshop W1 on "*Top predators as indicators of climate change: Statistical techniques, challenges and opportunities*" April 15–18, 2014, Kohala Coast, Hawaii, USA) and 3rd CLIOTOP Symposium on "*Future of oceanic animals in a changing ocean*" (September 14–18, 2015, San Sebastian, Spain; co-organized by Elliot Hazen). Dr. Hazen will give presentation on "*Scales of inference: The influence of spatial and temporal resolution on habitat-based models for marine predators*" in BIO paper session on Tuesday. The FUTURE Mini-Symposium will also be a good opportunity to highlight these activities. Dr. Hazen will give an 8-minute overview.

d) Dr. Tsutomu Tamura gave his report on the International Whaling Commission/Scientific Committee (IWC/SC) meeting in San Diego. The IWC/SC discussed the Species Distribution Model and its use in ecosystem modeling approaches for each marine mammal species. In 2017 an IWC/POWER cruise will focus on the Bering/Okhotsk Sea. Dr. Tamura described the gray whale workshop to develop an initial modeling framework for gray whales in the North Pacific in response to the effects of climate change (*AP-MBM Endnote 3*).

e) Dr. Andrey Vinnikov discussed the status of marine mammals in northeast of Russia. Stinky Gray whales high in aldehydes and ketones could not be consumed. Walruses have declined from 1980 to 2006, from 300,000 to 126,900. The main reason for the decline is the decrease of ice in the Bering and Chukchi seas. Villages near the haulouts often provide disturbance to walruses. Ice seals, primarily spotted seals, had a disease outbreak in 2011. A joint Japan–Russian survey was conducted in 2015 in the Okhotsk Sea. Fin whale were the most numerous – 100 sightings. There was also a wide distribution of smaller cetaceans. Three albatross species were sighted including two rare species – short-tailed and black-footed albatross. The final results of Okhotsk Sea survey will be available as part of SC International Whaling Commission report.

All participants found these reports to be very useful in our upcoming efforts.

AGENDA ITEM 4
Discussions

a) Review of Terms of Reference
AP-MBM reviewed and approved the Terms of Reference for a Section on *Marine Birds and Mammals* (*AP-MBM Endnote 4*). Dr. Hazen suggested adding an appendix of organizations (CLIOTOP/IMBER, Pacific Seabird Group, IWC, Ocean Sciences, ESSAS, for examples) the AP/new Section has relations with. Dr. Hattori will ask BIO for guidance. The ordering of the TORs (1-2-3 to become 2-3-1) was briefly discussed. As there was no strong opinion, members voted to keep the order the same as listed in *AP-MBM Endnote 4*. AP-MBM's parent, the BIO Committee, suggested the change from an AP to a Section since the AP will live only as long as FUTURE (providing advice to the program, as stated in its TOR#1) – until 2019, while a Section can remain longer (undergoing periodic review by its parent). Although the advice provided by AP-MBM is very highly regarded by Science Board, with good products, 'advice' is considered too general. A Section also is perceived to have more prestige. AP-MBM members unanimously voted to become a Section.

b) Change of Co-Chair
Dr. Watanuki will step down as Co-Chair after the Annual Meeting. Dr. Hattori was nominated to replace Dr. Watanuki, and accepted the position of Co-Chair. Dr. Hattori is also member of BIO which will allow a strong connection.

c) Review of Topic Session/Workshop proposals
Dr. O`Hara proposed a Topic Session on "*Understanding our changing oceans through species distributions and habitat models based on remotely sensed data*" for PICES-2016 (*AP-MBM Endnote 5*). Dr. Jacquelynne King (FIS, S-CCME, WG 27) planned and presumably withdrew a similar themed workshop for fish so this may be an opportunity to communicate with her, and combining the two proposals. Dr. Hazen proposed a Topic Session on "*What factors make or break trophic linkages?*" (*AP-MBM Endnote 6*). Dr. Andrew Trites proposed a Workshop on "*Consumption of North Pacific forage species by marine birds and mammals*" (*AP-MBM Endnote 7*).

