Copernicus Marine Service

COPERNICUS MARINE
8th GENERAL ASSEMBLY

BIODIVER-COAST: support for oyster aquaculture and biodiversity restoration in Galway Bay, Ireland.

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Marine Institute Foras na Mara

now Systems

PROGRAMME OF THE EUROPEAN UNION

Copernicus Europe's eyes on Earth

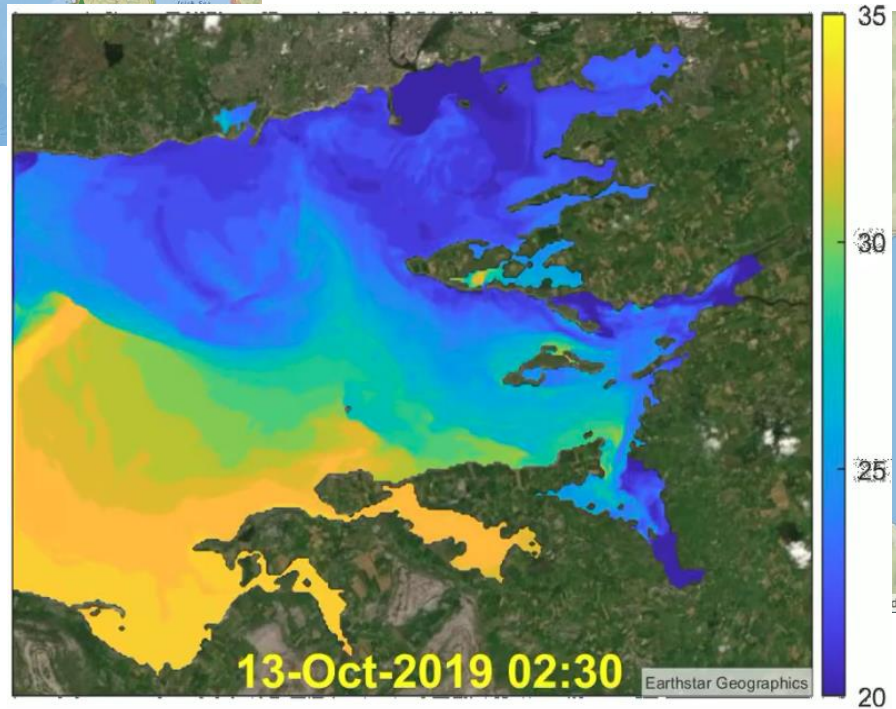
Copernicus Marine Service

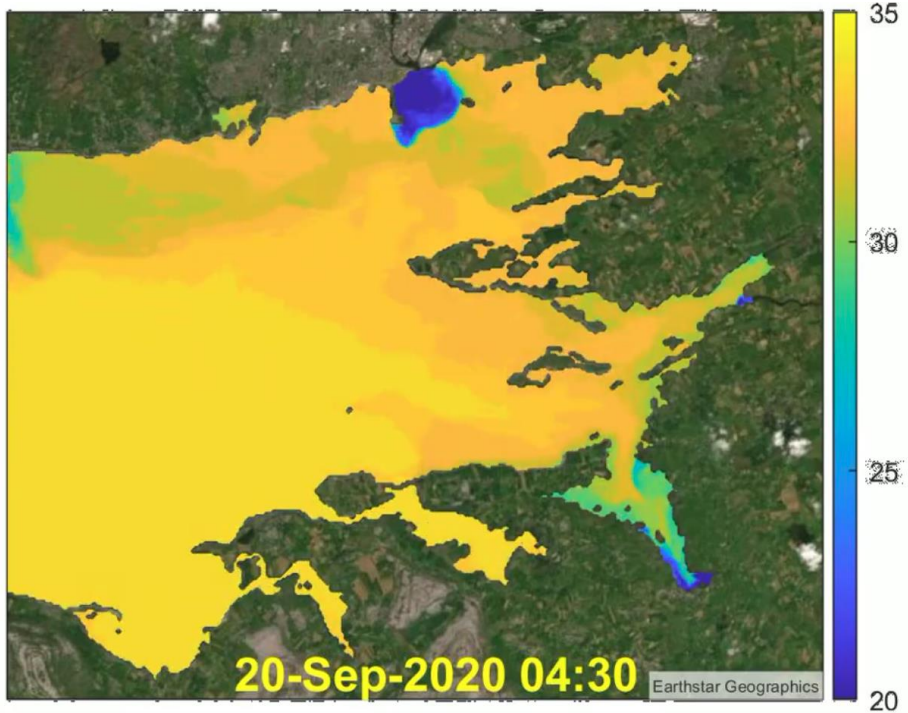
implemented by MERCATOR OCEAN INTERNATIONAL

