The role of microbial biodiversity in the functioning of marine tidal flat sediments

BIO-Tide

Koen Sabbe (Partner 1)

Funded projects final conference, 12-13 November 2019, Brussels

BiodivERsA COFUND Call (2015-2016)

« Understanding and managing biodiversity dynamics to improve ecosystem functioning and delivery of ecosystem services in a global change context: the cases of soils and sediments, and land- river and sea-scapes »

CONSORTIUM DESCRIPTION

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*Partner 2: Anders **Meibom**, Ecole Polytechnique Fédérale de Lausanne, Switzerland, funded by SNSF*

*Partner 3: Tom **Moens**, Marine Biology Lab, Ghent University, Belgium, funded by FWO*

*Partner 4: Cédric **Hubas**, Muséum National d'Histoire Naturelle, France, funded by ANR*

*Partner 5: Bruno **Jesus**, Université de Nantes, France, funded by ANR*

Self-funded partner: David Paterson, University of St Andrews, UK

BIO TIDE

GHENT UNIVERSITY

MUSÉUM NATIONAL D'HISTOIRE NATURELLE

ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

PROJECT DESCRIPTION

Identify and quantify the relation between microbial biodiversity and C cycle related ecosystem functions in contrasting tidal flat environments in the explicit context of biotic interactions.

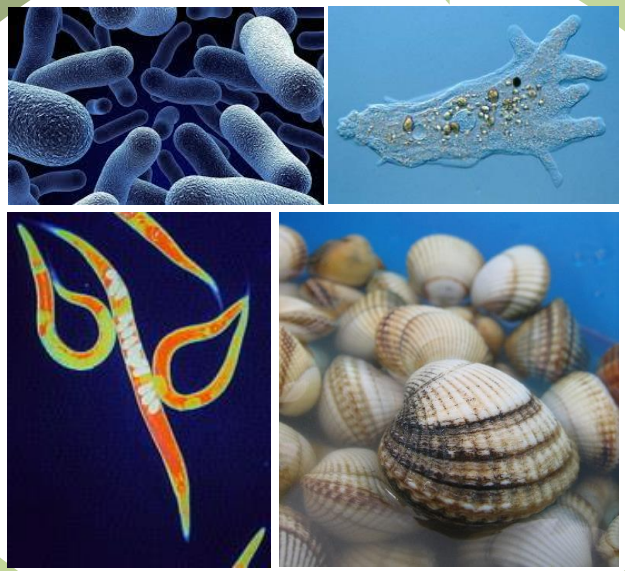
We show that

- The ecosystem services delivered by tidal flats arise from highly diverse microbial **biofilms**.
- Their **structure and functioning** is **modulated and stimulated** by complex and often highly specific **interactions** amongst microbial organisms, but also with the animals that graze the biofilms.
- Preserving **diverse and intact food webs is essential for the proper functioning** of these ecosystems and the **services** they provide

SCIENTIFIC OUTPUTS


SCIENTIFIC OUTPUTS

Tidal emersion
Hydrodynamics
Sediment type
Weather & climate
Light
Nutrients
Oxygen
…




SCIENTIFIC OUTPUTS

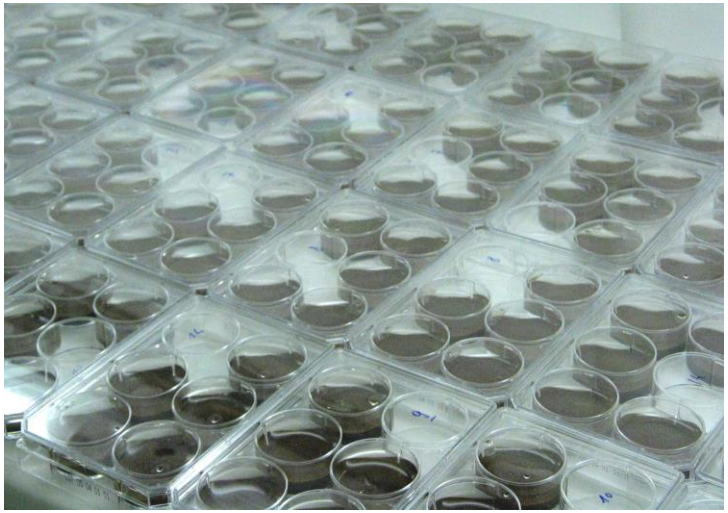
Field campaigns 2017-2018 (WP1)