AGENDA ITEM 5
FUTURE SSC

FUTURE SSC member, Dr. Oleg Katugin, briefly reviewed the program and SSC. He stressed that dissemination of information is particularly important to FUTURE. The program used to consist of three Advisory Panels – AICE, COVE, SOFE but these have been superseded by a FUTURE Scientific Steering Committee. The goal of the FUTURE SSC is to improve the relationship between FUTURE and expert groups and Committees. Drs. Katugin and Hiroaki Saito are the SSC liaisons with AP-MBM. Dr. Saito stated

that FUTURE is one of the highest priorities for PICES, and the goals for science have been clear but the goals to society have been less clear. Currently PICES has a Section on Human Dimensions of Marine Systems. Many expert groups consider the human dimension aspect, and it is an area where AP/S-MBM could extend its efforts.

AGENDA ITEM 6
AP-MBM project on "Climate and Trophic Ecology of Marine Birds and Mammals"

Dr. Trites led the discussion on AP-MBM's climate and trophic ecology project, described in its Activity Plan for 2015–2019 (approved by BIO at PICES-2014).

Target species and participants: Work undertaken by Drs. Trites and Tamura on marine mammals is in good shape. Out of 47 species of marine mammals in the North Pacific, 10 had good data, *e.g*., Stellar sea lions; a crude spreadsheet was constructed for the broadest species, with some detail for the finest. Dr. Trites requested support from seabird scientists: Dr. Watanuki and possibly Dr. William Sydeman. Important bird species include shearwaters (migration across basins), murres, auklets (Sydeman), kittiwakes (R. Orben), marbled murrelets (O'Hara), Laysan and black-footed albatross. Dr. O'Hara pointed out that in the first stages, looking at regional *vs*. far-traveling species might be useful, *e.g*., resident *vs*. transient. However, only some species have year-round information.

Funding: Dr. Watanuki will ask Dr. Sydeman to co-lead a proposal on seabirds with Dr. O'Hara and himself. Potential funding organization will be: NPRB, Lenfest – forage fish task force, Packard Foundation, ONR – international proposal.

Spatial and temporal scales: Dr. Trites asked AP-MBM members to consider appropriate spatial scales. Some members argued for hierarchical scales (*e.g*., bio-region, then a finer scale in data rich areas). Time series data is likely more important than spatial scale.

Samples and analytical techniques: AP-MBM will focus on stomach content data. Dietary analyses provide biases as well, which members need to keep in mind (*e.g*., overly low estimates of myctophids). A review of diet data based on stable isotopes and fatty-acid profiles may be done for the secondary stage of analyses.

Trophic linkage with prey population: AP-MBM needs support from FIS. On the prey side, FIS led by Dr. Libby Logerwell(?); also Drs. William Peterson (BIO), Sonia Batten (MONITOR), Sanae Chiba (MONITOR), Jerome Fiechter (POC), and Shin-ichi Ito (POC, S-CCME) to be considered. AP-MBM discussed a potential Working Group on 'Match/mismatch of prey and predator in the North Pacific'. The Workshop on "*Consumption of North Pacific forage species by marine birds and mammals*" (*AP-MBM Endnote 6*) proposed by Dr. Trites will focus on the top 10 species, at least mentioning the highest data richness species in the North Pacific. For Japan, top 3 species are the streaked shearwater, black-tailed albatross, and rhino auklet. Sooty and short-tailed shearwaters are of migratory importance. For the East Pacific, there are some similar species as well. The workshop will 1) bring together data holders and get data on a hard-drive, 2) explore existing movement models and bioenergetics of top predators, 3) identify species and regions of most interest. Dr. Tamura will provide baleen whale data for these efforts. Drs. Hiroto Murase and Kenji Konishi will report prey consumption and spatial modeling efforts. Dr. Vinnikov will be a Russian contact person but cannot report further on these efforts at this stage. Dr. Enyuan Fan will try to find some seabird data from ecosystem research projects. Dr. Hazen will help with proposal writing and analyses. It is important to include top predatory fish; potential contacts could be CLIOTOP, *e.g*., Drs. Jock Young and Bob Olson; Dr. John Field (FIS – for squid and groundfish), Dr. Libby Logerwell (FIS – for Bering Sea fish species) and Japanese researchers.

