

EGU25-4517, updated on 22 Apr 2026

<https://doi.org/10.5194/egusphere-egu25-4517>

EGU General Assembly 2025

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Operational oceanographic services in support of aquaculture and biodiversity in Galway Bay, Ireland

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Ostrea edulis has been harvested in Galway Bay, Ireland, for centuries, but the oyster aquaculture in the bay is facing multiple threats, including *E. coli* contamination, *B. ostreae* outbreaks and an alteration to freshwater inflow due to the development of a flood relief scheme. Periods characterized by low salinities ($S < 20 \text{ g kg}^{-1}$) are common in the bay, especially after heavy rainfall events. These episodes are often associated with increased oyster mortality rates and subsequent economic loss for the farming sector. It is therefore important for producers to have access to real-time data and marine forecasts, and this information has to be accessible in a user-friendly and interactive way. Access to static, climatological information on the distribution of different seawater properties affecting oyster farming is also interesting for long-term planning and management.

This contribution will present the developments funded under the Copernicus Marine Service COP INNO USER Programme and carried out by the Marine Institute, Ireland, and Nologin Oceanic Weather Systems, Spain, that facilitate the provision of these services to the local oyster farming sector and environmentalists involved in biodiversity restoration. A high resolution (70 m) hydrodynamic model of Galway Bay has been developed, covering inner Galway Bay east of Black Head. In parallel, a SWAN application has been developed to provide wave data for Galway Bay and adjacent shelf waters. A 2012-2022 hindcast was run to obtain static, climatological data on seawater temperature, salinity, bottom stress, and wave kinetic energy. Both models (hydrodynamic and wave models) run operationally, delivering a 3-day forecast every day. Marine conditions mapping and low salinity warning services have been implemented and current developments include the extension to biogeochemical variables, marine heatwaves and indicators of the rate of change of temperature and salinity during the extreme events.

Service to the end users in this project is facilitated through a user-friendly, interactive web application NAUI (biodiver.nauio.io) where real-time observational data, forecasts and c. 10 years hindcast data is provided. This application constitutes an excellent example of the increasing efforts to extend the amount of marine observations and forecasts available to the general public and can become an important tool for management of the aquaculture activity and for biodiversity preservation in the region. We are in the process of integrating with the European Digital Twin of

the Ocean since the service was selected as coastal demonstrator in the Digital Ocean Forum 2024. Integrating into EDITO would allow for a faster service and for an easy extension of the service to new geographical locations, enhancing its scalability and replicability.