Theme Session N Report 2024

The importance of operational oceanography in researching the changing ocean

Conveners: Francisco Campuzano (Portugal), Tomasz Dabrowski (Ireland), Tycjan Wodzinowski (Poland)

Session synopsis

Oceanographic environmental information is critical to understanding the interaction between marine fish, which are an important ocean resource, and their environments across multiple life-history stages. The concept of environment must be understood very broadly in this regard. It includes not only the other components of the trophic network in which fish are found, but also all the surrounding components of inanimate nature. The future of interactions between living, but also non-living parts of the environment, depends on changes in the oceans. The provision of routine oceanographic information needed for decision-making purposes is dependent on sustained research and development, from observation collection to delivery mechanisms.

The current context of ocean variability such as climate change and regime shifts affect the stability, resilience, and diversity of the ecosystems. Unfortunately, these changes are not just a steady, slow process. They are fed with sudden and sometimes unprecedented in their magnitude in the history of measurement phenomena such as heat waves, salinity anomalies, and the changes in frequency of cyclical events. To incorporate the environmental information in the advice process is becoming more relevant than ever. Therefore, it is necessary not only to observe but also to take up the challenge of analysing, understanding, and predicting the consequences of changes that create a new reality for existing marine ecosystems.

This theme session invited presentations and posters to demonstrate successful integration from physics to "fish" (or other ecosystem components), as well as examples of good practice. A key focus was to provide dialogue, networking, and information sharing opportunities for scientists across ICES community.

The oral presentations session was divided into three parts with three presentations each. Each was followed by an approximately 10-minute Q&A session and a discussion of the presentations.

The first part:

1. *70 Years of Ocean Monitoring Reveal Strong Environmental Control on the Productivity of a Heavily Fished Ecosystem*, Frédéric Cyr, Aaron Adamack, David Bélanger, Mariano Koen-Alonso, Darrell Mullowney, Hannah Murphy, Paul Regular, Pierre Pepin.
2. *Evaluating the validity of using sea surface temperature as a proxy for bottom temperature in habitat suitability modelling*, Xiangyan Yang, Robyn Linner, Cameron Hodgdon, Yong Chen.
3. *Using ocean models to understand pelagic connectivity of European sea bass*, Jennifer A. Graham, Joseph W. Watson, Richard D. M. Nash, Lianne Harrison, Kieran Hyder.

The second part:

4. *EuskOOS operational oceanography platforms in support of scientific fisheries surveys*, Caballero A, Manso-Narvarte I, Boyra G, Nieto A, Martínez U, Sobradillo B, Ibaibarriaga L, Alvarez P, Fievet G-A, Santos M, Cotano U, Rubio A.

5. *Understanding the impact of wind stress curl on blue whiting recruitment: insights from agent-based model simulations*, Costanza Cappelli, Hjálmar Hátún, Jan Arge Jacobsen, André W. Visser, Sara Accornero, Flemming Thorbjørn Hansen, Brian R. MacKenzie.
6. *Regional interconnectivity of Northeast Atlantic Mackerel eggs: a Lagrangian perspective*, Matthew D. Thomas1, Jennifer A. Graham, Steven Gregory, Lianne Harrison, Rebecca Holt, Nicola Walker, Joe Watson, Richard Nash.

The third part:

7. *NAUI - delivering climatological and real-time oceanographic data in Galway Bay*, Diego Pereiro, Tomasz Dabrowski, Jose María García-Valdecasas, Marcos Sotillo, Kieran Lyons, Glenn Nolan.
8. *Assessing the impact of an offshore longline mussel farm on local circulation in a highly hydrodynamic energetic bay*, Llucia Mascorda-Cabre1, Emma Sheehan, Martin Attrill, Phil Hosegood.
9. *Investigating shelf-fjord processes, tides and the linkage to productivity on the Faroe Shelf in the Northeast Atlantic Ocean with the FarCoast (ROMS) ocean model*, Sissal Vágsheyg Erenbjerg.

In addition, the following three poster presentations were part of Theme Session N:

1. *A trip through time: influence of seabed sediment composition in Nephrops norvegicus (L.) density in North Galicia Functional Unit 25 (NW Spain) in the 1980s vs 2020s.* Isabel González Herraiz et al.
2. *Predicting mackerel distribution in the southeastern Bay of Biscay from environmental data.* Ainhoa Beatriz Caballero et al.
3. *Operational water mass classification for the Northwest Atlantic continental shelf.* Kimberly J. W. Hyde et al.

The presentations showed examples of how models can be used to determine environmental change from archived and current data. It was pointed out that such models are useful in searching for the causes of past changes in the states of the ocean's living resources. Examples of working predictive models used to manage aquaculture, coastal infrastructure, and fisheries were also shown.

The session was well attended with both poster and oral presentations generating a lot of interest and follow up discussions, with 42 attending the oral session according to Whova.

Conclusion

The examples shown of working models prove that they are useful in marine management. For example, a successful study linking a climate index with ecosystem productivity and changes in fish biomass in the North Atlantic was presented with a clear delineation between favourable and less favourable years for ecosystem productivity. Other studies showed that relatively simple oceanographic Essential Ocean Variables, such as sea surface temperature, can be used to develop a habitat suitability index for lobster. The benefits of having an integrated operational oceanography observing system comprising e.g., of gliders, HF radars, and research cruises, in the context of providing an advice for anchovy and mackerel fisheries were also demonstrated.

Several presentations concerned the use of numerical modelling and model-based services in support of aquaculture, fisheries, and ecosystem management. This includes hindcasting and forecasting of oceanographic Essential Ocean Variables and disseminating through dedicated web platforms and stock connectivity studies using a lagrangian (i.e., particle-tracking) approach. Nowadays, there is a good history of using lagrangian models in support of fish egg and larvae tracking in the ocean. The models are being continuously improved, for example, by assigning a behaviour to the particles in line with the response of larvae to environmental conditions.

In summary, the community of scientists, decision-makers, and entrepreneurs who recognise the advantages of monitoring systems coupled with forecasting of hydrological conditions is expanding. An increasing number of projects undertaken in marine areas are simultaneously providing material for the development of monitoring and forecasting bases and technologies. At the same time, the development of models allows for a better understanding of past events.

Feedback

All these conclusions point to the need to continue the discussion on the state and development of operational oceanography in the form of a theme session during the next editions of ICES ASC.

The conveners wanted to thank the organizers for the professional preparation of the conference room, the help of the volunteers, and the operators of the live webcast.