



NEWSLETTER no. 1, 2016

ARCTic Marine Resources under Climate Change:
Environmental, Socio-Economic Perspectives and Governance

In the Arctic, higher temperatures and retreating sea ice will redefine boundaries of biological life, ecological structure, and commercial and social opportunities. Complex interactions exist, from the physical impacts in terms of temperature, ocean currents, and sea ice, via biological and ecological adaptations in terms of changing habitats, growth, and species interactions, via social and business enterprises in terms of new fishing areas and trade routes, to governance implications in terms of pressure on existing agreements, surveillance, and commercial activity. ARC-Change will study some of these interlinkages while bringing together expertise from an array of disciplines and institutions.

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The Core Research Team

Angelika Renner is a physical oceanographer and sea ice physicist at the Institute of Marine Research (IMR) in Tromsø. She received her Ph.D. in physical oceanography from the University of East Anglia in 2010. Angelika studies sea ice-ocean interactions and physical-biological coupling in polar regions. In addition to participation in several research projects funded by the Research Council of Norway (RCN), Angelika teaches at the Arctic University of Norway in Tromsø and at the University Center of the Westfjords in Iceland. In ARC-Change, Angelika will lead work package 1.

Nils-Arne Ekerhovd is an economist at SNF – Centre for Applied Research at NHH. Nils-Arne received his Ph.D. from the Norwegian School of Economics in 2009. His research revolves around shared fisheries agreements in a game theoretic perspective. He has participated in many RCN-related projects, such as FishExChange and the ongoing MESSAGE-project. Nils-Arne will lead ARC-Change work package 2.

Alf Håkon Hoel is a political scientist by training and research director at IMR in Tromsø. He is currently on leave, working on fisheries and ocean issues at the Royal Norwegian Embassy in Washington, D.C. Alf Håkon is an experienced researcher who has participated in a number of national and international research projects, expert groups, and committees. Alf Håkon's research interests include international marine resource management, environmental politics, and ocean law. In Arc-Change, Alf Håkon leads work package 3.

Sturla F. Kvamsdal is an economist at SNF and received his Ph.D. from the Norwegian School of Economics in 2010. His research focuses on ecosystem-based fisheries

management in an integrated science perspective. Sturla has participated in several research projects in Norway and abroad, and is currently project leader of the EINSAM-project. Sturla is also project leader of ARC-Change and leader of work package 4.

In addition to the core research team, research groups from IMR Bergen and the Norwegian School of Economics, as well as individual researchers from several international institutions, will take part in the project.

ARC-Change Work Packages

Work package 1 (Fish stocks under climate change) will assess observed and projected changes in the physical environment in the European Arctic and develop likely scenarios for distribution of key fish stocks. The work is divided into three tasks that include assessment and identification of key regions subject to ocean warming and sea ice retreat, calculation of distribution ranges of key fish stocks, and investigation of scenarios for life cycle changes. WP 1 relies on existing remote sensing sea ice data and surveys in combination with IMR models to assess past changes and current states of the ocean as habitat for key fish stocks. Global atmosphere-ocean general circulation models will be downscaled to get relevant projections for climate changes. The new Barents Sea Marine Atlas (BarMar) with fisheries data will be combined with studies of distribution relative to temperature and depth to calculate 3D distribution ranges. Ultimately, this will be coupled with knowledge about existing and potential spawning grounds, drift models, and swimming capacity to investigate fish stock life cycle changes.

Work package 2 (Economics of shared fisheries) will analyse effects from changes in productivity and distribution of fish stocks in Arctic and Sub-Arctic areas on existing international agreements. The three major tasks include evaluation of effects on revenues and costs in the fishing industry from changes in the fishing fleet and in distribution and availability of fish stocks, study of models and methods suitable for analysing how changes

in fish stock migrations affect the economics of international fisheries management agreements, and ultimately to investigate interdependent fisheries in the Northeast Atlantic and the stability of international fisheries agreements. Part of the analysis will use data from the Norwegian Directorate of Fisheries profitability surveys and shed light on fisher behavior under various ecosystem states and economic conditions. Another important part of WP 2 will be lessons from WP 1 regarding ecological changes following changes in the climate. The aim is to form a complete, integrated picture of current ecosystem production, interactions, and fisher behavior that further allows counterfactual simulation analysis. The framework can suggest, for example, changes to the value of marine ecosystem services under climate change.

Work package 3 (Natural resource governance in a warming Arctic) will account for current institutionalization of management practices and assess adaptive capacity of existing governance to projected climate changes. The work will review the existing legal framework and agreements relevant to the Arctic, including the UN Convention on the Law of the Sea, the UN Fish Stocks Agreement, FAO fisheries agreement, and international environmental law. WP 3 will further consider resource exploitation in light of environmental and socio-economic changes identified in WPs 1 and 2. The analysis will highlight relationships between various stakeholders such as fishers and other commercial agents, research institutions, and management bodies.

Work package 4 (Synthesis, project management) will facilitate integration of research and findings across the work packages and ultimately provide a project synthesis. A successful project has the potential to form an overall picture of climate change in the Arctic and its implications for fisheries management and resource governance more generally. The synthesis of ARC-Change will contribute towards development of robust governance and legal frameworks for a changing Arctic,

and will form a foundation for future governance guidelines that build upon an integrated understanding of challenges and opportunities. Project management tasks such as organization of meetings, dissemination, and website and newsletter responsibility will also reside with WP 4.

Kick-Off in Tromsø

The ARC-Change project arranged a small kick-off meeting in Tromsø September 27, 2016. The meeting was attended by the work package leaders, with some further project participants following the meeting via video link. The major topic of the meeting was plans for the three, main work packages and how to best create synergies between ARC-Change and other, current research. Eirik Mikkelsen from the Northern Research Institute (Norut) visited the meeting and presented relevant, ongoing work. The RCN-funded STOCK-SHIFT-project was also presented as highly relevant for collaboration with various parts of ARC-Change. Further topics on the agenda were plans for project meetings, dissemination, and public outreach. Various alternatives for the ARC-Change stakeholder workshop was discussed. Ideas for the project website and the project newsletter was also presented. The website is scheduled to go online during October 2016.



WP leads at kick-off in Tromsø. From left: Sturla, Nils-Arne, Alf Håkon, Angelika.

Main project partners:



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