

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 09:30–17:00 hours on 13 October 2012 in Hiroshima, Japan. The business meeting focused on the activities of AP-MBM at the Annual Meeting, and on preparations for a 2-day workshop to fulfill the objectives of the Activity Plan adopted during the 2011 Annual Meeting.

AGENDA ITEM 1

Welcome

Dr. Yutaka Watanuki (Japan), Co-Chair of AP-MBM, called the meeting to order and welcomed members and observers (*AP-MBM Endnote 1*). AP-MBM members representing Canada, Japan, and USA were present. AP-MBM asks that parent Committee, BIO, request all countries to send delegates to PICES Annual Meetings and AP-MBM business meetings, and that China and Korea nominate members to the AP-MBM. The attendance of two seabird experts from Canada, Drs. Ken Morgan and John Elliot, was noted and appreciated.

AGENDA ITEM 2

Adoption of agenda

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

AGENDA ITEM 3

Reports from participants

Dr. Robert Suryan (USA) reported on the progress of a special publication resulting from the 2011 joint PICES/ICES Topic Session (S2: BIO/POC Topic Session entitled “*Mechanisms of physical-biological coupling forcing biological “hotspots”*”). The deadline for manuscript submission was July 1, 2012, and manuscripts that were submitted are in various states of review. Accepted manuscripts (the editors are targeting 8–12) are approximately 1 year from publication in *Marine Ecology Progress Series*.

Dr. Peter Ross (Canada) reported on the progress of the Study Group on Marine Pollutants (SG-MP), which Dr. Ross chairs. The Study Group will be proposing, through MEQ, the formation of a new PICES Section on Emerging Topics in Marine Pollutants (S-ETMP). The Study Group will also be proposing a 1-day Workshop on “*Traditional seafoods of the Snuneymux’w First Nation in Nanaimo, BC: Insight into food, social and ceremonial uses*”, and a ½-day joint PICES/ICES Topic Session “*Status, trends and effects of pollutants in coastal ecosystems: Implications for wildlife and humans*” to be held at the PICES-2013. AP-MBM supports the SG-MP draft proposals, and noted the importance of these subjects to marine birds and mammals.

Dr. Ross also introduced BIO/MEQ Topic Session S6, entitled “*Environmental contaminants in marine ecosystems: Seabirds and marine mammals as sentinels of ecosystem health*”, to be held October 17, 2012. This session will identify spatial patterns and geographic areas of concern for pollutants or other stressors using bio-indicator species; examine mechanisms of transport, and ultimate disposition, of contaminants in marine ecosystems; and discuss health risks for certain predators and human consumers. Ten papers are included in this ½-day session that was proposed by AP-MBM and is being convened by Dr. Ross, Dr. Watanuki, and Dr. Hideshige Takada (Japan). AP-MBM discussed the benefits of this session and how it links to the AP-MBM Activity Plan. There was also discussion regarding the appropriateness of including human health risks in the abstract for the session. A brief report summarizing the presentations and conclusions was prepared by the co-convenors following the session and can be found in the Session Summary section of the Annual Report.

Dr. Hidehiro Kato (Japan) reported (*AP-MBM Endnote 3*) on his activities as the PICES liaison to the International Whaling Commission (IWC). The panel thanked Dr. Kato for his efforts to integrate PICES science into the IWC science-policy arena, and recommends to BIO that Dr. Kato remain as the PICES liaison. The AP also recommends to BIO that PICES support making a request to the IWC to include a seabird observer on the IWC POWER cruise. This sighting survey in the North Pacific covers a large geographic area, and will help meet the objectives of the new AP-MBM Activity Plan by providing valuable at-sea distribution data for seabirds. Dr. William Sydeman (USA) and Dr. Suryan (USA) will lead efforts to organize activities and obtain support for seabird observer(s) on this cruise should a request be approved by the IWC.

Dr. George Hunt (USA) reported on the activities of PICES Workshop W3 on “*The feasibility of updating prey consumption by marine birds, marine mammals, and large predatory fish in PICES regions*”. A more complete report of W3 can be found in the Session Summary section of this Annual Report. W3 was held on October 13, 2012, and was convened by Dr. Hunt (USA), Dr. Kato (Japan), and Dr. Michael Seki (USA). Information was presented on the availability of new data (post 1998) on the distribution, abundance, and diets of marine birds, marine mammals and large predatory fish across the North Pacific. W3 participants agreed that an update of the information on prey consumption by marine birds and mammals throughout the PICES areas of the North Pacific Ocean (contained in PICES Scientific Report 14, 2000) is warranted where these new data are available.

