Theme session B

ICES-PICES-CIESM session: Bioinvasion trajectories and impacts in contrasting marine environments

Conveners: Henn Ojaveer (Estonia), Cynthia McKenzie (Canada), Thomas Therriault (Canada)

The session hosted ten oral and seven poster presentations, with presenters provided the opportunity to give a short introduction of their posters during the session. A general discussion on bioinvasion trajectories, impacts and other topics relevant to the subject were held at the end of the session. The contributed presentations covered Atlantic and Pacific Oceans, Arctic and the Mediterranean Sea. Presentations included introduction vectors, population structure and dynamics, environmental impact, application of genetic methods, and several applied aspects (incl. risk assessment and marine conservation) of marine bioinvasions.

The discussion session was focussed on identifying broad future research needs in the field of marine bioinvasions, of potential interest of ICES, PICES and CIESM, and including Arctic research needs. The outcome of the discussion, which emphasized collaboration and the strength of joint ICES-PICES-CIESM activities, can be summarised as follows:

- Invasion trajectories and vectors are a common theme between regions and collaborative studies to investigate specific routes and vector risk would benefit from multi-region studies, particularly with regard to the Arctic.
- A joint effort to obtain critical data on shipping (vessels/routes/hot spots) from relevant authorities and to make them available to bioinvasion scientists, particularly for risk assessment studies.
- Sharing of data and making at least key information on recent introduction events freely available. ICES is using an online platform for reporting (AquaNIS), which already accommodates data from non-ICES areas. Sharing information success and failure of mitigation activities' would benefit regions and would provide information to inform response options.
- Prioritize investigation on one of the most important non-native species transfer pathway – hull fouling and niche areas, both on commercial ships and recreational vessels, and through this contribute to the IMO request for scientific information on use and effectiveness of IMO Biofouling guidelines globally.
- Coordinate and facilitate the study of the impact of non-native species on environments and particularly on vulnerable habitats (Arctic and Marine Protected Areas). Update the ICES Code of Practice and potentially develop new Codes of Practice for affected industries (Aquaculture, live fish trade). Some concern was expressed on the ethics of introducing non-native species, which may still be occurring in some regions.
- Investigations on adaptive capability and differences between non-native populations should also be a priority, as these have been shown to be relevant to impact and climate change. Explore NIS adaptability between different invaded locations in the ICES-PICES-CIESM domain to detect ecosystem level changes for specific invaders, which would help to characterize impact.

- Develop applications of molecular methods (incl. e-DNA), including the study of the genetic structure of non-indigenous species populations (e.g. early warning). Further, we need to determine how these results should/will be used by management agencies. This is especially true for 'shared waters' where integration is critical for success (and not wasting limited funding)
- Investing more effort in stakeholder communication and try 'standardising' messages to them. Communicate/educate managers and influence them to ask the right questions. A good example is Clean, Drain, Dry that now has relatively standard messaging/signage in North America.

ICES, PICES and CIESM are invited to consider the list above and first identify their priorities, to be later able to identify research issues of joint interest between the three organisations.