Energy transfer in marine ecosystems based on phytoplankton size structure from satellite remote sensing

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Although the connection from unicellular phytoplankton to predatory fish in the marine food web is well known, our current understanding on how the community composition of phytoplankton (e.g. their prominent size structure) may affect energy fluxes and transfer efficiency to higher trophic levels is still limited. This has implications for fisheries productivity, nutrient recycling and incorporation of carbon into seabed sediments. This project will aim at enhancing our understanding of low tropic level processes in marine food webs by,

(a) applying the state-of-the-art ocean colour algorithms [1], and further developing remote-sensing-based models to derive phytoplankton size structure from remote-sensing data;
(b) combining satellite-derived information on phytoplankton size structure and the in situ observations [2] of the environmental variables (subsurface temperature, salinity, and chlorophyll), phytoplankton and zooplankton taxa, and planktivorous fish; and
(c) developing a tri-trophic food web model to evaluate the implications of these size-structures and environmental parameters for energy transfer to higher trophic levels, and uncertainties in consumer biomass [3].

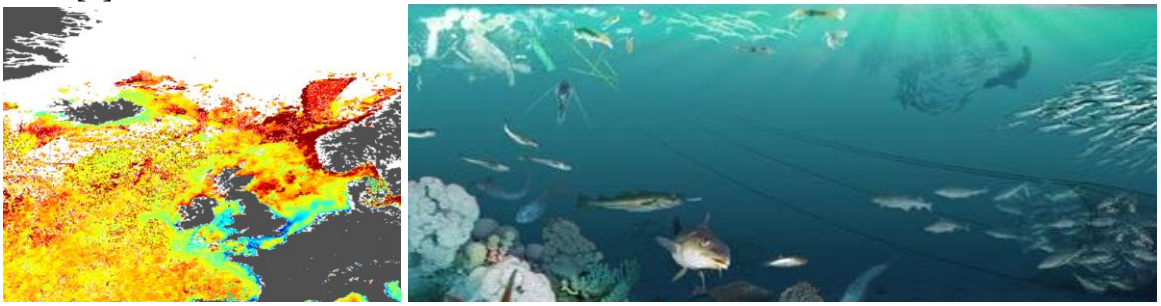

Fig 1: Satellite-derived information on phytoplankton size structure and Planktivorous fish (for illustration only)

The student will work on the interface between computer-based modelling, satellite remote sensing, and laboratory and field observations, in close collaboration with CEFAS and ICES.

Training opportunities: The student will receive training on satellite remote sensing of ocean, mathematical modelling, and software packages for analysis and visualization of large data at the UoR, and benefit from UoR's Researcher Development Programme. The student will learn to collect and analyze plankton and fish abundance and biomass data, as well as environmental data, at Cefas.

Student profile: We encourage applications from all relevant disciplines, including but not limited to Marine biology, Oceanography, Mathematics, Meteorology, or a closely related environmental or physical sciences. We will provide training on modelling and computer programming to motivated candidates as needed.

Funding particulars: This project includes CASE sponsorship from CEFAS, UK.

References: [1] Roy et al. (2013) Remote Sensing of Environment, 139, 185-197; [2] Capuzzo et al. (2015), Global change biology 21(6), 2206-2214; [3] Jennings and Collingridge (2015), PloS one 10 (7), e0133794;