

Paleo-ecology of SubArctic Seas Working Group (PESAS)

Terms of Reference for working group in Ecosystem Studies of Subarctic Seas (ESSAS)

Introduction:

Ecosystem studies of subarctic marine systems have been advanced significantly through collaborative and coordinated efforts of ESSAS. These efforts have focused research on the structure and function of physical, biological, and increasingly social dynamics of those systems. In a less comprehensive or systematic fashion, research has been advanced to understand the spatial and temporal dynamics of subarctic marine *paleo*-ecology through the comparison of marine cores, bio-geochemical and isotopic analyses of sub-fossil marine organisms, and human subsistence and settlement patterns of subarctic coasts and oceanic islands. ESSAS provides an ideal venue to bring these two traditions together to better understand the patterns and processes of subarctic marine paleoecology and the evolution of human-ecological dynamics that have led to the current state of subarctic systems. The Paleoeecology of Subarctic Seas Working Group (PESAS) brings together leading scholars in the paleoceanography, paleoecology, archaeology and history of the North Pacific/Bering Sea and North Atlantic to develop a synthetic overview of the evolution of the marine ecosystems and to identify additional research efforts that will add to this knowledge and advance our ability to anticipate future conditions beyond annual to decadal time scales. This working group is composed of individuals and collaborating groups preparing synthesis chapters for an overview volume on subarctic marine paleoecology in the time since human occupation.

The geographical scope of the working group will include the northern margin of the Pacific from the Sea of Okhotsk to the Gulf of Alaska and the Bering and Chukchi seas and of the North Atlantic from the Labrador Sea and Baffin Bay to the North and Norwegian Seas. The time frame of interest is primarily Holocene but includes the last 20Kya to allow examination of changes since the Last Glacial Maximum. The emphasis is on the interval/s in which modern humans have been present and engaged in these subarctic marine ecosystems. Data limitations will constrain the exploration of some patterns to Holocene and even late Holocene time frames, while others will provide longer views. One goal is to assess the state of data available and to highlight areas for future investment.

In addition to providing an up-to-date synthesis of paleo-oceanographic and ecological information that is at the center of this effort, this synthesis effort will contribute to a number of key topic issues in human pre/history. Among others, these include the state and possible role of the marine system in the Late Pleistocene humans colonization of the Americas; the development and intensification of human maritime economies in seasonally frozen environments; the contexts and constraints of maritime settlement of islands (Kurils, Aleutians, Kodiak, Shetlands, Faroes, Iceland, Greenland); and the emergence, transformation and collapses of intensified/commercial fisheries in the Late Holocene.

Guiding questions include the following, with a provisional list of relevant proxies indicated in square brackets to be refined by members of the WG:

1. How have physical parameters changed across the basins (currents, salinity, temperatures, sea ice distributions) ... in terms of seasonal variability and not just annual means?
2. How have patterns of marine productivity changed?
3. How have food web dynamics varied and at what time scales?

4. How have distributions and densities of anadromous and marine fish, shellfish, marine birds, and sea mammals changed?
5. How have humans adapted to and impacted marine ecosystems across the target areas? What is the evidence for developing maritime economies? How did these economies change?
6. How do the patterns identified in answers to the above questions correspond and differ across and between the subarctic basins? What can be inferred about larger scale oceanographic processes/dynamics as a result?
7. How do changes in the marine system compare to terrestrial and atmospheric climate proxies and GCM model predictions? E.g., How did changes in orbital (precessional) seasonality affect sea ice patterns, primary productivity, and human maritime adaptations?
8. Where are the critical data gaps in time and space needed to better address the above questions?
9. How do the patterns from paleoproxy data sets connect to modern, short-time scale instrumental data sets? What are the limitations and potentials for addressing contemporary (short to medium time scale questions) with data from marine paleo-ecological data sets?

Tasks

- Identify/verify contributors – Summer 2013 - Spring 2014
- Develop working group proposal – This document
- Seek workshop funding - NSF grant to B. Fitzhugh for April 2014 ESSAS meeting.
- Organize workshop/s (logistics): 2014 – Copenhagen; 2015 – Seattle, June 15-19.
- Organize volume outline and task author groups - April 2014/June 2015 ESSAS meetings.
 - WG disciplinary presentations – June 2015 (ESSAS meeting)
 - WG interdisciplinary synthesis overview presentations (2016 ASM)
- Initial deadline for manuscript chapters
 - December 2015 for disciplinary ms.
 - December 2016 for interdisciplinary ms.
- Identify publication venue and subvention funding – Spring 2016
- Edit and submit volume for publication – Winter/Spring 2017

Expected results

- Topic Session at ESSAS annual science meeting, April 7-9, 2014, Copenhagen.
- Focused presentations of planned chapter syntheses at 2015 ESSAS ASM with WG session to finalize publication logistics - June 2015.
- ESSAS sponsored theme session at the 2015 AGU meeting, IMBER, Future Earth, ICES/PICES or similar meeting.
- Edited volume with collection of papers (8-10) with one or two additional comparative analyses. Target venue to be negotiated with participating members and ESSAS community.

Members

- Jason Addison (USGS-Menlo Park)
- Morten Allentoft, (Natural History Museum of Denmark)
- CC Bitz (University of Washington)
- Thomas M. Cronin (USGS)
- Dagomar Degroot, (York University)
- Mike Etnier (Western Washington University; UW)
- Bruce Finney (Idaho State University)
- Ben Fitzhugh (University of Washington) - WG lead
- Caroline Funk (SUNY – Buffalo)
- George Hambrecht (University of Maryland)
- Naomi Harada (JAMSTEC)
- Richard Hoffman (York University in Toronto)
- Eline Lorentzen, (Berkeley/ Natural History Museum of Denmark)
- Morton Meldgaard (Natural History Museum of Denmark)
- Thomas McGovern (Hunter College CUNY, NY)
- Nicole Misarti (University of Alaska-Fairbanks)
- Kana Nagashima (JAMSTEC)
- Astrid Ogilvie (INSTAAR)
- Bo Poulsen, (Aalborg University) - pending
- Andrez Savinetsky (Severtsov Institute of Ecology and Evolution RAS, Russia)
- Axel Timmermann, (Univ. of Hawaii)
- Anne de Vernal (GEOTOP & Département des sciences de la Terre et de l'atmosphère Université du Québec à Montréal)
- Catherine West (Boston University)
- Jim Woollett (Université Laval)