Multi-use platforms at sea (MUPS): an innovative way to manage offshore space and reduce coastal anthropic pressure

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Background:

Offshore management is a future challenge for the development of sustainable growth for aquaculture and offshore renewable energy industries. The worldwide increase of demand for both industries requires developing efficient tools to optimize the use of the offshore space. Multi-use platforms at sea (MUPS) would provide a pathway for a high-tech low carbon energy industry that aligns with UN sustainability goals. Furthermore, the increase of offshore infrastructure could have both beneficial (e.g. creation of artificial reef) and detrimental effect (e.g. spread of invasive species) effects on biodiversity, which need to be quantified and qualified.

Objectives:

Create an accurate numerical model (i.e. hydrodynamic model and particle tracking model (PTM)) to:

- Define larvae pathways to study connectivity among populations, which will benefit shellfisheries
- Provide information on the possibility to use offshore renewable energy (ORE) infrastructures to collect larvae
- Study the impact of ORE on larval recruitment
- Improve accuracy of hydrodynamic models for future ORE projects (e.g. tidal stream and tidal range power plants)

Methods:

Lagrangian drifters were released on the 18th of July 2021 during a multi-disciplinary research cruise on the RV Prince Madog funded by SEEC (http://seec.bangor.ac.uk/). Microstar drifter comprise a surface spherical float, a drogue positioned at 1 m depth, and a GPS positioning connected to a satellite to record the drifter trajectory every 30 min. The drifters were released in the eastern Irish Sea near Llandudno (North Wales, U.K.), selected due to for the proximity of active offshore wind farm (OWF) sites, and the potential for additional sites in the future.

Preliminary Results:

The drifters remained approximately 25 days in the water column until they reached the Cumbria coast (Drifter 1) and Morecambe Bay (Drifters 2 and 3; Figure 1). Results show that the drifters follow the same direction towards North East with a net distance travelled of around 90 km. Drifter trajectory results show that they crossed several OWF sites, which if they were larvae (e.g. mussels and oysters) could potentially have settled on the infrastructure. Results highlight that drifters remain close to each other and the same area during the first ten days.

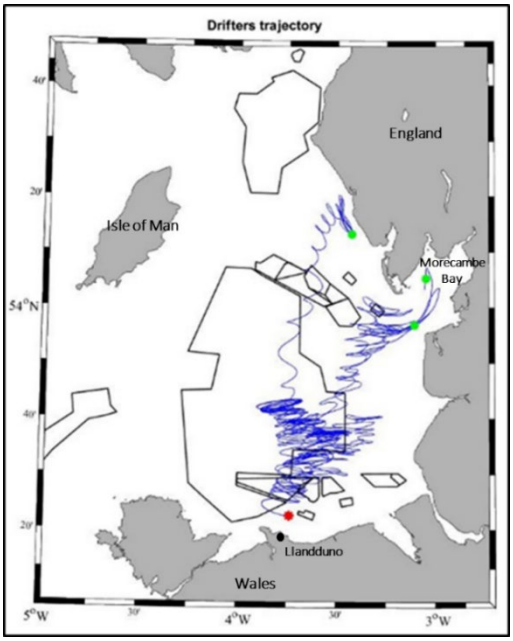

Figure 1: Drifters trajectory (blue line). The release site (red dot) and end sites (green dots) are represented. ORE sites are delimited by black lines.

Next steps:

- As the drifters were successfully recovered they will be released again during 2022 in order to generate more data for different years and tidal/weather conditions
- Calculate time of drifter present in ORE area
- Validate PTM trajectory against drifter data
- Calculate evolution of root mean square error between drifter to define diffusivity for PTM
- Determine the key physical processes leading to differences in drifter trajectories, i.e. barotropic vs baroclinic flows

Deliverables:

EWTEC 2021 conference: “Evidence of potential synergy between aquaculture and offshore renewable energy in the Irish Sea”.