Baie of Bourgneuf June 2017 – SIP experiment
Schelde estuary June 2018 – omics approach

Experiments (WP2-4)

Modeling (WP5)

Upscaling (remote sensing)(WP6)




SCIENTIFIC OUTPUTS

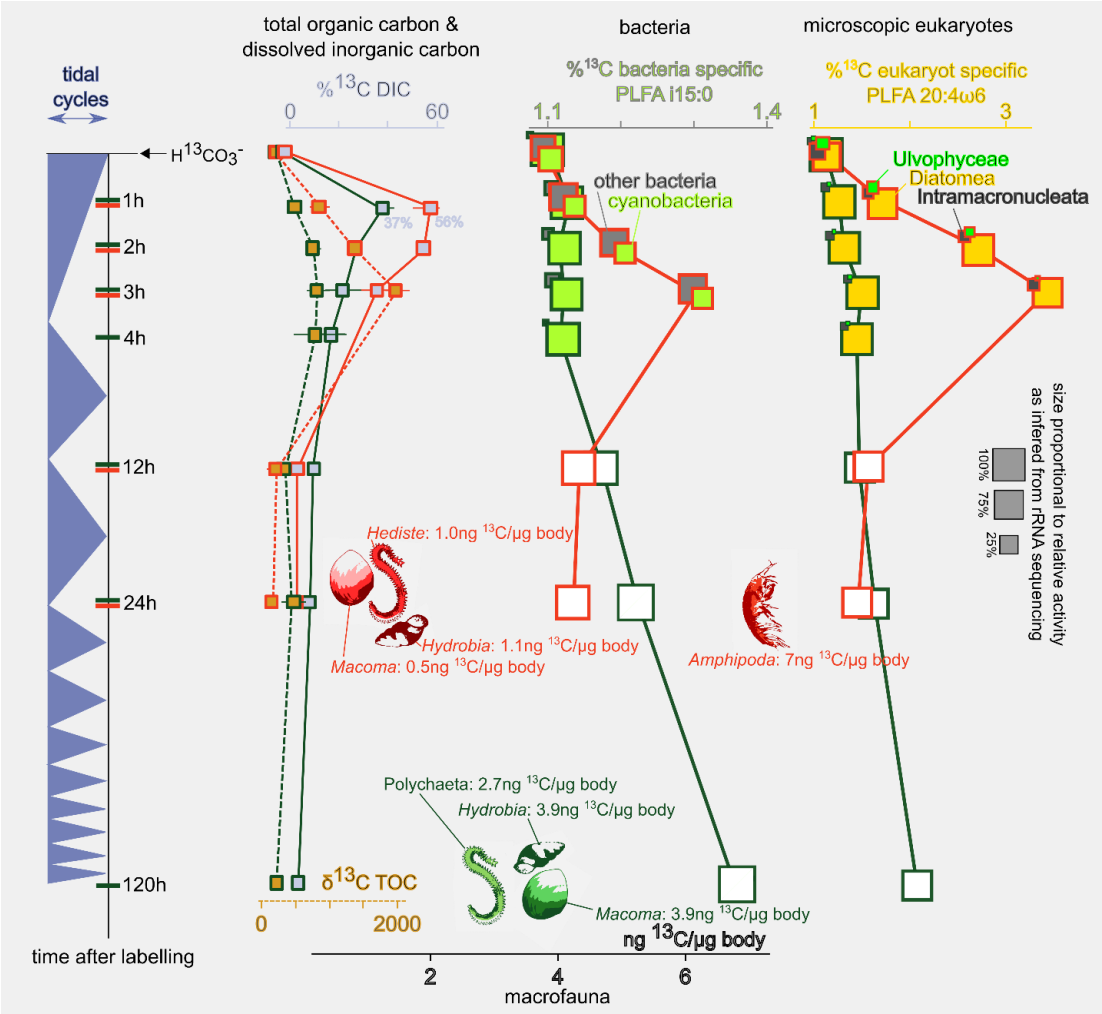
Field campaign 2017 (all P)