W3 participants also agreed that it would be valuable and possible to include a select group of large predatory fishes (tuna, salmon, groundfish) in a new technical report on prey consumption by top predators. W3 participants acknowledged that considerable effort and resources would be required to assemble and integrate the requisite information. In addition, the appropriate framework, leadership, and participation necessary to undertake this task were not decided during W3. AP-MBM members discussed these issues in depth, and while they acknowledged the value of updating and producing a new report on prey consumption, they noted the ongoing commitments by members of AP-MBM in its approved Activity Plan. AP-MBM participants also noted that its ongoing activities in spatial ecology would provide complementary information needed for an update on prey consumption, and that this work could be done sequentially. In summary, the framework and participants needed for a new effort on prey consumption could not be determined at this time. One member of AP-MBM, Dr. Andrew Trites (Canada), indicated a willingness to explore ways in which a new report on prey consumption could be prepared. AP-MBM will evaluate the options for updating estimates of prey consumption in the North Pacific in 2013 with the expectation that a formal request may be made at the 2013 Annual Meeting to establish a new Working Group on Top Predator Prey Consumption.

Action: Dr. Trites (Canada) to explore ways in which a new report on prey consumption could be prepared.

AGENDA ITEM 4

Discussions

a. AP-MBM Terms of Reference

In response to the new overall PICES Science Plan of FUTURE, revised Terms of Reference (TOR) for AP-MBM were adopted at the 2011 Annual Meeting, and were subsequently approved by BIO. These Terms of Reference (*AP-MBM Endnote 4*) were reviewed and agreed upon.

b. Progress of AP-MBM Activity Plan

AP-MBM developed a 3-year Activity Plan that was adopted at PICES-2011, and was approved by the BIO Committee (*AP-MBM Endnote 5*). Discussion of the Activity Plan was conducted during the afternoon and revolved around proposals for the PICES 2013 Annual Meeting. In particular, AP-MBM focused on the specific goals and participants of the proposed Workshop, and on assessing the plans of the Workshop relative to the overall objectives and proposed products of the AP-MBM Activity Plan.

c. *Review of topic session proposal for PICES 2013*

Dr. Sydeman reviewed the nature of the ½-day Topic Session proposed for PICES-2013, titled “*Are marine ecosystems of the North Pacific becoming more variable?*” (AP-MBM Endnote 6). If approved, the session will be convened by Dr. Steven Bograd, Dr. Libby Logerwell, Dr. Sydeman, and Dr. Watanuki. Dr. Sydeman indicated that he has received positive feedback and interest from the list of possible invited speakers.

AGENDA ITEM 5

Review activities related 3-year program of AP-MBM, Spatial Ecology and Conservation, and workshop proposed for PICES-2013

Dr. Suryan led the afternoon discussion focusing on the AP-MBM Activity Plan and the importance of the proposed workshop (AP-MBM Endnote 7) for the successful completion of the overall objectives of the Activity Plan. The objectives of the Activity Plan are:

1. Compile and integrate available datasets from tracking and vessel-based survey studies of marine birds and mammals.
2. Synthesize distribution data of MBMs and assess changes over time.
3. Examine physical and biological factors that correspond to high use “hot spots”.
4. Map and provide information on important ecological areas in the PICES regions.

AP-MBM discussed how the end products of the Activity Plan would/could be used; whether the activities should involve habitat modeling (in addition to the compilation of datasets to create distribution maps and summaries); whether the end-product would incorporate a database (in addition to a PICES Scientific Report); where the final products and database would reside; whether our efforts would incorporate into any existing regional/global database; and what additional sources of funding would be available to support the workshop and, possibly, to support a spatial analyst for 1–2 years.