Project in a nutshell

Galway Bay

Salinity distribution in Galway Bay





BIODIVER-COAST service

The service that is being developed aims to support:

- sustainable mariculture
- biodiversity restoration
- informs policy and supports policy implementation

Two Use Cases:

- mapping marine conditions (example Fig. 1)
- low salinity warning (example Fig. 2)

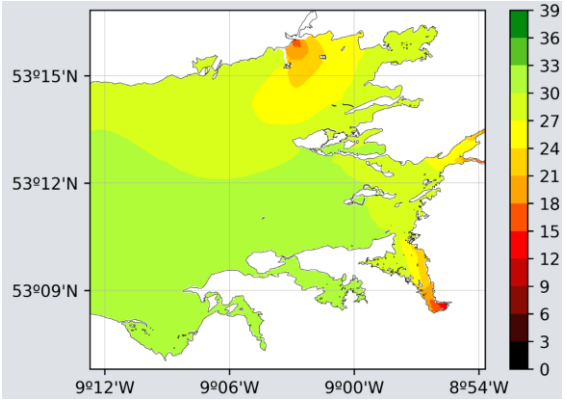


Fig. 1. Long-term (2012 – 2022) average surface salinity.

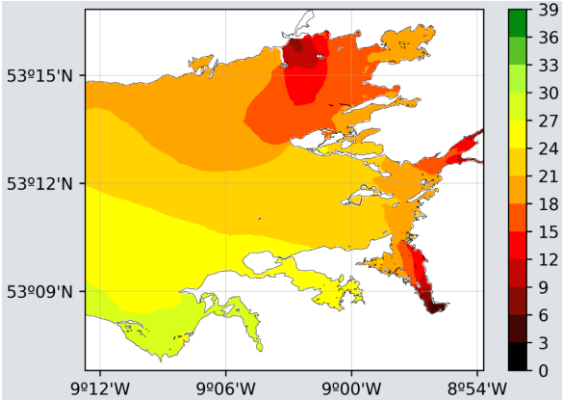


Fig. 2. Surface salinity during a wet period in March 2020.

Consortium

Consortium

Marine Institute, Ireland

State agency responsible for marine research, technology development and innovation in Ireland.

https://www.marine.ie/

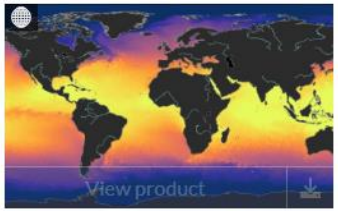
Nologin Oceanic Weather Systems, Spain

Developer of operational downstream coastal monitoring and forecasting services actively contributing to build Digital Twins of the Ocean and Coast