^{13}C pulse-chase experiment to follow C flow over time (5 days), mud vs sand)

RNA-SIP and PLFA-SIP to unravel role of individual groups

Rapid and differential uptake of ^{13}C, with long persistence in muddy system

→ modeling

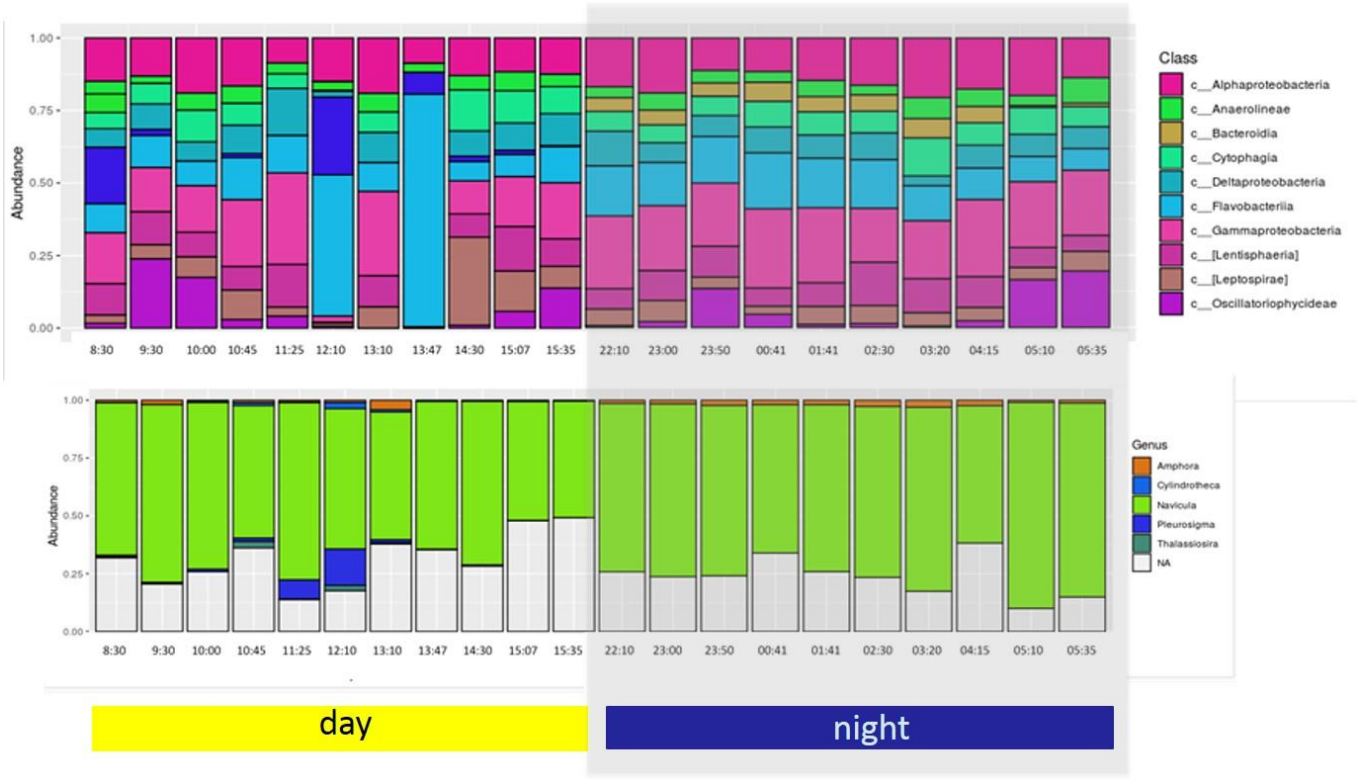



SCIENTIFIC OUTPUTS

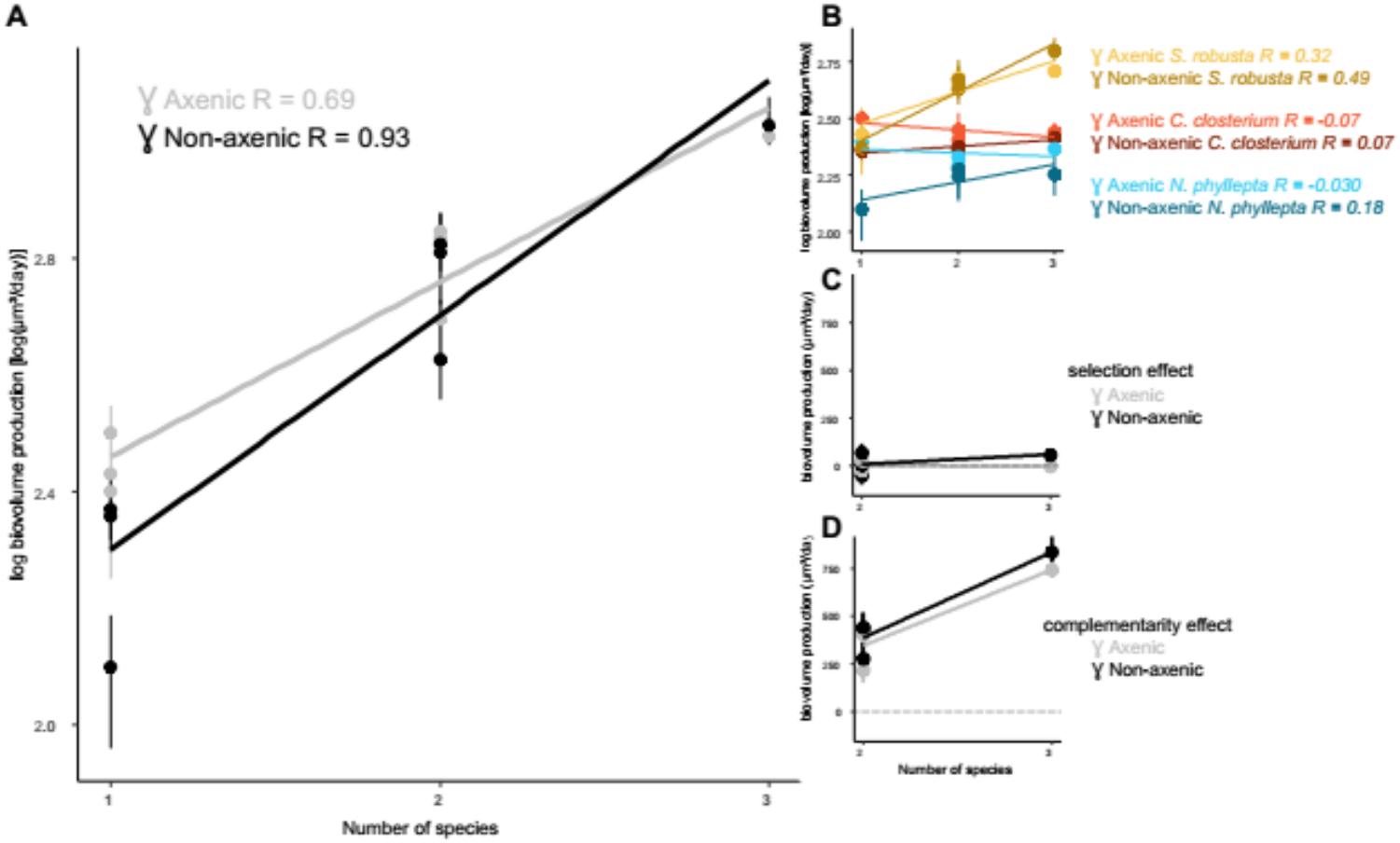
Field campaign 2018 (all P)

