

Appendix A: S-MBM Action Plan, 2022-2026.

The S-MBM proposes to address the next stage of Climate and Trophic Ecology of Marine Birds and Mammals over the next 5 years. This program has been chosen because marine birds and mammals (MBMs) can have top-down effects on marine ecosystems and because MBMs respond to multiple scales of variability in the environment and their prey-base. We are completing our update of the 2000 report (Hunt et al., 2000) on diets and food consumption of marine mammals with case studies from seabirds as well based on additional datasets and improved bioenergetic models. Combining this information with data on prey quantity, quality, composition and distribution will further allow us to better understand and predict how variability in prey will impact MBMs. In particular, we plan on examining the influence of climate variability and change on trophic linkages and, ultimately, the distribution and abundance of MBMs in the North Pacific. In addition, our project will link directly with other PICES committees (e.g., BIO, FIS, POC, MEQ), provide improved data on energy flow needed for ecosystem models for PICES sub-regions and broader LMEs, and will address the goals of FUTURE to forecast ecosystem status and understand how marine ecosystems in the North Pacific respond to climate change and human activities.

Our project is premised on the fact that MBMs are important top predators that respond directly to changes in, and consume large amount of, forage species. It also recognizes that MBMs can induce trophic cascades, and that they are susceptible to changes in marine food web structure and productivity as a result of both natural and anthropogenic impacts. MBMs overlap directly with anthropogenic stressors, such as climate change, plastic and other pollutants, increased shipping, and fishery interactions. Finally, many MBMs are easily observed and highly mobile, and are considered sentinels of ecosystem status and health. As such, we believe the detailed analyses of MBMs that we are proposing will contribute significantly to meeting the objectives of FUTURE.

The following describes: 1) the rationale of our proposed project, and 2) describes potential activities or products to be accomplished by the S-MBM over these 5 years.

Our activity plan will focus on the “Interaction between MBMs and other ecosystem components and stressors.” This will include important sub-themes such as:

- Documenting, understanding, and potentially forecasting changes in forage species and response of MBMs to these changes.
- MBMs as ecological indicators of changing marine ecosystems using metrics such as population vital rates, spatiotemporal distributions and abundances, diet composition, body condition and stress hormones.

Phases:

1. Identification and assessment of important stressors (anthropogenic and environmental) on MBMs, developing Pathways of Effects (POE) models, and estimating potential impacts from these stressors.
2. Use of MBMs as indicators of impacts regionally and among regions.
3. Comparative synthesis of information from phase 1 and 2 across the PICES region.

Upcoming possible workshop themes:

1. Anthropogenic stressors, mechanisms and potential impacts on MBMs (led by M Kim, P O’Hara and Y Watanuki)
2. Climate change (including Marine Heat Waves) associated changes in migration patterns/distribution of MBM (led by W Sydeman, K Hattori and P O’Hara)
3. Predicting changes in small pelagic prey fish and potential impacts on MBMs (led by H W Kim and E Hazen)
4. MBMs as indicators of impacts (led by R Ream and W Sydeman)