AP-MBM Endnote 1

AP-MBM participation list

Members

Enyuan Fan (China)
Kaoru Hattori (Japan)
Elliott Hazen (USA)
Patrick O'Hara (Canada)
Tsutomu Tamura (Japan)
Andrew Trites (Canada)
Andrey Vinnikov (Russia)
Yutaka Watanuki (Japan, Co-Chairman)

Observers

Steven Bograd (USA, FUTURE)
John Elliot (USA)
Oleg N. Katugin (Russia, FUTURE)
Hiroaki Saito (Japan, FUTURE)

AP-MBM Endnote 2

AP-MBM meeting agenda

1. Call to order – meeting participants, new members of PICES community
2. Review agenda (modify as needed)
3. Country Reports from participants
   a: Scientific Report on "SPATIAL ECOLOGY" (Watanuki)
   b: International Symposium related to MBM-AP activities
   c: Link with other groups during this meeting
   d: Report of IWC activities (Tamura).
   e: Investigation of marine mammals by TINRO and cetaceans in Okhotsk (Vinnikov)
4. Discussions
   a: Review AP-MBM Terms of Reference and change of AP to Section
   c: Change of Co-Chair (Y. Watanuki to K. Hattori)
   b: Review 2015 Topic Session proposal: Distribution of top predator (O'Hara); Workshop proposal: Prey consumption (Trites); Factors making break of trophic linkage (Hazen)
5. FUTURE SSC comments
6. 2015-2019 MBM-AP project
   Title: Climate and Trophic Ecology of Marine Birds and Mammals
   Leader: Andrew Trites (Canada)
   Co-leaders: Yutaka Watanuki (Japan), William Sydeman (USA), Elliott Hazen (USA, non-member)
   Long term strategic plan; link with FUTURE, other committees, potential workshop, Session

AP-MBM Endnote 3

PICES Observer Report on the 2015 IWC Scientific Committee Meeting

Tsutomu Tamura
The Institute of Cetacean Research, 4-5, Toyomi-cho, Chuo-ku, Tokyo, 104-0055, Japan.

The 66th scientific committee meeting (SC) of the International Whaling Commission (IWC) was held in San Diego, USA from May 22–June 3, 2015. A total of 125 participants from 33 contracting governments, in addition to 72 invited experts and 6 observers from 6 international organizations (CCAMLR, IUCN, PICES, SPAW, *etc*.) participated at this year's annual meeting. For the management of cetacean stocks, which is the most important task for the committee, the SC explored improvement of management methods for cetacean stocks after enforcement of the commercial whaling moratorium in 1985, and had already agreed with the scientific basis of the Revised Management Procedure (RMP) in 1996 through long-time endeavors by many scientists. The IWC/SC is continuing to check the trial performance and implementation of the RMP for the stocks after completion of their comprehensive assessments.

Under the IWC/SC, the following six sub-committees and eight working groups have been established:

- Sub-committee on Revised Management Procedure (RMP),
- Sub-committee on Bowhead, Right and Gray Whales (BRG),
- Sub-committee on In-depth Assessment (IA),
- Sub-committee on Southern Hemisphere Whale Stocks (SH),
- Sub-committee on Small Cetaceans (SM) and
- Sub-committee on Whalewatching (WW),
- Working group on Aboriginal Whaling Management Procedure (AWMP),
- Working group on Stock Definition (SD),
- Working group on Non Deliberate Human Induced Mortality of Large Whales (HIM),
- Working group on Environmental Concerns (E),
- Working group on Ecosystem Modeling (EM),
- Working group on DNA Testing (DNA),
- Working group on Review of Sanctuaries and Sanctuary proposals and
- Working group on Scientific Permit (SP).