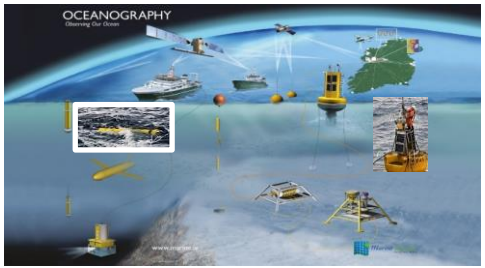
https://www.nowsystems.eu/

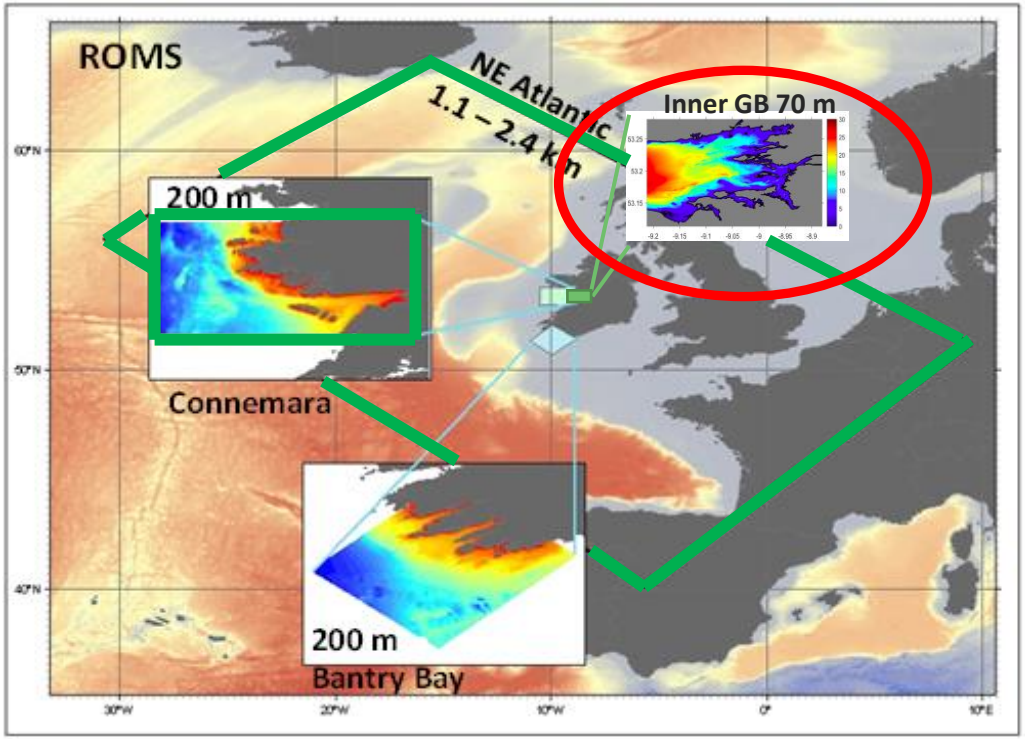
Copernicus Marine Products and Coastal model

Downscaling to Galway Bay



Global Ocean Physics Analysis and Forecast





Galway Bay model

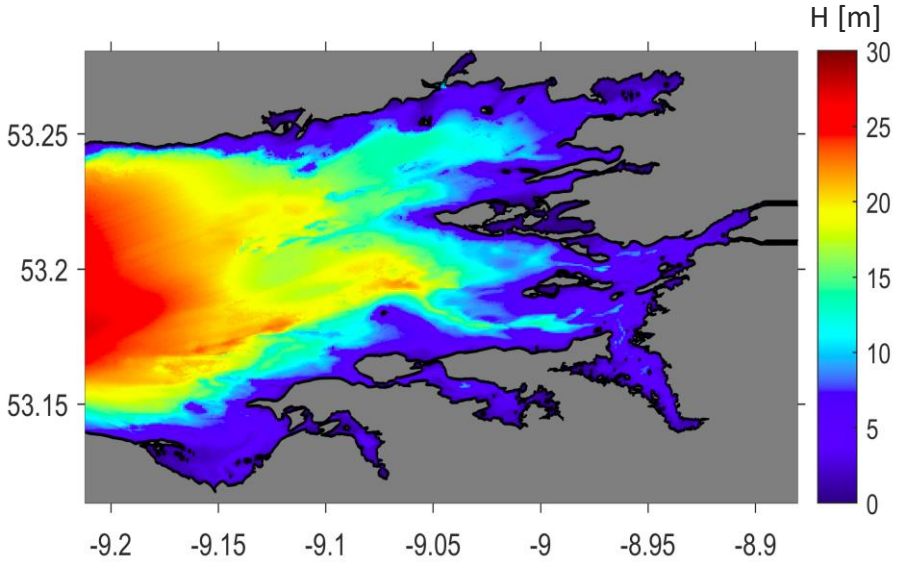


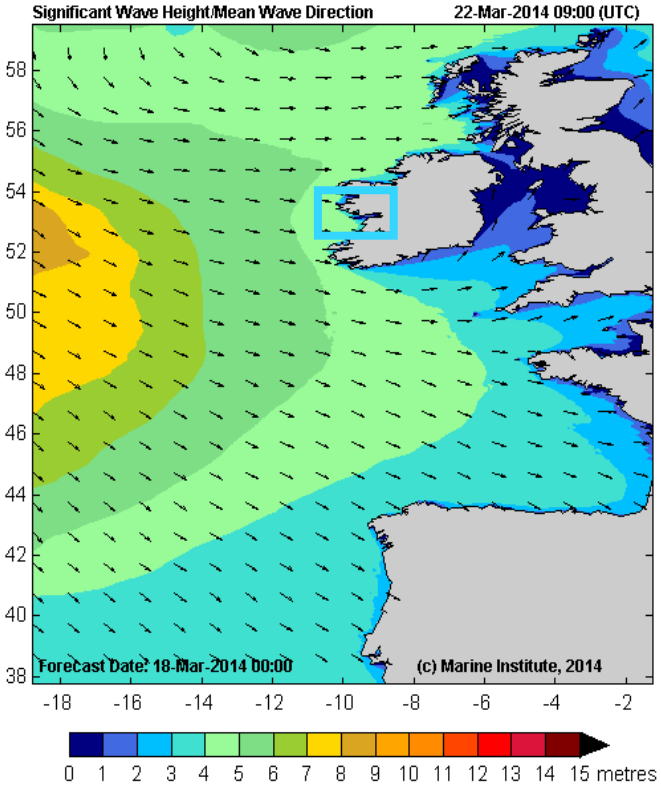
Fig 1. The extents and bathymetry of Galway Bay model