Amplicon seq, metatranscriptomics and metabolomics to unravel activity of individual microbial groups in relation to C fluxes

→ modeling

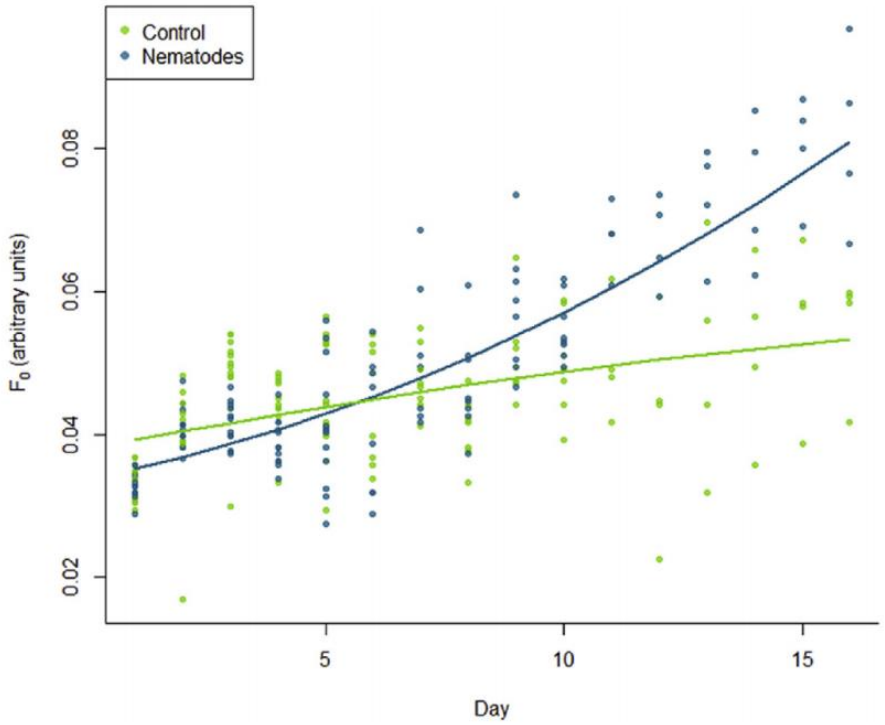



SCIENTIFIC OUTPUTS

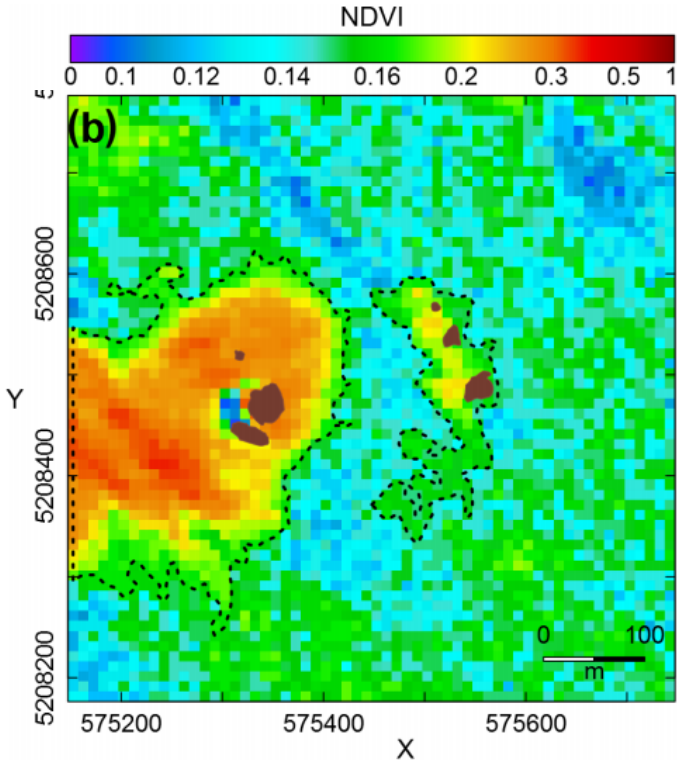


Increased production in multispecies diatom biofilms, mediated by complementarity effects, are enhanced in the presence of bacteria (Koedooder & Stock et al. Front. Microbiol. 2019)(P1,3)


SCIENTIFIC OUTPUTS



Nematodes stimulate diatom biomass accumulation of the biofilm and cause a shift in diatom community structure (D'Hondt et al. Mar. Env. Res. 2018)(P1,3)