Every substantial issue is discussed once at the sub-committees or the working group and then goes to plenary of the committee. After completion of its business at its annual meeting, the IWC/SC makes scientific advices and recommendations to the IWC commission.

This year the following topics were noted in discussions from the 2015 annual meeting (especially for North Pacific Ocean-related matters):

1. RMP implementation

No further trials were carried out for the North Pacific stocks in this year. It was agreed that the proposed start of implementation on North Pacific stock Bryde's whales in 2016 be postponed to 2017. There were some developments of methods to estimate MSYR using an IBEM model in relation to the *Catch Limit Algorithm* (*CLA*) process. Whale sighting cruises in the Okhotsk Sea were proposed by Russia and the plans for those were reviewed and endorsed by the SC.

2. Comprehensive assessment, *etc*.

Under the comprehensive assessments through IA, SH and BRG sub-committees, there was some progress on North Pacific sei whales in relation to both stock separation and population abundance. Regarding the conservation of western North Pacific gray whale stock, which is highly depleted, a report on its structure and status was given at the 2nd Workshop on "*The rangewide review of the population*". This Workshop was a technical follow-up to the 2014 workshop that had thoroughly reviewed the available information on *inter alia* stock structure, abundance and biology with a view to developing an initial modelling framework for gray

whales throughout the North Pacific. The 2015 Workshop reviewed progress made inter-sessionally on recommendations made at the 2014 workshop and annual meeting of the SC.

3. Management of aboriginal and subsistence whaling

The IWC/SC has managed ongoing aboriginal and subsistence whaling with using AWMP (Aboriginal and subsistence whaling management scheme) including: Bowhead whale stocks in the Arctic region, fin whale, minke whale and humpback whale stocks of west Greenland and humpback whale off St. Vincent and Grenadines, and Eastern stock of gray whales of Chukotoka. Examinations of updated scientific information by the IWC/SC concluded the present catch levels for the respective stocks would not be harmful. This year whale stocks including North Pacific grey whales, fin, common minke and humpback whales of west Greenland were especially discussed.

4. Scientific permits (SP)

The SP Sub-committee to review of scientific permit program (based on Article VIII of the international convention for regulation of whaling), reviewed the report from the research results and plans for Japanese scientific permits. Regarding the Japanese Whale Research Program under SP in the western North Pacific (JARPN II), it was noted that the expert panel meeting for its final review will be held in Tokyo in early 2016.

5. Environment issue and Ecosystem modeling

For environment issues around cetacean stock managements, the SC has two working groups (E, Environmental concern and EM, ecosystem modeling), and discussed a number of matters related to environmental factors that affect cetaceans. This year, progress on E Working Group issues were reviewed for:

1) State of the Cetacean Environment Report (SOCER);
2) Review progress in planning for POLLUTION 2020+I,
3) Review oil spill impact, especially the Deepwater Horizon (DWH) in 2010;
4) Review contaminant threat assessment;
5) Review cetacean Diseases of Concern (CDoC). This topic and working group were known as 'CERD' – 'cetacean emerging and resurgent diseases' prior to this meeting but was changed by the SC to 'CDoC' – 'cetacean diseases of concern';
6) Review anthropogenic sounds on cetaceans and approaches to mitigate effects issue;
7) Review activities related to Climate Change issue;
8) Review cetacean and marine debris.

For ecosystem modeling, the EM Working Group dedicated its time to three general tasks: (1) reviewing ecosystem models and modeling approaches that were developed outside of the IWC/SC, especially CCAMLR's ecosystem monitoring (WG-EMM) and management programme; (2) exploring how the ecosystem model (IBM; Individual based simulation model) can contribute to developing scenarios for simulation testing of the RMP; (3) reviewing issues relevant to ecosystem modeling within the SC, focusing on changes in body condition of the Antarctic minke whales in conjunction with environmental changes used in the analyses based on JARPA II (Japanese scientific permit sampling); (4) last year the SC agreed to review the application of species distribution modelling (SDM) and associated techniques as they pertain to the goals of the Committee, and established an inter-sessional Correspondence Group to develop guidelines and recommendations for best modelling practices.

