

Theme session D Report

Past, present, and future of marine plankton assemblages and communities

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Content

This session as proposed by the ICES Working Group on Zooplankton Ecology (WGZE) brought an opportunity to: explore the breadth and scope of advances in marine plankton research; identify knowledge gaps and research challenges; and in a context of global change, to discuss future steps to increase our understanding of marine plankton in pertinent research areas.

The aim of the session was to provide an opportunity for the most recent plankton research to come forward and to be inclusive of new approaches and technologies. The intent was to capture research that provides insights about plankton at different scales. These being different scales of ecological organisation (individual species, populations, assemblages and communities), as well as different spatial scales and temporal scales.

The levels of plankton ecological organisation exist in a context of their environment and in many settings this environment is experiencing changes. Given these conditions, the session welcomed submissions for plankton research framed in an environmental, food-web or ecosystem context, and research with a focus on responses of plankton to environmental and ecological change.

The session received 35 submissions (24 oral, 11 poster presentations) by May 2020 and all submissions fit the above criteria. The postponement of the ICES ASC in 2020, resulted in changes in some submissions. The virtual ICES ASC Session D taking place in 2021 still had high participation with 26 submissions that resulted in an excellent variety of presentations by the submitting researchers.

For the live session event, the 26 presentations were divided into five sub-sessions and led by one of the session co-conveners. These five sub-sessions focused on the following areas: 1) descriptive studies/ plankton communities/ plankton and the environment; 2) dispersal / distribution; 3) image analysis / automated methods of plankton monitoring; 4) molecular techniques; 5) food-webs / trophic interactions.

Given the online format of the live event and the two hours allocated to the session, the intent of dividing the presentations into sub-sessions was to provide an opportunity for lively discussion. The presenters were notified in advance of the live session event and asked to watch the pre-recorded presentations from other presenters in their sub-session. The live-event session plan was also uploaded in advance, to the conference platform, so that attendees of the ASC could similarly watch the pre-recorded presentations in advance if they planned to attend a particular sub-session. During the live session, each presenter gave a brief oral summary of their submission and the floor was opened up for discussion of the

presentations. The co-convenors had questions planned in advance to stimulate the discussion, but these were largely not needed.

Highlights from discussions in the sub-sessions included:

- In the sub session on *descriptive studies / plankton communities / plankton and the environment* and the sub session on *dispersal / distribution*, conversations focused on the impacts of future environmental change (climate warming, ocean acidification, hypoxia, freshening events) on the plankton communities and on the distribution/dispersal of planktonic components
- The sub session on *molecular approaches* highlighted the power of this new tool to identify individual species, to enumerate composition within bulk samples, or to supplement traditional net-and-microscope based approaches. The sub session discussions focused heavily on identifying which molecular methods worked best for which plankton group. The "best" methods vary both within and between major plankton groups (e.g., phytoplankton vs zooplankton, diatoms vs dinoflagellates vs microbial plankton).
- Within the sub session on *image analysis / automated methods of plankton monitoring* the participants exchanged questions regarding the wider application of the methods used in their research (e.g. wider application of the Plankton Imager or of the dynamic optimization procedure)
- Within the sub session on *food-webs / trophic interactions* the participants discussed the idea (presented in the *dispersal / distribution* sub-session) that some of the zooplankton distributions in their studies may be related to predation, light penetration and depth. There was also discussion of how zooplankton community composition, zooplankton abundance, and environmental influences may be related to ichthyoplankton abundances, spatial and temporal trends, and possibly used for recruitment indexes

Conclusions

The session on *Past, present, and future of marine plankton assemblages and communities* held an impressive quality of presentations and posters. A take home message was that plankton assemblages and communities are extremely important elements of the marine ecosystems, being a foundation of the entire food-web. Knowledge on plankton communities provides useful information on the state of ecosystems and predicting possible future changes to them. The submitted presentations provided a wide regional coverage including: North Atlantic, North Sea, Mediterranean Sea, Adriatic, Arctic, and more specifically southern California Current, Bay of Biscay, Madeira Archipelago, Hudson Bay, west coast of Scotland, NW Atlantic continental shelf. Several presentations were impressively integrative and inter-disciplinary. There were also various nice examples of forward looking methods and approaches that can be applied in the field of plankton research.

Feedback

The session was well received by the participants and the audience of the ASC, who provided feedback on the session. They found the session interesting and with good

discussions. Participants indicate that the session had good engagement and the audience noted a lively Q&A session. Participants also expressed being grateful that this session took place given the limited venues for discussing and presenting the latest plankton research. For example, the last ICES/PICES Zooplankton Production Symposium occurred 5+ years ago and the next one has been repeatedly postponed.