The presence of live oyster reefs promotes biofilm development and affects biofilm spatial distribution around oyster reefs (Echappé et al. Biogeosciences 2018)(P1,5)


SOCIETAL / POLICY OUTPUTS

Established and new stakeholder engagement

Existing & new collaborations (Bio-Littoral, NIOZ, Benth'Ostrea, Synoxis Algae,…)
Cofunding (Région de Bretagne, UGent,…)

BIO-LITTORAL
Expertises et Conseils en Environnements Marin et Estuarien

Outreach

Academic presentations (EMBS, EPC, BPS, …) and papers
Policy informing
Science festivals, art

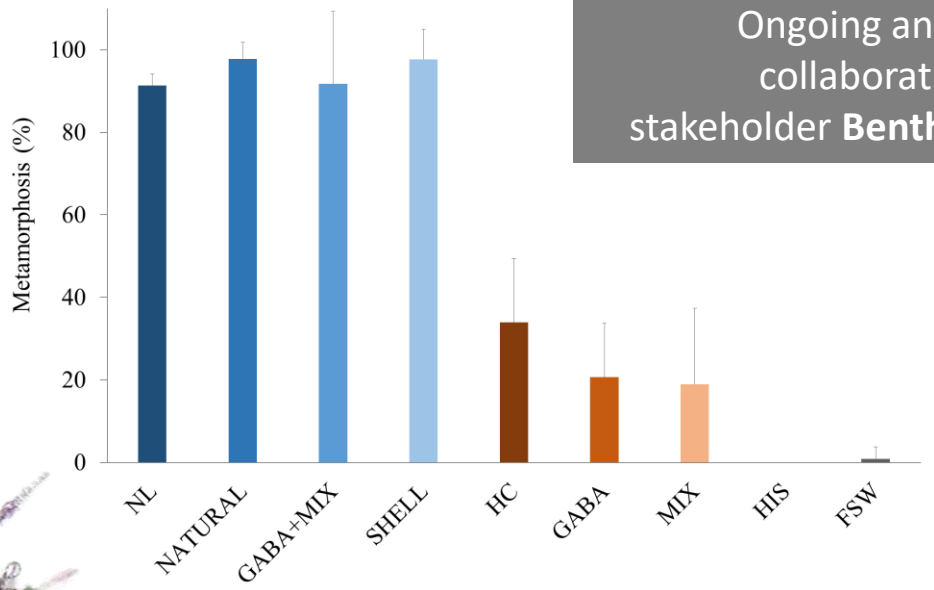
New projects

ITN Training Network BEEP (P5); Global Inter-Korean Marine Project, 02 –constructing an innovative technology platform for marine diatoms in tidal flats (P1); FWO (P1,5); …

