ICES Theme Session F

Arctic Biodiversity under Climate Change and Other Stressors

Conveners: Sarah Bailey (Canada), Philippe Archambault (Canada), Andrea Sneekes (The Netherlands)

The Arctic marine environment is experiencing major changes due to on-going climate change and increases in human activities. The reduction of coastal sea-ice already hinders traditional hunting, reduces the activities of unique Arctic fauna, and has opened new routes for intercontinental shipping and new access to oil and gas resources. The resulting ecological changes will be complex, including increases in productivity, changes in food web structure, losses of native species, and gains of non-native species. Within this context, papers were invited on the following topics:

* Arctic Biodiversity
* Aquatic Invasive Species
* Climate Change Impacts
* Human Activity Impacts

This session, comprised of contributions from Canada, Finland, the Netherlands, Norway, and Russia, attracted more than 50 participants. Quite a variety of topics were presented and discussed, including risk assessment and management of aquatic invasive species, changes in distribution and ecology of Arctic fishes, functional redundancy and shape analysis as methods to evaluate ecological changes in fishes and analysis of sea temperature variation at different time scales.

Initially, the session focussed on aquatic non-native species (ANS) research in the Arctic. Most ANS have occurred in temperate latitudes where shipping activity is greatest; however, as few systematic surveys have been conducted in the Arctic historically, we have little knowledge about the presence or impact of ANS in this region. Further, shipping is not the only possible pathway to result in a spread of ANS through, and to, Arctic seas as aquaculture and ranching activities, incremental spread from fishing activities, exploitation of mineral resources are likely to feature in ANS spread. In addition natural spread by warm currents and by rafting is likely to enable the extension to the range of many species in both the North Atlantic and North Pacific oceans (F:01). Once it has been identified which species are being transported to the Arctic, niche modelling can be utilized to examine the potential that species will survive, establish and have negative impact (F:02). Once ANS have become established, it is important to document abundance and distribution, as well as impacts and rates of spread (F:04). Temperature may be a limiting factor in the development of treatment systems to prevent future ANS introductions (F:03, F:11).

Later, the session turned focus to the importance of understanding the functioning, diversity and vulnerability of Arctic ecosystems in order to manage natural resources properly. Two very compelling presentations highlighted how functional redundancy and shape analysis might be useful tools in a system where there is limited baseline information and uncertainty under climate change (F:05, F:06). Poster presentations extended the analysis of impacts on climate change on commercial fish stocks (F;07, F:09, F:10).

Despite the diverse set of contributions, there were common themes across the session. Clearly, the absence of historical data/knowledge in the Arctic hinders our ability to understand current mechanisms and make predictions for the future. There is a general uncertainty if our understanding/knowledge from temperate ecosystems can be directly applied to Arctic ecosystems. There is a need to better understand the impacts of range extensions into the north. Finally, it was broadly recognized that ANS and climate change are but two stressors currently active in the Arctic. Interacting effects of ocean acidification, sea level and salinity changes, and physical human activity impacts are all emerging stressors that should be considered for future research. It is expected that there will be a great demand for science advice in the near future as resource development continues in the Arctic.