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"A Dynamic Arctic in Global Change"

BOOK OF ABSTRACTS

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markers from key species in the SSL provided new insights in trophic transfers in this part of the Arctic Ocean, and we suggest that the prevalence of a high energy SSL might explain the large Dutch bowhead whaling that took place in Whalers Bay between 1670 to 1800, as well as the recent observations of whale aggregations. This study is a part of the RCN funded ArcticABC and Marine Night projects (http://www.mare-incognitum.no/) and Arctic Size University of Tromsø.

O 106 THE PARADOX OF POLAR OCEANIC NITROGEN FIXATION

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Measurements of biological nitrogen fixation are typically conducted in oligotrophic subtropical and tropical marine environments where concentrations of fixed inorganic nitrogen are low. To date, only a handful of studies have reported nitrogen fixation rates from high latitude marine environments. However, further investigation is needed to resolve the activity of marine diazotrophic assemblages and their potential to introduce new nitrogen into polar ecosystems. Nitrogen fixation rates were measured at 19 locations across the Atlantic sector of the Arctic Ocean in summers 2015 and 2016 using a modified gas dissolution 15N2-tracer addition method. While we measured sub-nanomolar to nanomolar rates only in distinct samples in the upper 100 m of the water column (in the presence of micromolar concentrations of dissolved inorganic nitrogen), the natural abundance delta ^{15}N values of particulate organic matter at these and other depths were very low. These results combined would indicate active nitrogen fixation that might be very variable in time and space, possibly due to the nutrient replete conditions. Together, these measurements aim to reconcile the paradox of polar marine nitrogen fixation and elucidate how nitrogen fixers could potentially impact current concepts in Arctic carbon and nutrient cycling.

O 143 IS WHEN THE TABLE IS SET MORE IMPORTANT THAN HOW MUCH IS ON IT? WARMING AND SOUTHEASTERN BERING SEA FISHERIES

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The amount of primary production ultimately sets the upper limit on the biomass of fish in a region, but the timing of that production may affect the disposition of primary production within the regional fish and shellfish communities. The extent and timing of sea-ice-retrea affects not only the availability of ice algae, but also the timing of the spring bloom. The timing of availability of algae and phytoplankton in spring over the middle shelf is critical in determining egg production and larval growth and survival of large, lipid-rich zooplankton. Consumption of these lipid-rich zooplankton by age-0 walleye pollock (*Gadus chalcogramma*) and Pacific cod (*G. macrocephalus*) is essential for the sequestration of lipids in age-0 walleye pollock and Pacific cod during summer and fall. Without these lipids, age-0 pollock, and possibly cod, survival to recruitment is low.

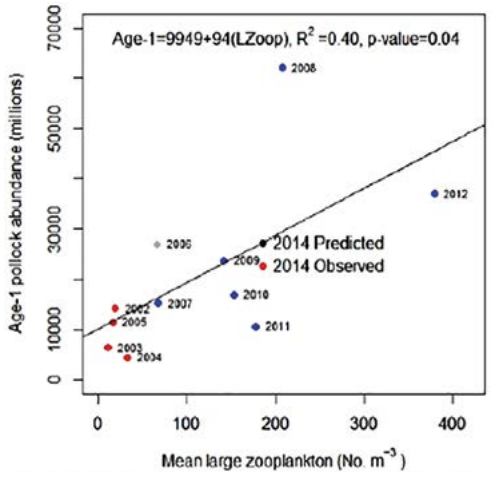

Figure 1: Linear relationships between mean large zooplankton abundance during the age-0 life stage of pollock and the estimated abundance of age-1 pollock abundance of the year class 2002-2012, from Ianelli et al. (2015). The 2014 points are the observed stock assessment estimates of age-1 pollock from Ianelli et al. (2015) and the predicted age-1 pollock estimates are from our regression model using large zooplankton From Eisner, L. and Yamiichi, E. 2016. NPFMC Ecosystem Considerations for 2016, p. 127.

Pacific cod year class strength correlates strongly with year class strength of pollock, and thus both species share periods of strong and weak year-classes. If the recruitment of these commercially important fish is ultimately dependent of the timing of the availability to zooplankton of algae in spring, then, as the timing of that early production changes, there may be a very severe impact on two of the eastern Bering Sea's most valuable groundfish fisheries.

O 140 THE INFLUENCE OF SEA ICE CONCENTRATION ON PHYTOPLANKTON COMMUNITY STRUCTURE IN THE CHUKCHI AND EAST SIBERIAN SEAS

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To understand the influence of sea ice retreat on the phytoplankton community distribution in the rapidly warming Arctic Ocean, the field surveys were conducted in August 2012 and 2015 in the Chukchi and East Siberian Seas. Pigment analysis and chemical taxonomy were used to enumerate major phytoplankton groups. The average sea ice concentration in August 2012 was lowest since the sea ice observations from 1979, with higher sea surface temperature. The deeper mixed layer depth (MLD) and higher surface nitrate concentrations were due to exposure of the sea surface to wind in August 2012. The euphotic depth and subsurface chlorophyll maximum layer were deeper in August 2015 than those in August 2012. Even though a little difference of the average of phytoplankton biomass between two periods, phytoplankton community structure dramatically

different during two study periods. Small phytoflagellate groups, prymnesiophytes, prasinophytes, dinoflagellates, cryptophytes, were dominated in phytoplankton biomass in August 2012, while the diatoms predominated in the study area in August 2015. Several environmental factors were found to affect the interannual variation of phytoplankton community structure in the surface layer of the Chukchi and East Siberian Seas, but they appeared to be controlled mainly by deeper MLD and seeding from sea ice caused by sea ice retreat and extend, respectively. Furthermore, underwater light conditions might be one of the influential factors for phytoplankton distribution in the subsurface layer of this area.