Lon 1 = 8.88 W
Lon 2 = 9.21 W

Lat 1 = 53.11 N
Lat 2 = 53.28 N

Horizontal resolution = 70 m
Vertical resolution = 8 sigma levels
Max depth = 30 m

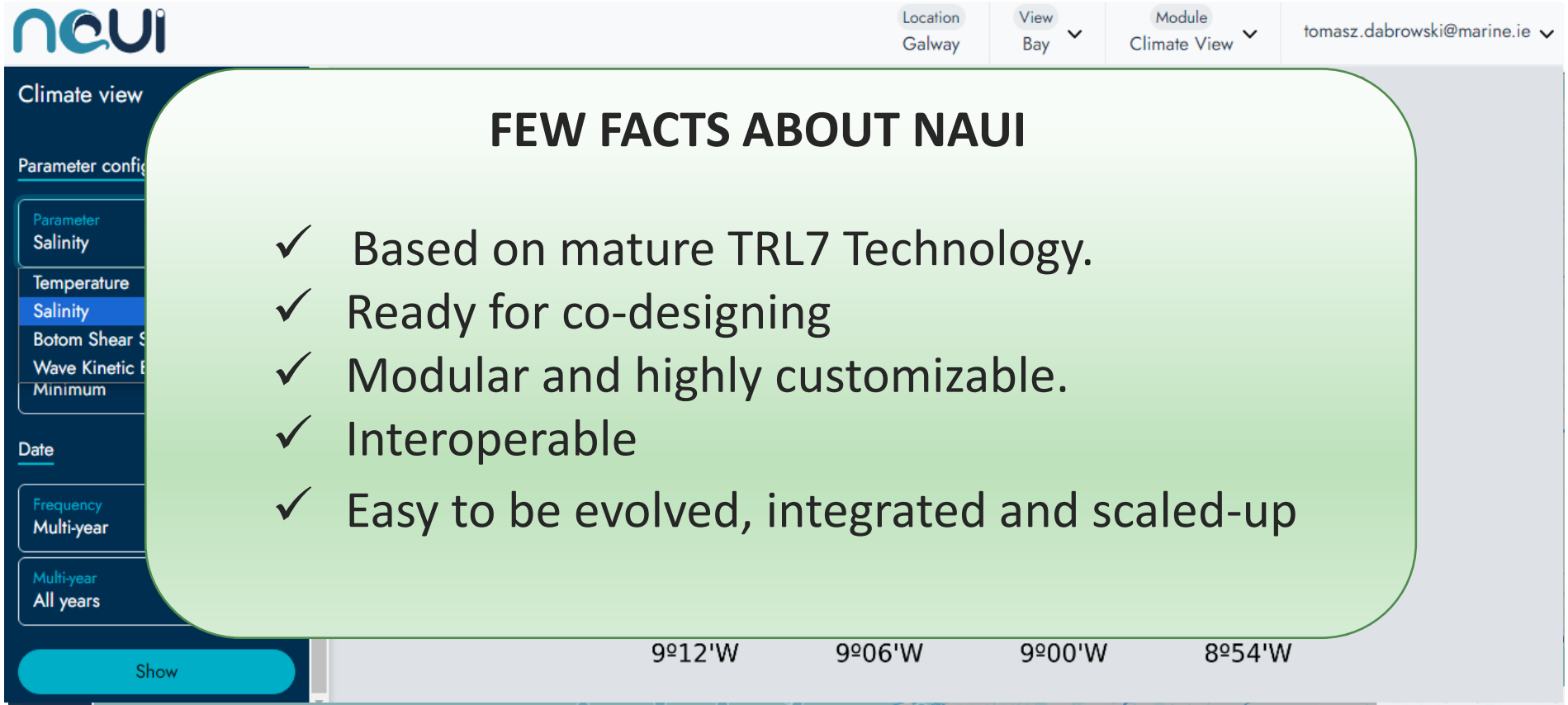
Wave model is also part of the service



Model code	**SWAN**
Model Grid	Rectangular 0.025° and 200 m
Bathymetry	GEBCO & INFOMAR
Forcing	• 1-Hourly ECMWF 0.1° • Copernicus GLO wave model
Forecast Period	+6 days (daily)
Hindcast Period	-7 days (weekly)
Output	• significant wave height, wave period, wave spectra • @ 3 hrs spatially • 20 stations @ 0.5hr
Other Domains	West Coast 0.004°

Seamless coastal service

Wave model is also part of the service



FEW FACTS ABOUT NAUI

- ✓ Based on mature TRL7 Technology.
- ✓ Ready for co-designing
- ✓ Modular and highly customizable.
- ✓ Interoperable
- ✓ Easy to be evolved, integrated and scaled-up

Use Case 1 – mapping marine conditions

- Operational forecasts as well as multi-year, annual, seasonal and monthly static layers were produced for several hydrodynamic parameters derived from the models (*salinity, temperature, shear stress, wave kinetic energy*)

- These layers are useful to understand the inter- and intraannual dynamics in the bay, identify areas under the influence of freshwater, areas with high bottom shear stress and kinetic energy and prone to excessive warming during the heatwaves

- These are all aspects of concern, as they increase oyster mortality

- The oyster mortality model, which calculates mortality based on salinity, temperature and exposure time was applied to the 10-year (2012-2021) seabed temperature and salinity series from the Galway Bay model to obtain a map of the estimated 10-year total mortality throughout Galway Bay.

