Sentinel-3 products for detecting EUtROphication and Harmful Algal Blooms in the French-English Channel (S-3 EUROHAB).

S-3 EUROHAB

TASK 2. Activity 2.2: Deliverable T2.2.1.
Parameters to increase the productivity and efficiency of maritime operations.

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Summary:

Clams, mussels, oysters and king scallops are the main edible marine molluscs in the France-England Channel area. They are naturally low in carbohydrates and saturated fat and provide an excellent source of B12 vitamin, omega-3, choline, iron, selenium and zinc. Environmental factors such as temperature, salinity, dissolved oxygen, nutrients, toxins and parasites, can have either beneficial or adverse effects on cultivated or natural marine bivalve stocks.

The optimum seeding times to maximise the productivity of specific bivalve shellfish species can be derived using tightly constrained temperature ranges in the water column. Extreme low temperature winters prior to the spring can also enhance the productivity of bivalves by reducing the spat (larvae) predators.

Since phytoplankton is the primary food source of bivalve molluscs, Chlorophyll-*a* (not surprisingly) affects bivalve growth rates. For example, Oyster development is significantly and positively affected by chlorophyll-*a* concentrations. The most productive shellfish can be obtained when specific phytoplankton species are available as a food source that have grown under optimal nutrient, light and temperature regimes to enhance the omega-3 fatty acid content in the cells that are passed up the food chain to shellfish. The dominant phytoplankton in the water column is an indicator of these conditions.

Salinity is a marker of fresh and salt-water and varies as a function of riverine input and the tidal cycle. Each bivalve species that inhabits estuaries and littoral areas have optimum salinity growth ranges. For example, high mortality of King Scallop larvae can occur if salinity drops below 20 PSU when temperature does not exceed 10°C. Some Giant Scallop species are also negatively impacted by a decrease in salinity.

Habitat type can influence fatty acid composition within the mussel *Mytilus galloprovinciallis* flesh and some studies have shown that mussels from rocky shores contained lower concentrations of fatty acids than those from sub-tidal areas.

By contrast, parameters such as Turbidity can trigger substantial mortality of Clams, since it can affect the gills and therefore oxygen exchange. Turbidity also influences the amount of available light in the water column which can in turn reduce phytoplankton biomass, thus reducing food availability for bivalves. In addition, high Particulate Organic Matter (POM) concentrations are also associated with consequent bacterial and viral loads, which can harm bivalves.

A number of the parameters that enhance and decrease the productivity of shell fish are available from satellite remote sensing data. These include temperature, salinity, light, Chlorophyll-a (Chl *a*) as a proxy for phytoplankton biomass, suspended particulate matter

(SPM) and proxies for bathymetry and / or habitat type. Following stakeholder consultation through dedicated workshops in England and France, a number of these parameters have been made available through the S-3EUROHAB web alert system. and include temperature, chlorophyll-*a* and POM.

Recent further consultation with stakeholders through the S-3 EUROHAB project has also facilitated the development of new parameters for the web alert system. These include the Productivity Index, which is defined as the ratio between production of shellfish and the resources required to obtain the production. It enables an estimation of the capacity and efficient use estimates of these production resources. In relation to HABs, all of the measures required and restrictions implemented by management authorities in monitoring and regulating HAB occurrences can lead to an efficiency or productivity loss. These are linked to losses in operational time, costs associated with changes in work strategies and practice habits. The S-3 EUROHAB web alert system therefore represents a tool through which information can be disseminated faster, more precisely and more frequently, both spatially and temporally. It could potentially also reduce institutional and administrative factors that reduce resource productivity, by preventing market recall and destruction of toxin contaminated products. These Productivity Index maps are currently being developed within the S-3 EUROHAB project.