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PANABIO – A STRATEGIC APPROACH TO LARGE-SCALE DATA INTEGRATION, ANALYSIS AND MODELING BY MEANS OF A GEO-REFERENCED INFORMATION SYSTEM FOR PREDICTING THE RESPONSE OF BENTHIC BIOTA TO ENVIRONMENTAL CHANGE IN ARCTIC SEAS

Dieter Piepenburg *(Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Germany)*
Philippe Archambault *(Institut des sciences de la mer, Université du Québec à Rimouski, Canada)*
Lis Lindal Joergensen *(Institute of Marine Research, Norway)*

Dieter.Piepenburg@awi.de

Arctic marine biota are affected profoundly and at large scales, albeit with distinct regional differences, by accelerating environmental change, such as ocean warming and acidification, ice-shelf and sea-ice decline. Moreover, increasing human activities, e.g., exploration/exploitation of natural and mineral resources, ship traffic, and tourism, add further cumulative pressures on them. Substantial effects are expected, leading to shifts in key ecosystem functions and services, e.g., biodiversity, trophic interactions, carbon and nutrient cycling, calcification. To understand, predict and mitigate the profound ecological consequences of these environmental changes, there is a need to describe the ecological status quo in terms of structural and functional properties on both regional and pan-Arctic scales. Moreover, the assessment of shifts in ecosystem functioning and ecosystem services require the ability to identify and analyze the relationships between environmental drivers and ecosystem functions in both time and space. To address this challenge, we propose to conceive, develop, implement and utilize a pan-Arctic knowledge system on benthic biota (PANABIO), which integrates reliable, quality-controlled and geo-referenced data on marine communities with environmental information (observation and model data) at high spatial resolution and modeling tools. A close international cooperation of researchers is required to combine data and expertise in a joint cross-disciplinary effort to establish such a system. With the option of coupling to models of species distribution patterns and organism energetics, as well as to dynamic climate and oceanographic models, PANABIO would allow for (a) providing ecological baseline data to gauge ecosystem changes against, (b) analyzing coupling mechanisms between environmental drivers and ecosystem functions/services on regional and pan-Arctic scales, (c) developing future ecosystem scenarios in response to external forcing, and (d) creating online stakeholder-oriented visualization and analysis tools. In this presentation, we will (i) review ongoing/planned efforts of large-scale data integration at our institutes and at international level, (ii) describe fields/opportunities of international and transdisciplinary collaboration in such efforts, (iii) showcase advantages and possible applications, (iv) outline some technical aspects (needs, resources, properties, standards, etc.) of a publicly accessible pan-Arctic knowledge system, and (v) identify priority issues (technical, legal, etc.) to be solved yet. The talk will demonstrate the huge benefits of pan-Arctic data-integration efforts to advance our knowledge and understanding of processes determining the distribution of benthic species and communities in the changing Arctic.