

Newsletter BIODHYL #2

April 2025

INNOVATION ASPECTS

- Identification of factors influencing the typology and evolution of biofouling by multivariate analysis of environmental, depth and hydromechanical parameters
- Long-term monitoring on a mobile device requiring an appropriate maintenance protocol

PROJECT OBJECTIVES

- **To gain a better understanding of biofouling**, the characteristics of the organisms that make it up, its evolution over time and the environmental variables that influence it
- **To identify the most reliable and robust techniques and protocols** for accurately characterising biofouling automatically in order to model its effects



This project benefits from French State funding managed by the ANR as part of the France 2030 investment plan, and financial support from the Brittany, Occitanie, Pays de la Loire and SUD Provence-Alpes-Côte d'Azur regions.

PARTNERS



SAMPLE COLLECTION AND ANALYSIS

STUDY SITES

BASSE DES CHATS

APPEAL

MEMOFLOW

OMEGA

CAP COURONNE

DEPLOYMENT OF THE SYSTEM ON A NEW SITE

APPEAL BUOY Off Groix & Belle-Île

The biofouling monitoring system was installed on the APPEAL buoy at the end of 2023. The first samples were collected in June 2024 after a 6-month immersion at three different depths: - 2 m, - 23 m and - 43 m. A second survey was carried out in March 2025.



MEMOFLOW BUOY Golfe de Fos

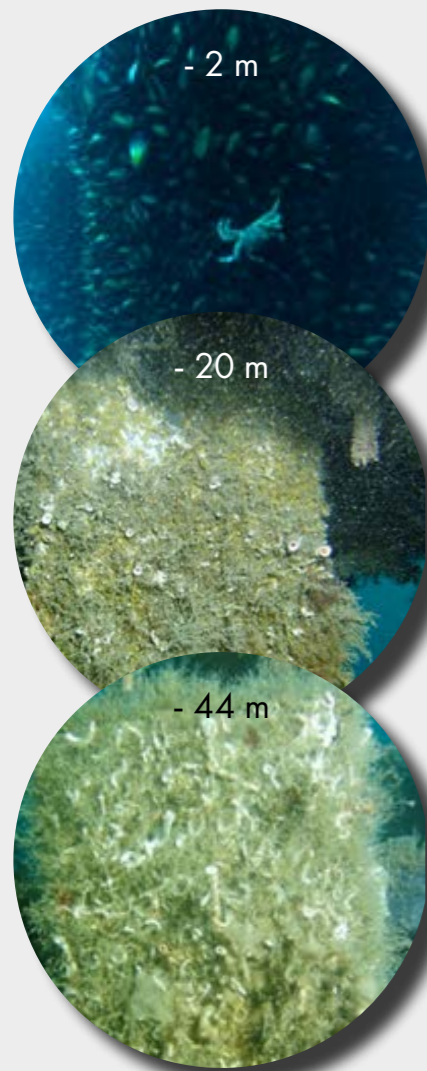
Before the MEMOFLOW buoy was trawled in February 2024, 17 samples in the form of PVC sheets were collected after 1 year's immersion at three depths: - 2 m, - 20 m and - 44 m.

Several studies have already been carried out on these samples:

- Measurement of the thickness, fresh weight (in air and water) and volume of the biofouling to estimate its density
- Preliminary taxonomic analysis to determine which species are present and which are dominant

First results suggest that:

- The thickness, weight, volume and density of biofouling decrease with depth, with a very marked difference between - 2 and - 20 m.
- The composition of the biofouling is strongly affected by depth: while mussels dominate at the subsurface, serpules, a species of marine tubicolous polychaete worms, are found mainly at depths of 20 m and 44 m.
- The rate of colonisation is significantly slower at -44 m, but the presence of solitary ascidian larvae, which can reach a size of 20 cm in the adult stage, supports the need to monitor biocolonisation over several years.



OMEGA BUOY Golfe de Fos

As the MEMOFLOW buoy can no longer be used, discussions were initiated in February 2024 with the Mediterranean Lighthouses & Beacons Service to study the feasibility of equipping one of their buoys, also located in the Gulf of Fos.

It's a great collaboration that came to fruition in February 2025 with the deployment of the biofouling monitoring system on the OMEGA buoy. The OMEGA buoy is particularly interesting because it is located in an area that is representative of the conditions found at floating wind turbine pilot farms in the Mediterranean.

During this deployment, samples were taken and a probe measuring several physico-chemical variables was deployed to characterise the body of water at this monitoring point.



Maxime SUROY

Centre Manager

Direction Interrégionale de la Mer Méditerranée

The participation of the Lighthouses & Beaconsin BIODHYL allows us to go beyond our daily missions by taking a concrete part in innovation in the maritime world.

The use of our buoys as instrumentation support and the trust placed in our agents to implement the project is a great recognition of our expertise in this field. So, thank you to France Energies Marines for its confidence!



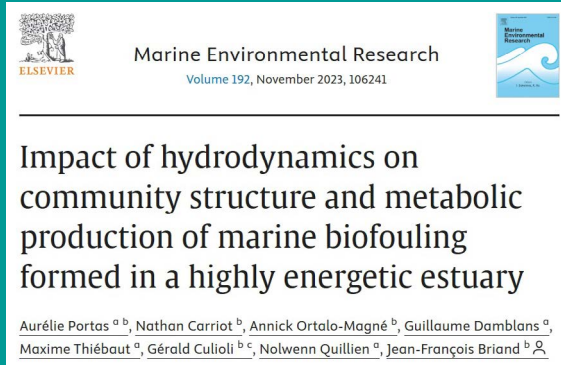
SCIENTIFIC ARTICLES PUBLISHED

November
2023

Marine Environmental Research Portas *et al.*

Impact of hydrodynamics on community structure and metabolic production of marine biofouling formed in a highly energetic estuary

The original multidisciplinary approach described in this article has demonstrated the importance of fluid shear stress on both the structure of the biofouling and the metabolic response of these complex communities.



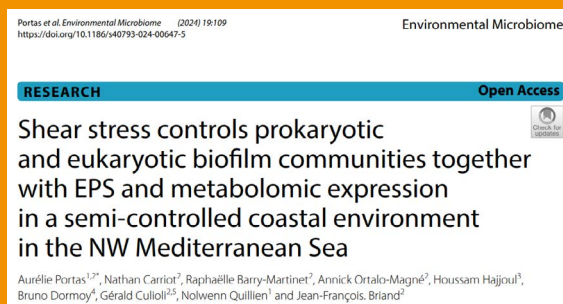
December
2024

Environmental Microbiome Portas *et al.*

Shear stress controls prokaryotic and eukaryotic biofilm communities together with EPS and metabolomic expression in a semi-controlled coastal environment in the NW Mediterranean Sea

This multi-disciplinary study in a controlled environment showed that it is movement and not so much the intensity of the shear force that has an effect, whatever the season. The results suggest an adaptive response aimed at resisting shear forces and favouring the selective development of crust-forming macro-organisms, such as bryozoans.

In the static configuration, analysis of the metabolites produced by the biofouling communities revealed increased predation and greater cooperation between the organisms compared with dynamic conditions. The sessile ciliates present protect themselves by surrounding themselves with a matrix of extracellular polymeric substances (EPS).



www.france-energies-marines.org/en/projects/biodhyl/