It was agreed that input data would include tracking (satellite, GPS, geolocator) data, strip and line transect vessel survey data (at this time, we do not intend to use data from platforms of opportunity). The end product will be distribution layers, essentially a data compilation, integration, and mapping exercise. The final PICES Scientific Report will include regional spatial summaries, but not include habitat integration or modeling. Data layers will include utilization distributions and/or raster files in formats that can be opened in various formats. We may need to digitize PICES regions and redefine certain regions, *e.g.*, Aleutian and Kurile Island regions. The end product users will be able to use the distribution layers for many purposes, including prey consumption, habitat modeling, marine spatial planning, risk assessment, *etc.* The scale of the data will depend on the survey or device used to collect the data. We will disaggregate data as much as possible (*e.g.*, devices with differing resolutions), and use case studies in smaller areas with good ship-based and tracking survey data overlap to determine the best ways to integrate data (see more detail below). We recognize this is not a product for scientists to conduct fine-scale analyses such as fine-scale nearshore movements.

Many databases already exist for the data that we will use, therefore, we will not duplicate these efforts. Any data that we acquire directly from data holders that is not currently archived in a database, will, with the data holder’s consent, be archived into an existing database. Data provided in raw format will not be archived or distributed without the data holders consent. The final data layers that we produce will be aggregated at a minimum spatial scale acceptable to all data providers. These aggregated data layers will be available for download from the PICES website. Attendees noted the potential to have the final distribution layers available for viewing on a PICES web-based mapping application.

AP-MBM discussed the funding needed to complete objectives of the Activity Plan. Funding is needed to invite speakers to the workshop during PICES-2013. Potential funding sources include PICES for 2 invited speakers, and possibly the North Pacific Research Board to host the workshop and for invited speakers. Funding will be pursued to support a post doc to work on this project. Potential sources of these additional

funds include a formal proposal for US\$100K or more to the North Pacific Research Board and/or the Office of Naval Research.

AP-MBM then focused discussion on the following objectives of the workshop:

1. Determine an analytical approach to integrate datasets.
2. Identify methods to spatially interpolate data.
3. Determine what environmental data to include for spatial modeling.
4. Determine how regions will be selected if we produce regional analyses/summaries (*i.e.*, PICES regions or establish biologically relevant areas)?

To successfully accomplish these objectives, AP-MBM discussed who should attend the workshop (key data holders, spatial analysts, and/or end product users), the format of the workshop, and data sharing policies.

It was agreed that the workshop should involve 10–12 invited attendees, including specialists in what we discussed as the three most important areas: tracking data (diverse experience, not species-specific), survey data, and statistics/modeling. Potential attendees were identified, including:

1. Data holders and database managers:

- John Piatt: North Pacific Pelagic Seabird Database (ship-based surveys),
- Scott Shaffer: Tracking of Pacific Pelagics (TOPP) seabird data holder,
- Kathy Kuletz: ship-based survey data holder for Alaska region,
- Ken Morgan: at-sea seabird data holder for Canada (Environment Canada),
- Karin Forney: NOAA/SWFSC,
- Dr. Okamura: Fisheries Agency. 2000–2007 database from Japan,
- Pat Halpin: Duke University, OBIS Seamap database,
- Yuri Arthukin, Victor Shuntov, and Alexander Kitaysky, for Russian survey data,
- Russ Andrews (Alaska Sealife Center) and Vladimir Burkanov, for Russian tracking data,
- Andrew Trites, University of British Columbia, pinniped tracking data.

2. Spatial analysts:

- Y. Kanaji: Habitat modeling (non-Baysian) of porpoises,
- Sei-Ichi Saitoh: Satellite remote sensing and marine GIS for habitat modeling of top predators,
- Devin Johnson: Baysian modeling, tracking and survey data, pinnipeds,
- Brett McClintock: modeling, tracking and abundance (density) data, pinnipeds,
- Paul Conn: modeling, survey and abundance data, pinnipeds and cetaceans,
- Jeff Laake: modeling, abundance and survey data, MARK, pinnipeds and cetaceans,
- John Durbin: survey and abundance data, cetaceans,
- Alex Zerbini: survey and tracking data cetaceans,
- Jeremy Sterling: tracking and environmental/oceanographic data, pinnipeds,
- Jarrod Santora: modeling marine bird survey data and implications for defining ecologically important areas,
- Martin Renner: modeling marine bird survey data,
- Elliott Hazen: modeling predator-prey distributions and variability with climate,
- Lynn Thomas: MOCHA, CREMES – state-space modeling,
- Ian Johnson: Dalhousie University – Baysian statistics,
- Ben Best: spatial statistics,
- Patrick O'Hara: modeling marine bird survey data,

3. End product users:

- Francis Weise (or other NPRB representative): Science Director, North Pacific Research Board.

