



North Pacific Fisheries Commission

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A summary of 2022 activities by PICES Working Group 47 (WG-47) on Ecology of Seamounts

PICES' Working Group on Ecology of Seamounts (WG-47) was established in 2020 and has been active for almost two years. A description of WG-47 merits, terms of reference, work plan, and anticipated scientific outputs are available at <https://meetings.pices.int/members/working-groups/wg47>.

In 2021, WG-47 objectives included (1) gathering data on the distribution and life history of species associated with seamounts in the North Pacific Ocean and facilitate their submission to appropriate biodiversity databases (e.g. OBIS), (2) gathering data on key environmental variables hypothesized to influence the distribution and diversity of species associated with seamounts, and (3) convening a 2-day workshop on modelling the distributions of seamount taxa.

In 2022, WG-47 objectives included (1) identifying environmental and ecological predictors of patterns in the distribution and biodiversity of seamount taxa, (2) applying one or more modeling approaches to predict the distribution of seamount taxa in the North Pacific Ocean, (3) using available data to predict climate induced changes in the distributions of seamount fauna, and (4) convening a topic session on seamount ecology.

Because of the pandemic, many of WG-47's scientific activities have been postponed. Nevertheless, WG-47 co-chairs, Dr. Janelle Curtis and Dr. Mai Miyamoto, co-convened a two-day Workshop on "Distributions of pelagic, demersal, and benthic species associated with seamounts in the North Pacific Ocean and factors influencing their distributions" at PICES-2022 in Busan, Korea. The primary aims of the workshop were to:

- Identify and understanding factors influencing the diversity and distributions of species associated with seamounts in the North Pacific Ocean.
- Build capacity to develop predictive habitat models for seamount species.
- Consider how seamount species distributions are likely to respond to natural and anthropogenic forcing, including climate change.

The workshop was divided into three main topics: (1) a series of oral and poster presentations on seamount ecology, (2) case studies of particular topics on predictive modeling of seamount taxa and (3) discussions of emerging issues that were inspired by the presentations and case studies. WG-47's workshop began with an informative presentation by the invited expert, Telmo Morato, from

the Okeanos Research Institute of the University of the Azores in Portugal: *Improved deep-sea biodiversity assessments inform sustainable management of seamount and other geomorphologic features in a changing planet: Lessons learned from the North Atlantic.*

During the workshop, three oral presentations examined zooplankton productivity around seamounts in offshore regions. The fish fauna of seamounts was also explored through a series of presentations and posters. The final topic addressed by presentations was the distribution and VMEs on seamounts in the North Pacific Ocean. Following the presentations, the workshop moved to discussing key topics related to predicting the distribution of taxa associated with seamounts. Key environmental factors that were highlighted as being important for both species distribution models (SDMs) and for spatial management based on those SDMs included bathymetry data and geomorphological structures. Participants also discussed the value of including surface variables, such as chlorophyll *a*, as predictors in SDMs and considering how these variables may be important for different taxa. Discussions of spatial scale of both modeling and species distributions were a highlight of the workshop. Participants discussed the importance of flow patterns around seamounts and their effects on deep scattering layers and the availability of food, including overwintering copepods. The implications of benthic-pelagic coupling and species interactions for SDMs were discussed at length. Participants discussed the importance of clearly communicating the uncertainty associated with model predictions, especially given the broader scale of explanatory variables that are often used to predict the distributions of species that are distributed over smaller scales. The impacts of climate change on zooplankton and the seamount communities is generally unknown, however workshop participants were able to draw some broad conclusions regarding potential impacts in the future.

WG-47 co-chairs, Dr. Janelle Curtis and Dr. Mai Miyamoto, also co-convened an annual business meeting at the 2022 PICES Annual meeting in Busan, Korea. This meeting focused on introductions of members and observers, discussions of WG-47's terms of reference and exchanging information and ideas about participants' seamount research activities. Participants share an interest in the work of regional fisheries management organizations (RFMOs) on the identification of VMEs on seamounts.

PICES WG-47 on Ecology of Seamounts is convening a session at the 2023 PICES Annual Meeting in Seattle, USA: *Seamount biodiversity: vulnerable marine ecosystems (VMEs) and species associated with seamounts in the North Pacific Ocean.*

Although this WG-47 is not a joint working group of PICES and NPFC but VME is one of the priority areas for cooperation identified in the Framework for scientific collaboration between the two organizations.

WG-47's session is of interest to both PICES and NPFC, which have identified VMEs as a priority area for cooperation in the *NPFC–PICES Framework for Enhanced Scientific Collaboration in the North Pacific*. Therefore the six co-convenors (Dr. Janelle Curtis, Dr. Mai Miyamoto, Dr. Chris Rooper, Ms. Devon Warawa, Dr. Samuel Georgian, and Dr. Akash Sastri) are requesting that NPFC co-sponsor this session by contributing the equivalent of \$5,000 USD.

Description of WG-47's Session at the 2023 PICES Annual Meeting: Seamount biodiversity: vulnerable marine ecosystems (VMEs) and species associated with seamounts in the North Pacific Ocean.

There are tens of thousands of seamounts worldwide and their abundance is greatest in the North Pacific Ocean. The ecology of only a few has been studied, in part because of how deep and remote most seamounts are. The difficulty in studying the ecology of seamounts means that they are poorly understood habitats in terms of the pelagic, demersal, and benthic species that they support. These are unique habitats for deep-sea organisms and many seamounts are biodiversity hotspots with relatively high rates of endemism. They can host diverse communities of benthic filter feeders, including corals and sponges. Some dense communities of biogenic organisms on seamounts are recognized as vulnerable marine ecosystems (VMEs), in part because they can support high biodiversity and provide critical habitats for socioeconomically important fishes and invertebrates that attract commercial fishing and other anthropogenic activities. The biodiversity of fishes is high on seamounts; almost 800 species of fish have been recorded from seamounts, representing half of the orders of fishes. As such, seamounts are important sources of food. New and readily available data can be integrated to better understand factors that influence the distribution and trends in seamount biodiversity, including those related to oceanic fronts and eddies and to future climate-change scenarios. This proposed topic session will focus on improving our understanding of seamount biodiversity and exchanging ideas on methods to identify VMEs and areas likely to be VMEs. As such, it will lay the foundation for WG-47's activities to identify potential indicators for assessing and monitoring the biodiversity of pelagic, demersal, and benthic taxa associated with seamounts.