O 139 MONITORING OF ARCTIC MARINE MICROBES VIA AN OBSERVATION STRATEGY INTEGRATING AND STANDARDIZING STATE OF THE ART SAMPLING AND MOLECULAR TECHNOLOGIES

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Information on current diversity and biogeography of Arctic marine microbes (bacteria, archaea and single cell eukaryotes) with adequate temporal, spatial and taxonomic resolution is urgently needed to better understand natural dynamics of ecosystem states in space and time, and consequences of environmental change caused by anthropogenic factors. Here, we introduce a standardized molecular-based observation strategy for high resolution assessment of marine microbes in space and time, even in remote areas such as the Arctic Ocean. The observation strategy involves molecular analyses such as Next Generation Sequencing (NGS) and quantitative polymerase chain reaction (qPCR) of diverse environmental samples, collected from sea ice, water column and seafloor with a complementary set of automated and ship-based sampling approaches. This includes newly developed automated under-way sampling, moored sediment traps and year-round water samplers, as well as CTD-casts, multi-corers, bottom landers and in the future seafloor crawlers. An integrated standardized dataset including linked, searchable information on synchronous environmental variables provides comprehensive information on the diversity, abundance and biogeography of Arctic marine microbes, covering all three domains of life. The development of the observation strategy involves a set of coordinated pilot studies testing questions of temporal and spatial resolution, i.e. to assess the impact of sea-ice on Arctic marine single-cell eukaryote community composition, or of ocean warming in Eastern Fram Strait since the year 2000. In the future, the observation strategy for Arctic marine microbes will be implemented as a distributed Molecular Microbial Observatory in the framework of the Arctic observatory FRAM (Frontiers in Arctic Monitoring) and contributes to the ATLANTOS strategy for an integrated Atlantic observatory including genomic information.

O 141 ARCTIC BENTHIC COMMUNITIES STRUCTURE AND FUNCTIONING DURING SPRING SEA ICE CONDITIONS

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Diminishing sea ice cover may have consequences for functioning of Arctic marine ecosystems by leading to altered quantity and quality of primary production, and changes in organic matter export fluxes.

The aim of this study was to examine macrozoobenthos community structure and function in relation to sea ice cover, stage of spring bloom, and depth. Samples were collected during R/V Polarstern PS92 “TRANSSIZ” and R/V Helmer Hanssen “ARCEx” cruises in different environmental conditions, from shallow Svalbard fjords, continental shelf to the deep Sophia Basin and Yermak Plateau, and along a gradient in sea-ice cover. Organic Matter (OM) fluxes, the main food source for the benthic communities, were sampled from sediment traps, and from chlorophyll *a* maximum layer and above the bottom. In order to determine benthic community structure sediment samples were sieved on 0.5 mm. Additionally, samples for stable carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$) isotopes analysis were collected to determine food sources and trophic position of animals. For each station, push-cores (10 cm Ø and 20 cm deep cores) were collected and used for bioturbation analyses.

The OM concentrations and export flux at all stations were depended on the sea ice cover, bloom state, and depth. OM origin differed depending on the location, and both terrestrial and fresh ice algal and phytoplankton production were observed. Presence of fresh OM on shallower stations was related to higher macrozoobenthos abundance and diversity, and intensity of bioturbation.

O 109 AN ATLANTIC DISTRIBUTED BIOLOGICAL OBSERVATORY (DBO) INITIATIVE

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The presentation informs and invites input to a new initiative on establishing an Atlantic Distributed Biological Observation (DBO) network. It is motivated by the challenge of observing the rapid changes in the Arctic marine physical environment and ecosystem responses. This is both due to the remote location restricting observations, cloudiness and sea ice limiting earth observations, shortcoming of biological sensors to be deployed on moorings, as well as the lack of surface water data from mooring observations due to sea ice constrains. The European Arctic, including the Atlantic inflow to the Arctic Basin, has turned out to be one of the regions showing larges anomalies compared to the 1980-2010 period with respect to sea ice extent, sea ice thickness, increased productivity due to longer open water periods, appearance of autumn phytoplankton blooms, new species establishing including northward expansion of fish species. There is therefor a need for innovative and collaborative strategies to increase our observations in the seasonal ice zone of this region.

Inspired by the successful Pacific Arctic marine DBO program where scientists have collaborated in Arctic marine data collection and compilation since 2010, an Atlantic DBO initiation workshop was organized in Tromsø, November 2016 (co-founded by IASC mwg and RCN). The aim was to establishing a complementary initiative on the Atlantic side of the Arctic Ocean. A board was established and the group came up with 5 suggested transects (Figure 1). These five transects (A_DBO 1-5) is selected partly based data from on existing time series and their guidance for good observational sites, and partly on the need to increase or coordinate observations in specific regions, motivated by planned research activities. Utilizing the framework and experience from the DBO on the Pacific side, this is an important step towards a Pan-Arctic observational system.