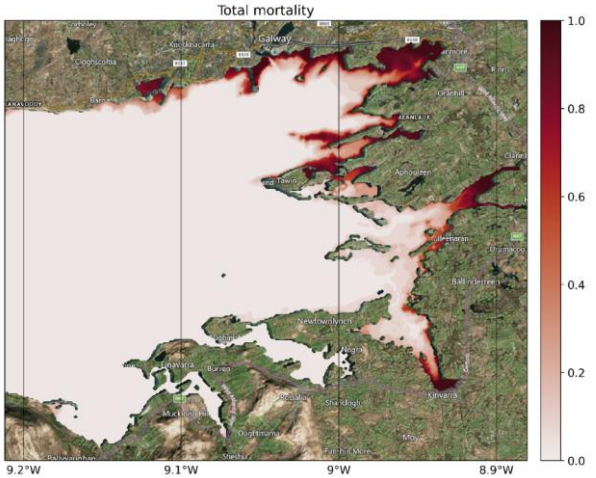
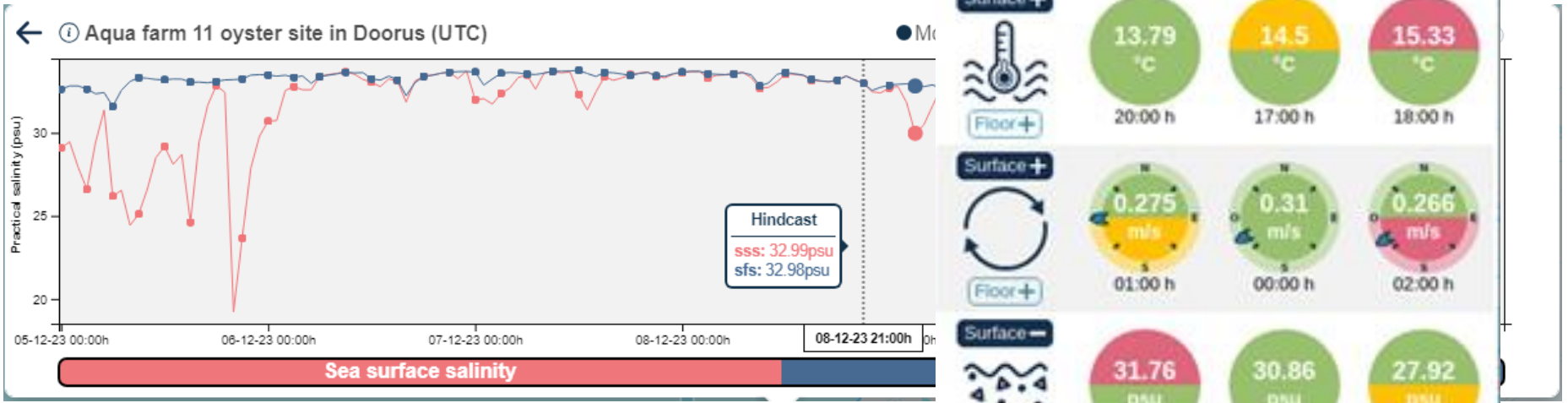
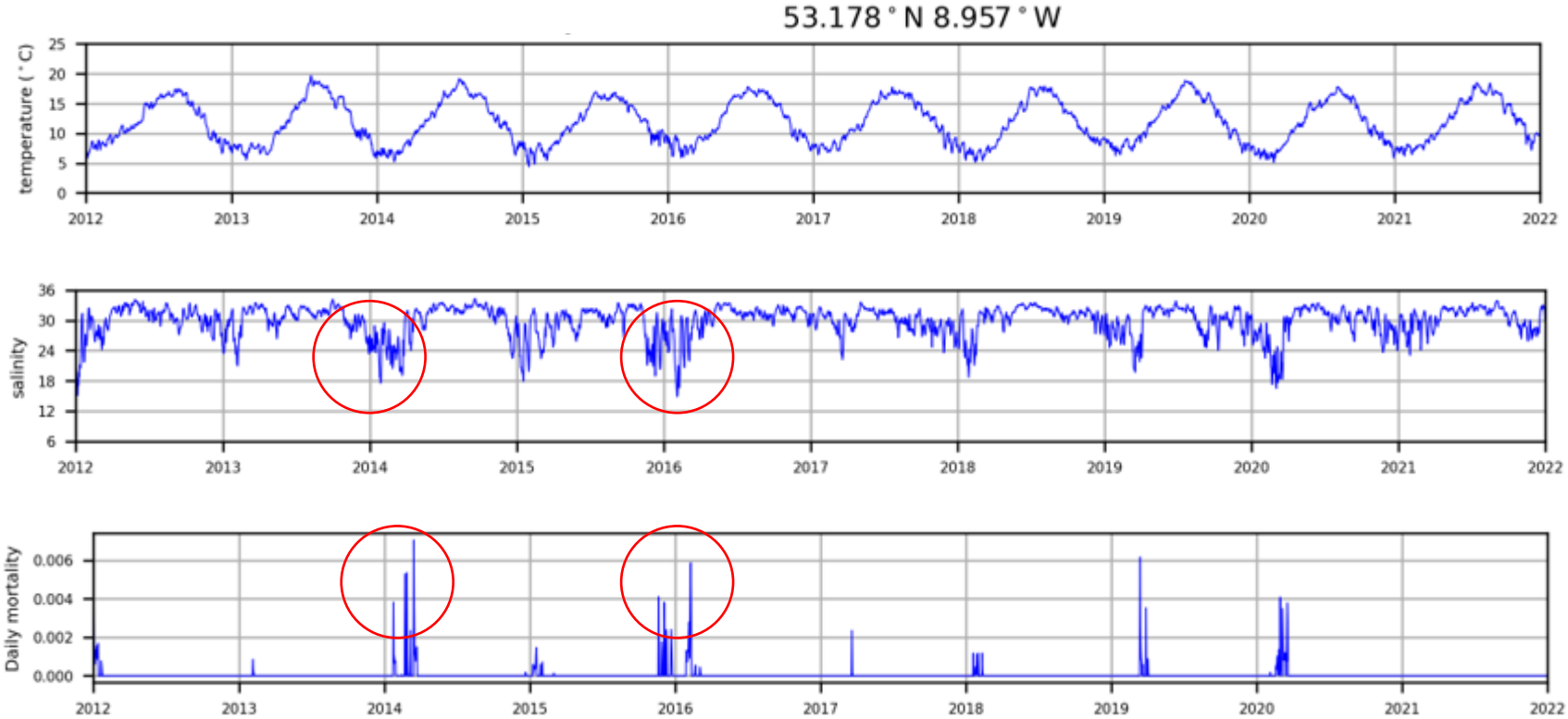


Fig. Oyster mortality computed from a 10 year hindcast

Use Case 2 – low salinity warning



Use Case 2 – low salinity warning



Acknowledgements

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The government of Ireland funds the ongoing operation of the Galway Bay forecasting model by the Marine Institute

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