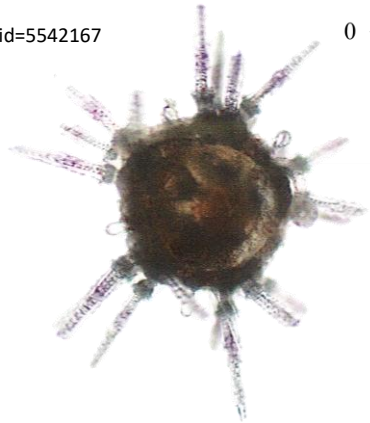
SOCIETAL / POLICY OUTPUTS

Society-relevant research: sea urchin and oyster aquaculture

By Marco Busdraghi - Own work, CC BY 3.0, https://commons.wikimedia.org/w/index.php?curid=5542167



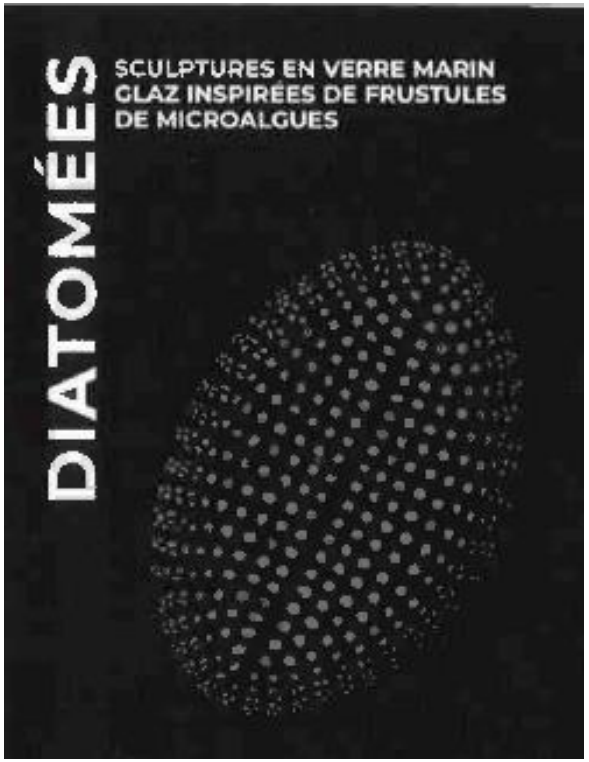
Ongoing and future collaboration with stakeholder **Benth'Ostrea**

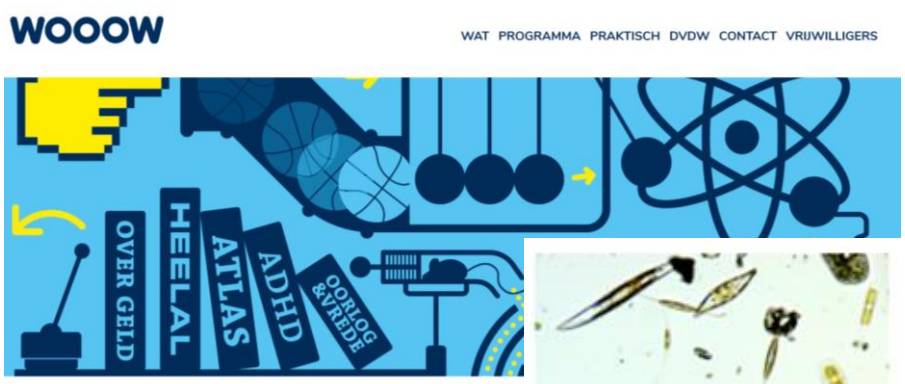


Diatom biofilms significantly enhance metamorphosis success from planktonic larvae to benthic juveniles in sea urchins (Castilla-Gavilán et al. Aquaculture 2020)(P5)

SOCIETAL / POLICY OUTPUTS

Outreach to general public





Interactions with general public and artists to inform about importance microbial life in tidal flats

https://www.lamerxxl.com

http://www.wooowfestival.be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ANR

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fwo
Opening new horizons

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