AP-MBM agreed that a 2-day workshop was needed, and that the format would involve a discussion of datasets, analytical techniques, end products, form working groups on Day 1, and Review and testing applications, approaches, data outputs on Day 2. A subsample of all data types will be acquired and analyzed beforehand to maximize group productivity during the workshop. The workshop would also focus efforts on regional case studies to resolve data integration issues. Suggested case studies included:

- Case Study #1: Bering Sea near the Pribilof Islands – vessel at-sea surveys vs. tracking data for fur seals, black-legged kittiwakes, and thick-billed murre.
- Case Study #2: Kuroshio Extension: Japanese Fisheries Agency vessel survey and albatross tracking data. Also continuous plankton recorder (CPR) vessel-based surveys and streaked shearwater geolocator data.
- Case Study #3: California Cooperative Oceanic Fisheries Investigations vessel surveys and tracking of Laysan albatrosses, sharks, tunas, *etc.*
- Case Study #4: California Current with NOAA NMFS rockfish vessel surveys and black-footed albatross and sooty shearwater, pinniped, shark, *etc.* tracking data.

Finally, AP-MBM agreed that data sharing policies would involve a formal sharing agreement, similar to that used by OBIS Seemap, *etc.* In addition, every data holder will need to be contacted to confirm use, even if their data are already archived in a database (unless their data are specified as available for all use without request).

Ultimately, this technical workshop on methodology (including modeling, analysis) to derive “hotspots” of seabird and marine mammal aggregations or diversity is necessary to enhance the science needed to address our focal area of Spatial Ecology and Conservation. The workshop will emphasize methods to synthesize disparate bird and mammal distribution and abundance data (*e.g.*, how to combine tracking and shipboard observations) and key product development, such as the production of maps of important and vulnerable areas based on these distributional data.

AP-MBM Endnote 1**AP-MBM participation list**Members

Kaoru Hattori (Japan)
 Hidehiro Kato (Japan)
 Rolf Ream (USA, Co-Chairman)
 Peter Ross (Canada)
 William Sydeman (USA)
 Andrew Trites (Canada)
 Yutaka Watanuki (Japan, Co-Chairman)

Observers

Steven Bograd (USA)
 John Elliot (Canada)
 Dave Foley (USA)
 Elliot Hazen (USA)
 George Hunt (USA)
 Ken Morgan (Canada)
 Jarrod Santora (USA)
 Robert Suryan (USA)
 Tsutomu Tamura (Japan)
 Atsushi Tsuda (Japan)

AP-MBM Endnote 2

AP-MBM meeting agenda

1. Call to Order – Review Agenda (modify as needed)
2. Introductions - meeting participants, new members of PICES community
3. Reports from participants
 - a) Outcome of the 2011 Session S2 Hot Spot (R. Suryan)
 - b) Report of Workshop W3 2012 (G. Hunt)
 - d) Introduction of Topic Session S6 2012 (P. Ross)
 - c) IWC (H. Kato)
 - d) Link with other groups
4. Discussions
 - a) Review MBM-AP Terms of reference
 - b) Progress of AP Activity Plan, Spatial Ecology and Conservation (R. Suryan)
 - d) Review 2013 session proposal and identify possible participants and speakers Session (W. Sydeman)
 - e) Long term strategic plan; link with FUTURE, other committees, potential workshop, Session
5. Review activities related to the renewed 3-year term of AP-MBM, Spatial Ecology and Conservation and Workshop plan (R. Suryan)

AP-MBM Endnote 3

PICES Observer Report on the 64th IWC Scientific Committee Meeting

Hidehiro Kato

Tokyo University of Marine Science and Technology, Tokyo 104-8477, Japan

The 64th scientific committee meeting (SC) of the International Whaling Commission (IWC) was held in Panama City, Panama, from June 11 to 24, 2012. A total of 102 participants from 30 contracting governments, in addition to 48 invited experts and 5 observers from 5 international organizations (ACCOBAMS, CCAMLR, IUCN, PICES and SPAW) participated at this year's annual meeting. PICES was especially welcomed by the IWC/SC.