6. North Pacific Sighting survey cruise (IWC/POWER)

IWC sponsors an international cetacean sighting survey program, started in 2010, in cooperation with Japan, Korea and United States. The project includes line transect sighting for estimating population abundance and biopsy skin-sampling and photo ID for stock structure on major large cetaceans. The project was renamed POWER (North Pacific Whales and Ecosystem Research) in 2011, and this year the SC received the 2014 cruise report conducted in waters surrounding 30°N–40°N and 170°E–160°W, which sighted 140 Bryde's, 1 blue, 1 sei and 155 sperm whales during its 3,233.0 nm searching cruise (Figure 1). A 2016 POWER cruise is

planned for waters surrounding 20°N–30°N and 160°W–135°W. Dr. Hidehiro Kato (former PICES/IWC observer) presented a request from PICES' AP-MBM/ to do a piggyback survey of sea-birds on the vessel. However, the request was not accepted again due to logistical reasons, mainly the limitation in the number of researchers that can be accommodated.

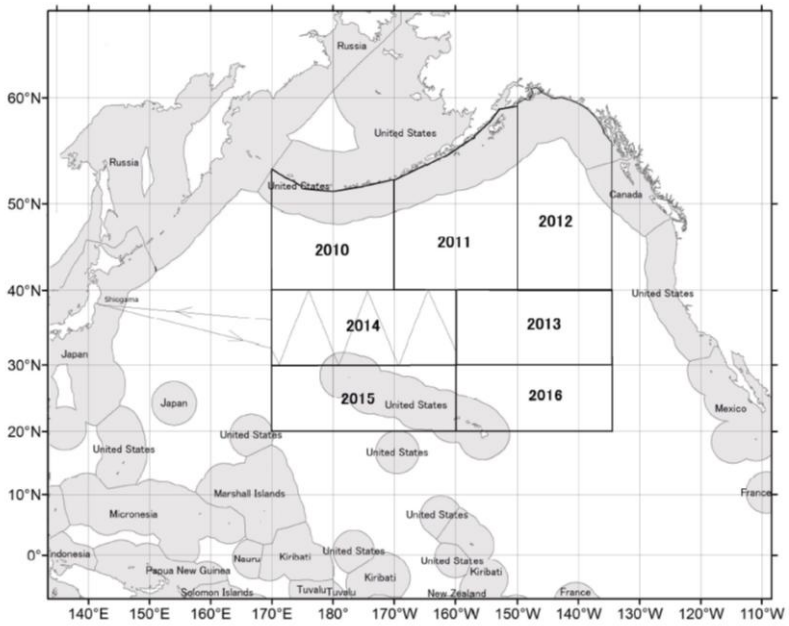

Figure 1. Research area and the trackline design of the 2014 IWC/POWER cruise.

7. Other issues

The SC agreed that Dr. Tsutomu Tamura should represent the SC as an observer at the next PICES Annual Meeting.

This was the final year of office for the Chair (Dr. Toshihide Kitakado) and the Vice-Chair (Dr. Caterina Fortuna) of SC. In accordance with its Rules of Procedure, the Vice-Chair automatically becomes the new Chair for the next three years. The Committee elected Dr. Robert Suydam (USA) to be the new Vice-Chair by consensus.

The next meeting of the Scientific Committee (SC/66b) will take place in Bled, Slovenia, from June 5–19, 2016.

8. Commission meeting

The Commission meeting was not held in this year. The next meeting of the Commission (IWC/66) will take place in September 2016.

Further details from the IWC meeting can be found in the 2015 Scientific Committee report.

