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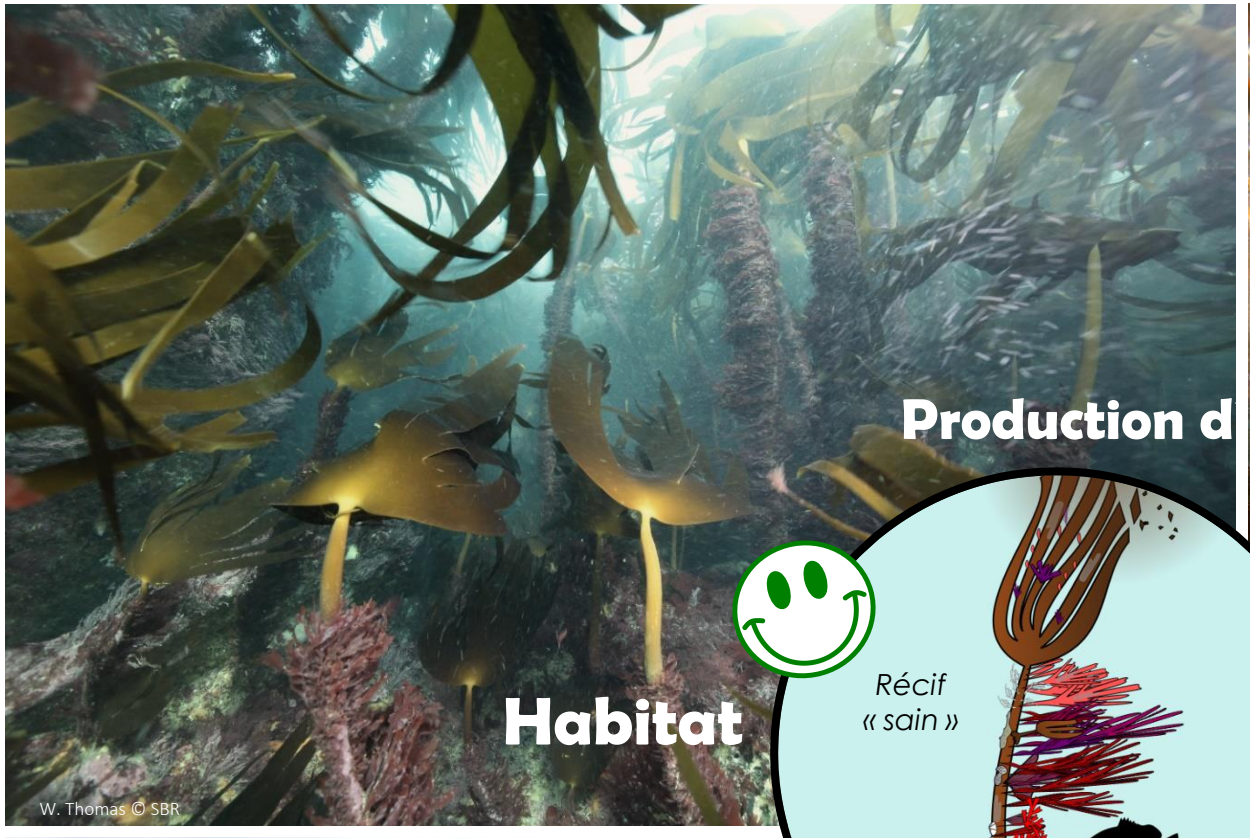
Station Biologique de Roscoff

UNIVERSITÉ CAEN NORMANDIE

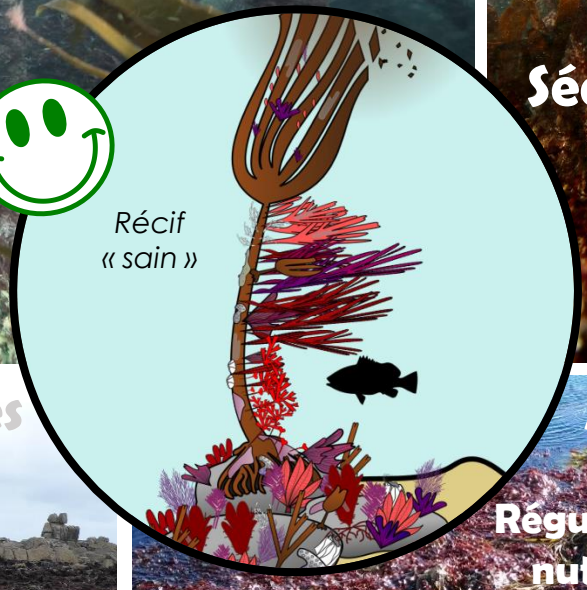
¡KELP ME!