For the management of cetacean stocks, which is most important task for the committee, the SC explored improvement of management methods for cetacean stock after enforcement of the commercial whaling moratorium in 1985, and had already agreed with the scientific basis of RMP (Revised Management Procedure) in 1996 through long time endeavors by many scientists. The IWC/SC is continuing work on checking the performance and implementation trial of the RMP for the stocks through after completion of their comprehensive assessments.

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

- Sub-Committee on the Revised Management Procedure (RMP);
- Sub-Committee on Bowhead, Right and Gray Whales (BRG);
- Sub-Committee on In-Depth Assessments (IA);
- Sub-Committee on Other Southern Hemisphere Whale Stocks (SH);
- Standing Sub-Committee on Small Cetaceans (SC);
- Sub-Committee on Whalewatching (WW);
- Working Group on the Implementation Review of Western North Pacific common minke whales (NPM);
- Standing Working Group on an Aboriginal Whaling Management Procedure (AWMP);
- Working Group on DNA (DNA).
- Working Group on Stock Definition (SD);
- Working Group on Estimation of Bycatch and other Human-Induced Mortality (BC);
- Standing Working Group on Environmental Concerns (E);
- Working Group to Address Multi-species and Ecosystem Modelling Approaches (EM);

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 advice and recommendations to the IWC.

This year the following topics were noted:

1. RMP implementation

The IWC/SC focused on general issues such as maximum sustainable yield (MSY) rate and catch limit algorithm (CLA), and specific implementations on the western North Pacific Bryde's whale, western North Pacific common minke whale, North Atlantic fin whale and North Atlantic common minke whale stocks and North Atlantic sei whale stocks. In the North Pacific region, preparations of the implementation were almost done for WNP Bryde's whales but its assessment will be postponed till 2016, and it was the peak of discussion for western North Pacific minke whales in terms of stock structure scenario for the trial.

2. Comprehensive assessment (CA)

Under the comprehensive assessment (CA), this year the IWC/SC continued the review of stock status of blue and humpback whales, and right whales in the southern hemisphere. Also, both east and west stocks of the North Pacific gray whales were highlighted. It was the most highlighted topic and the SC settled the discussion on population abundance of the Antarctic minke whale though there were still unsolved problems on their time trend.

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 Chukotka. Through examinations of updated scientific information, the IWC/SC concluded the present catch levels for respective stocks would not harm the stocks. However, at the commission level, it was not supported that Denmark proposed minimum increase of catch quota.

4. Western gray whales

The western gray whale stock is noted as a highly depleted stock with a population size of around 120. The IWC/SC received a very interesting report that a Russian-U.S. research team, in cooperation with the IWC/SC, had tagged a large male with a satellite tag in the summer of 2010. It was noted that the animal crossed the Okhotsk Sea, southern parts of Bering Sea, and reached the west coast of North America.

5. Environment issues and ecosystem modeling

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

1. State of the Cetacean Environment Report (SOCER),
2. Update on POLLUTION 2000+ Phase II, including assessment Oil Spill impacts on cetaceans,
3. Review of Cetacean Emerging and Resurging Disease (CERD),
4. Review of new information on anthropogenic sound,
5. Review of progress on recommendations from the 2nd Climate Change Workshop, and others.

The Ecosystem Modeling Working Group dedicated its time to three general tasks:

- (1) review of ecosystem modeling efforts undertaken outside the IWC;
- (2) explore how ecosystem models contribute to developing scenarios for simulation testing of the RMP; and
- (3) review of other issues relevant to ecosystem modeling within the Committee.

Under item (1), it was noted through reviewing some documents* that with the move toward ecosystem-based management, consumption by marine mammals warrants inclusion as a source of natural mortality in assessments of mammal prey stocks. For item (2), it was emphasized again the value of implementing this in small steps rather than going immediately to complex models, and it was agreed that consideration of simple models of whales and prey should be a priority issue for future meeting. Under item (3), through reviewing the paper on Antarctic minke whale body condition changes to environment effects, it was noted that for an understanding of the possible relationships between food intake and stomach fullness, analyses of the consequences of the diurnal patterns of food intake should be important; alternative models for stomach evacuation (such as linear and exponential models) should be examined.