AP-MBM Endnote 4

Terms of Reference for a Section on Marine Birds and Mammals (S-MBM)

1. Provide information and scientific expertise to the PICES community and the FUTURE program, as well as to BIO and other scientific and technical committees when requested, about the biology and ecological roles of marine birds and mammals (MBMs) in the PICES region;
2. Identify important problems, scientific questions, and knowledge gaps for understanding the impacts of climate change and anthropogenic factors on MBMs and ecosystems in the PICES region through Workshops, Topic Sessions and Scientific Reports;
3. Assemble information on the status and key demographic parameters of MBMs, and contribute to the Status Reports and Outlooks—and improve collaborative, interdisciplinary research with MBM experts and the PICES scientific community.

Core Elements of S-MBM Implementation Plan Phases (3 years in duration)

- Understand the top-down effects of MBMs on North Pacific Ecosystems;
- Further knowledge on the bottom-up forcing of MBMs abundance and distribution;
- Determine the response of MBMs to changes in climate.

<u>Phase 1: 2015–2017 Top Down</u>

- Compile a database on seabird and marine mammal diets, and population abundance in the North Pacific.
- Prepare Scientific Report summarizing diets of seabirds and marine mammals (MBMs) in the North Pacific including a full bibliography of data sources, reports and publications.
- The report will also contain the review of sessions and workshops that will be held in 2016 and 2017 related to variations in diets of MBMs.

<u>Phase 2: 2017–2019 Bottom-up and Synthesis</u>

- Prepare a report on the effects of climate-induced changes in prey quantity and quality on the consumption of prey by seabirds and marine mammals in the North Pacific.
- Communicate and integrate science through international symposiums and peer reviewed literature

AP-MBM Endnote 5

Proposal for a 1-day Topic Session on
"*Understanding our changing oceans through species distributions and habitat models based on remotely sensed data*" at **PICES-2016**

Convenors: Patrick O'Hara (Canada), Elliott Hazen (USA), Sei-Ichi Saitoh (Japan), Yutaka Watanuki (Japan)

Invited speaker: William Sydeman (USA)

Topic Session description
Determining marine animal distributions directly through at-sea observations or tracking is costly and logistically challenging. Moreover, even with limitless time and resources, information is limited because many species disperse over long distances including trans-hemispheric migrants. Species Distribution Models (SDMs) provide a tool to estimate present distributions and to project into the future (assuming species-environment relationships remain strong), but these models require substantial environmental data to accurately predict distribution and change. Increasingly, SDM approaches rely on remotely-sensed satellite data as indices of environmental conditions, particularly as proxies for primary and possibly secondary productivity.

Satellite datasets are inexpensive to use, widely served, well-documented (*i.e.*, scientifically defensible), and globally synoptic, allowing for easy spatio-temporal comparisons. However, satellite-borne sensors measure characteristics of the ocean at the surface while marine organisms respond to spatial and temporal features of the ocean at depth, which may require more complex approaches. In this session, we will investigate the opportunities and challenges of using satellite-based habitat models and ways we can advance SDMs for a better understanding our changing oceans and for improving management.

In particular, we solicit papers exploring the benefits and tradeoffs of using satellite-borne data to detect mechanisms of distributional and range shifts. This session will provide the PICES community and the FUTURE program with a better sense of the quality of fisheries, seabird, and marine mammal SDM under development in relation to climate change in the North Pacific.

AP-MBM Endnote 6

Proposal for a 1-day Topic Session on
"*What factors make or break trophic linkages*?" at PICES-2016

Convenors: Elliott Hazen (USA), Jameal Samhouri (USA), Shin-Ichi Ito (Japan), Jennifer Boldt (Canada)