September 26th, 2023 MNHN Paris, France

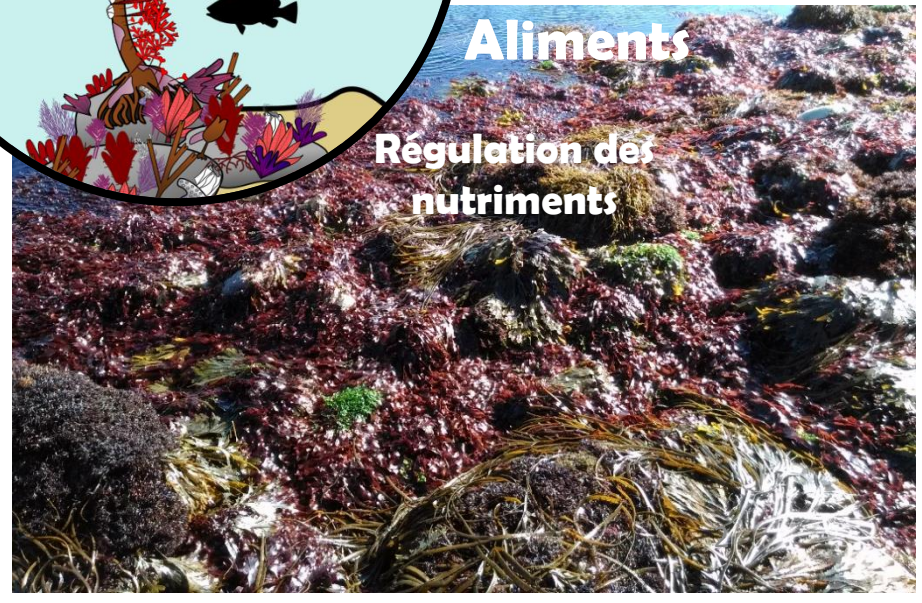
MSCA COFUND 2022 -2024
Grant agreement No. 899546.


Habitat
W. Thomas © SBR


Production d'O_2
Séquestration de carbone
Biodiversité
Y. Fontana © SBR


Récif « sain »


Biotechnologies
© JC Leclerc


Aliments
Régulation des nutriments

OSPAR COMMISSION

Case report for
kelp forest habitat

2021

Biodiversity and Ecosystems Series

Y. Fontana © SBR

W. Thomas © SBR

De nouveaux substrats durs…

Check for updates

news & views

OCEAN SPRAWL

Structures spread across our seas

Construction along coasts and offshore is accelerating. A new study estimates the extent of different developments and their wider influence and forecasts their expansion.

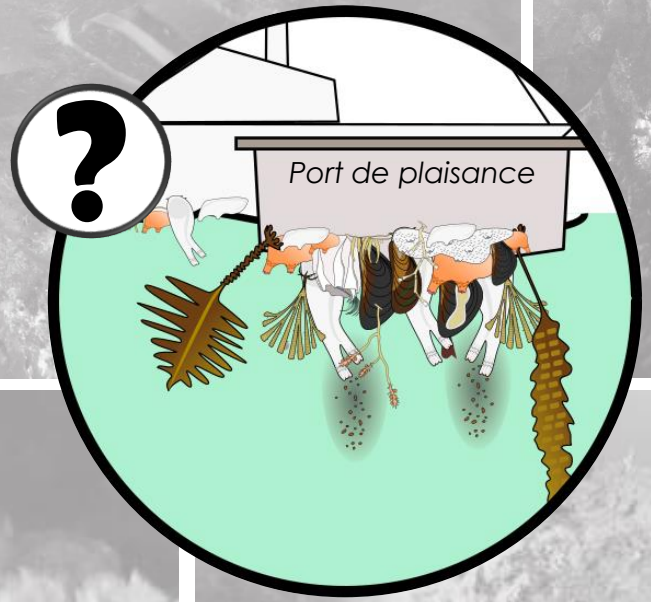
Stephen J. Hawkins, Louise B. Firth and Ally J. Evans