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

It was agreed the comprehensive cetacean sighting survey project would be commenced in summer 2010 under cooperation between Japan, Republic of Korea and the United State under auspices of the IWC. The project includes line transect sighting for estimating population abundance and biopsy skin-sampling and photo ID for stock structure of major large cetaceans. It was also agreed for years 2011 onwards, that the project will be conducted by the IWC/SC directly as its own middle- to long-term research project. The project was renamed to be "Pacific Ocean Whale and Ecosystem Research (POWER)" project in the last year. It was reported that the 2011 POWER cruise was successfully conducted; it was particularly noted that there were considerable numbers of biopsy and photo ID samples from humpback, fin and blue whales in addition to many sighting of fin and sei whales. (The 2012 POWER cruise has already been conducted from June to September 2012 as scheduled). For 2013 and onwards the cruise will be conducted at lower latitudes between 40°N to 30°N east of 160°E.

A request from PICES on the possibility of a sea-birds sighting survey on the POWER cruise was discussed at the SC meeting for the IWC/POWER project. The SC identified some important scientific aspects in the PICES request; however, it thought it was rather difficult to accept the request at that moment due to logistical reasons, especially as there was limited accommodation for the number of researchers and a time constraint with other research activities.

7. Other issues

The SC also covered relevant issues on small cetaceans, whalewatching, by-catch and humane deduced mortality, *etc.* as in many previous years.

8. Next year's meeting

The next annual meeting of the IWC/SC will be held at Jeju-do Island, Korea from June 3 to 15, 2013, and the Commission will not meet until some time in 2014.

* details of the paper:

SC/64/EM 1; Link, J.S. An overview of ecosystem models germane to whale population issues. 10pp.

SC/64/EM2; Col, L.A., Link, J.S., Cadrin, S. and Palka, D. Marine mammal (prey) consumption on the northeast US continental shelf. 52pp.

after Kato (2011)

AP-MBM Endnote 4**Terms of Reference (revised in 2011)**

1. Provide information and scientific expertise to BIO and the FUTURE Program, and, when necessary, to other scientific and technical committees with regard to the biology and ecological roles of marine mammals and seabirds 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 in ecosystems of the PICES region through Workshops, Theme Sessions and Science Reports.
3. Assemble information on the status and key demographic parameters of marine mammals and seabirds and contribute to the Status Reports.
4. Improve collaborative, interdisciplinary research with marine mammal and seabird researchers and the PICES scientific community.

AP-MBM Endnote 5**Plan of activities (2012–2014)**

Marine birds and mammals (MBMs) are: 1) highly mobile and their movement and distribution are easily observed from above the sea; 2) important marine top predators that consume substantial amounts of forage prey; and, 3) susceptible to the changes in marine food web structure and productivity, and to a variety of anthropogenic impacts, so they are believed to be sentinels of ecosystem health. Incorporating these characteristics of MBMs, and the objectives of FUTURE, we propose Spatial Ecology and Conservation as the topic of priority for AP-MBM 2012–2014 activities. Terms of Reference are revised accordingly (*AP-MBM Endnote 4*). Here we 1) describe the rationale of this topic, 2) summarize related past activities, and 3) describe potential activities or products to be accomplished by AP-MBM during the next three years (the term length for APs in PICES).

Topic summary (2012–2014): Spatial Ecology and Conservation

Leaders: Rolf Ream (USA), Yutaka Watanuki (Japan), Robert Suryan (USA, non-member),

Rationale:

Marine birds and mammals (MBMs) are not distributed evenly and aggregate at various temporal and spatial scales due to physical forces, biochemical factors, patchiness of their prey, behavioral and social factors, and the spatial dynamics of marine ecosystems. Thus coupling their distribution at sea with physical and biological factors is a subject of great interest and importance (Coyle *et al.* 1992, Hunt *et al.* 1993, and many others).

Research on the distribution and movement of MBMs in marine ecosystems can be relatively easy to accomplish and provides useful information for marine spatial planning and management (LME, IBA, IEA, and MPA; Hyrenback *et al.* 2000, Worm *et al.* 2003, Hooker 2008, Louzao *et al.* 2009). Additionally, identification of biological hot spots, where abundance and/or biodiversity are high, and elucidating the mechanisms, through the combination of biological (movement of MBMs and primary production) and physical information, that are responsible for establishing and maintaining (spatial and temporal stability/frequency) the hotspots, is critical for fisheries and conservation of MBM.