Topic Session description
Mechanistic linkages from physics to phytoplankton to zooplankton to fish remain central to understanding climate forcing on marine ecosystems. Thus, it will be useful to understand how ecosystem linkages and species distribution are influenced by ocean features and how these linkages translate through the food web. Specifically, what information can be gained from moving beyond a single linkage (*e.g.*, phytoplankton to zooplankton) towards a comparison across trophic levels in three very different North Pacific ecosystems. Examples of such factors may include but are not limited to broad scale anomalies (*e.g.*, the blob, ENSO events, Kuroshio / Oyashio dynamics), temporal mismatches among physical processes, prey, and predators (match / mismatch hypothesis), and population fluctuations (*e.g.*, lipid poor *vs*. lipid rich zooplankton). We have suggested (but not limited to) three study areas, the California Current, the Kuroshio Current, and the Bering Sea to examine linkages from physics to phytoplankton, phytoplankton to zooplankton, zooplankton to fish, birds and mammals, and fish to birds and mammals. By looking particularly at multiple ecosystems and trends and anomalies across multiple trophic linkages, we can better understand how climate variability and

anthropogenic forcing may cascade through these marine ecosystems. We propose a topic session that will involve participation from multiple PICES committees and will focus on physical forcing and trophic linkages from physics to top predators. Specifically, we would request presentations on topics that (a) examine how changes in physical oceanography in both study areas lead to long term trends or anomalous responses in primary production, zooplankton, fish, and top predators, (b) how trophic relationships may respond to physical forcing and changes in species abundance and spatial distribution, and (c) test for threshold responses (non-linearity) across trophic levels to changes in physical oceanography and the population dynamics of other species (competitors, prey, and predators).

AP-MBM Endnote 7

Proposal for a 1-day Workshop on
"*Consumption of North Pacific forage species by marine birds and mammals*" at PICES-2016

Convenors: Andrew Trites (Canada)**,** Patrick O'Hara (Canada), Elliott Hazen (USA), William Sydeman (USA), Tsutomu Tamura (Japan), Yutaka Watanuki (Japan)

Co-sponsoring organization: North Pacific Research Board is a potential co-sponsoring organization.

Workshop description
Marine birds and mammals (MBMs) are known to consume substantial amounts of prey species, and can impact prey populations and sometimes induce trophic cascade. Therefore, MBMs can impact forage fish populations as well as lower tropic level organisms, and may compete with fisheries and other top-predators. Quantifying the effects of MBMs on marine ecosystem requires knowledge of diets and quantities of prey species consumed. Such data are also needed to examine the influence of climate variability and change on trophic linkages in the North Pacific, as well as to understand how changes in prey quantity, quality, composition and distribution affect the abundance and distribution of marine birds and mammals.

Our proposed workshop is a key component of our AP-MBM/BIO's new program to assess the climate and trophic ecology of marine birds and mammals. Modelers (movement and energetics of animals) and holders of dietary and distribution data for the 10 most intensively studied species of seabirds and marine mammals in the North Pacific will be invited to 1) give succinct reviews and overviews of modelling techniques and the temporal and spatial data sets held by their agencies or collaborators (morning). They will also participate in breakout groups (afternoon) to affirm species and regions of interest, discuss limitations of the data sets, identify alternative sources of data and information, and discuss existing movement and bioenergetic models. The conveners will meet the following morning to prepare the workshop report. Holding this workshop is an important first step in compiling and integrating the dietary and movement datasets we are seeking, and ensuring that the models that will be developed by graduate students that some of the AP-MBM/BIO members are expected to supervise are well thought through and have a high probability of success.

Potential participants:
We expect 20–30 people will attend. This includes all AP-MBM/BIO members who will be tasked with presenting species summaries. We will also invite PICES members who have been modelling movements of fish to attend, as well as other holders of seabird and marine mammal data that have not been a part of PICES to collaborate with us and attend our workshop. Finally, we will seek one or two researchers with specialties in movement and bioenergetics modelling to attend, and would appreciate funding from PICES to support travel for 1 person that would be expected to participate in the full PICES meeting.

Publications:
A summary of the workshop presentations and conclusions will form part of the AP-MBM's annual report, and may also be an appendix to our final report on the climate and trophic ecology of marine birds and mammals.