Related past activities of AP-MBM:

BIO (AP-MBM) co-sponsored the Topic Session titled, “*Hot spots and their use by migratory species and top predators in the North Pacific*” at PICES-2004. The related papers were subsequently published in Deep Sea Research II (2006). BIO (AP-MBM)/POC co-sponsored the Topic Session titled, “*Mechanisms of physical-biological coupling forcing biological hotspots*” at PICES-2011. Due to advancements in tracking techniques, studies on the movements of MBMs and the factors affecting their distributions have progressed substantially (Pinaud *et al.* 2005, and many others). At-sea bird and mammal census data are also accumulated and analyzed with the aid of new spatial statistics (Louzao *et al.* 2009 for an example).

Activity plan:

In three years (2012–2014), AP-MBM will: 1) synthesize distribution data of MBMs (boat-based, tracking, and terrestrial surveys) and its temporal change, 2) examine physical and biological factors that correspond to ecological/economic (fisheries) hot spots, and 3) provide information on important ecological areas in the PICES region to facilitate sustainable use of marine resources. These efforts will be useful for identifying important (for productivity, biodiversity, fisheries) and vulnerable (because of climate and anthropogenic impact including fisheries and pollution) ecological areas in the PICES region and to help understand the spatial and temporal dynamics responsible for variable habitat use (*i.e.*, biological hotspots). Knowledge of MBM use of ecological important areas, now and in the future, will contribute to the FUTURE mission of understanding climate change and anthropogenic impacts on marine ecosystems in the PICES region.

Time schedule:

PICES 2012 Annual Meeting (Japan), including a ½-day AP-MBM business meeting and a proposed Topic Session on “*Spatial patterns of anthropogenic stressors: predators as sentinels of marine ecosystem health*” (Co-convenors: P. Ross and Y. Watanuki).

2013 potential inter-session workshop (location to be determined):

A 2-day workshop on methodology of data analysis and modeling of at-sea spatial data, and for standardization of mapping efforts is planned. This workshop would emphasize methods to synthesize disparate bird and mammal distribution and abundance data, and to standardize development of key products, such as an atlas of important and vulnerable areas based on their distributional data. At the PICES 2013 Annual Meeting (Nanaimo, Canada), there are plans for a ½-day business meeting and potential Workshop or Topic Session on “*Modeling changes of distribution and ranges of MBMs in relation to climate change and anthropogenic impact*”.

The PICES 2014 Annual Meeting will include a ½-day business meeting with potential Workshop and Topic Session to synthesize the data and make an atlas of important and vulnerable areas using distribution of MBMs. Proceedings and a PICES Science Report (Ream, Suryan, Watanuki) will follow.

AP-MBM Endnote 6

**Proposal a ½-day Topic Session on
“*Are marine ecosystems of the North Pacific becoming more variable?*” at PICES-2013**

A primary forecast from Global Climate Models (GCMs) is increasing variability in the physical and biological attributes of marine ecosystems (IPCC 2007). It is also well known from oceanography, marine ecology, and fisheries biology that variability is a key attribute to population stability/instability. Increasing spatial and temporal variance has also been hypothesized to be a precursor to long-term marine ecosystem change or “regime shifts”. In this theme session, we invite papers that test hypotheses of increasing marine ecosystem variability relative to global climate change, be they of natural or anthropogenic origins. In particular, we invite studies that (1) address the theoretical basis for variance changes in North Pacific marine ecosystems using global climate models, paleo-ecological data, or experimental evidence, (2) directly test an hypothesis of “increasing ecosystem variability” using observational physical and/or biological data, and (3) consider how human social and economic systems and structures may be affected by increasing ecosystem variability, including the possible need for modifications in conservation and management strategies to deal with greater unpredictability and extremes in ecological conditions. A special volume for the primary literature will be investigated pending sufficient subscription to this session. Alternatively, a meta-analysis/review paper may be developed.

Proposed invited presentations:

- Model predictions of change in North Pacific ecosystem variance/variability (E. Di Lorenzo, USA),
- Paleo-ecological studies of ecosystem variability: the case of coral reefs (J. Pandolfi, Australia),

- Is climate and ecosystem variance altering pulses in recruitment of Northeast Pacific fish (J. Field or A. Hollowed or M. Litzow, USA),
- Managing fisheries for changes in system variance/variability (I. Perry, Canada or T. Essington, USA).

Sponsoring Committees: BIO/FIS/POC

Co-convenors: Steven Bograd (proponent POC/WG 27), Elizabeth Logerwell (proponent FIS), William Sydeman (lead), Yutaka Watanuki (proponent AP-MBM/BIO)

AP-MBM Endnote 7

Proposal for a 2-day Workshop on “*Marine bird and mammal spatial ecology*” at PICES-2013

Marine birds and mammals (MBMs) are highly mobile, yet relatively easily observed and tracked to determine their spatial distribution throughout the North Pacific Ocean. They are important marine top predators that consume substantial amounts of prey, and are susceptible to changes in marine food web structure, productivity, and to a variety of anthropogenic impacts. Therefore, MBMs are highly visible sentinels of ecosystem health and its change. To incorporate these roles and characteristics of MBMs into ecosystem based management and meet objectives of FUTURE, the PICES MBM Advisory Panel (MBM AP) proposed to focus on MBM spatial ecology and conservation as a priority topic for their 2012–2014 activities.

Over the past several decades, a wide variety of research programs have collected observational and tracking data of MBMs throughout the North Pacific. Portions of these data have been compiled into large databases, such as the North Pacific Pelagic Seabird Database. Others, however, still need to be integrated for more complete coverage of the PICES regions. We propose to hold a workshop to devise a strategy to compile and integrate these various data sets. Workshop invitees will include data holders and spatial analysis experts. Once data are compiled and integrated, our overall objectives will include: 1) synthesize distribution data of MBMs and assess changes over time; 2) examine physical and biological factors that correspond to high use “hot spots”; 3) map and provide information on important ecological areas in the PICES regions. Holding the proposed workshop is an important first step to compiling and integrating these massive datasets. In February 2012, we held discussions with several of the main data holders/contributors and they expressed broad support for this effort.

Sponsoring Committee: BIO

Potential co-sponsors: North Pacific Research Board and other potential co-sponsors.

Convenors:

- Robert Suryan (lead), Oregon State University, Newport, OR, email: rob.suryan@oregonstate.edu
- William Sydeman (proponent APMBM/BIO), Farallon Institute for Advance Ecosystem Research, Petaluma, CA, email wsydeman@faralloninstitute.org,
- Yutaka Watanuki (proponent APMBM co-chair/BIO), Graduate School of Fisheries Sciences, Hokkaido University, Hakodate, Japan, email:ywata@fish.hokudai.ac.jp,
- Rolf Ream (proponent AP-MBM co-chair/BIO), National Marine Mammal Laboratory, National Marine Fisheries Service, Seattle, WA, email: rolf.ream@noaa.gov.

Potential invited participants: (a maximum of 10 will attend)

- Y. Kanaji: Habitat modeling of porpoise: variability that depends on different statistical techniques,
- Sei-Ichi Saitoh: Satellite remote sensing and marine GIS for habitat modeling of top predator,
- Devin Johnson: modeling, tracking and survey data, pinnipeds,
- Brett McClintock: modeling, tracking and abundance (density) data, pinnipeds,
- Paul Conn: modeling, survey and abundance data, pinnipeds and cetaceans,
- Jeff Laake: modeling, abundance and survey data, MARK, pinnipeds and cetaceans,

AP-MBM-2012

- John Durbin: survey and abundance data, cetaceans,
- Alex Zerbini: survey and tracking data, cetaceans,
- Jeremy Sterling: tracking and environmental/oceanographic data, pinnipeds,
- Jarrod Santora: modeling marine bird survey data and implications for defining ecologically important area,
- Martin Renner: modeling marine bird survey data,
- Elliott Hazen: modeling predator-prey distributions and variability with climate,
- John Piatt: North Pacific Pelagic Seabird Tracking Database,
- Scott Shaffer: Tracking of Pacific Pelagics (TOPP) seabird data holder,
- Daniel Costa: Tracking of Pacific Pelagics (TOPP) marine mammal data holder,
- Kathy Kuletz: ship-based survey data holder for Alaska region,
- Francis Wiese: Science Director, North Pacific Research Board.

Output: Results stemming from this workshop will be published as a PICES Scientific Report at the end of AP-MBM's renewed 3-year term (2011–2014).