The built environment is spreading along the planet's coastlines and plunging into ever-deeper waters, a phenomenon aptly dubbed 'ocean sprawl'[1]. Most of the world's relentless current and projected population growth is in coastal areas, driving urbanization and land claim for homes, industry, commerce, tourism, transport and associated infrastructure. Coastlines will be simultaneously squeezed by rising and stormier seas, prompting proliferating sea defences[2]. Hydrocarbon exploitation went offshore 100 years ago and is penetrating ever-deeper waters. Renewable-energy generation has expanded rapidly in shallow seas and is now moving further offshore with floating wind turbines.

Aquaculture has spread from enclosed to open waters, and deep-sea mining is next. But the accelerating expansion of construction across the ocean often passes unnoticed given deserved attention to anthropogenic climate change and overfishing. Deep-water expansion is out of sight and mind. Writing in *Nature Sustainability*, Bugnot et al.[3] provide a timely inventory of the current extent of such marine structures and forecast their likely spread.

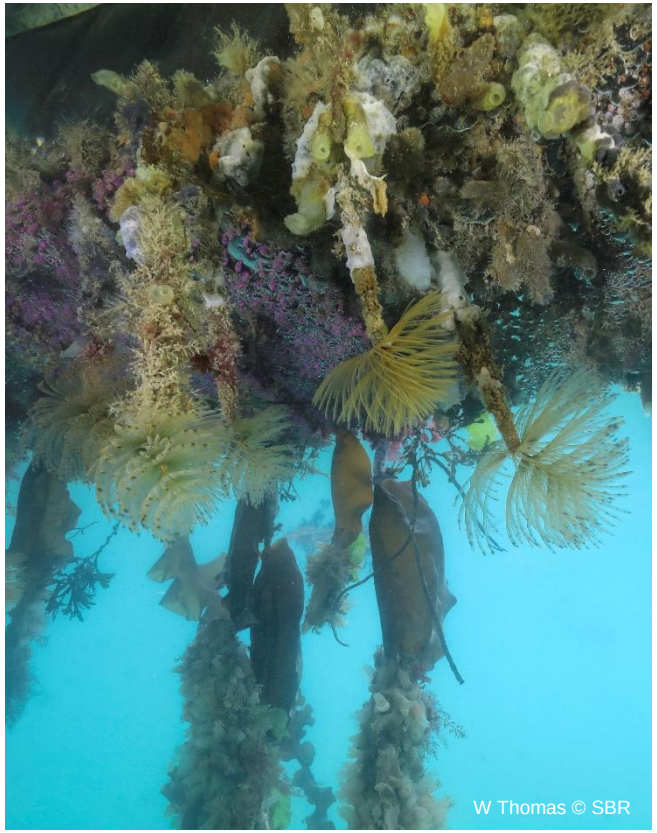
Marine artificial structures modify habitats, changing the surrounding ecology[4]. As on land, many habitats are literally built over. On soft muddy and sandy seabeds, structures generate islands of artificial hard habitat[5]; biological communities shift from sediment dwellers to surface-[illegible]ched filter-feeding animals and seaweed[illegible] Structures like piers or oil rigs attra[illegible] and crabs, which forage around the[illegible] Complex rocky reefs are replaced b[illegible]sia smooth surfaces such as quays or a wal[illegible] often much less suitable as mari[illegible] habita Perhaps the most far-reaching impact is on connectivity: structures act as barrier[illegible] on land, whereas at sea they can provide stepping stones, especially for invasive non-native species[1]. Local piecemeal construction can scale up insidiously, epitomized by the increasingly crowded north Italian Adriatic and the recently recognized coastal 'Great Wall' of China. As appreciated in cities, the attendant li[illegible]

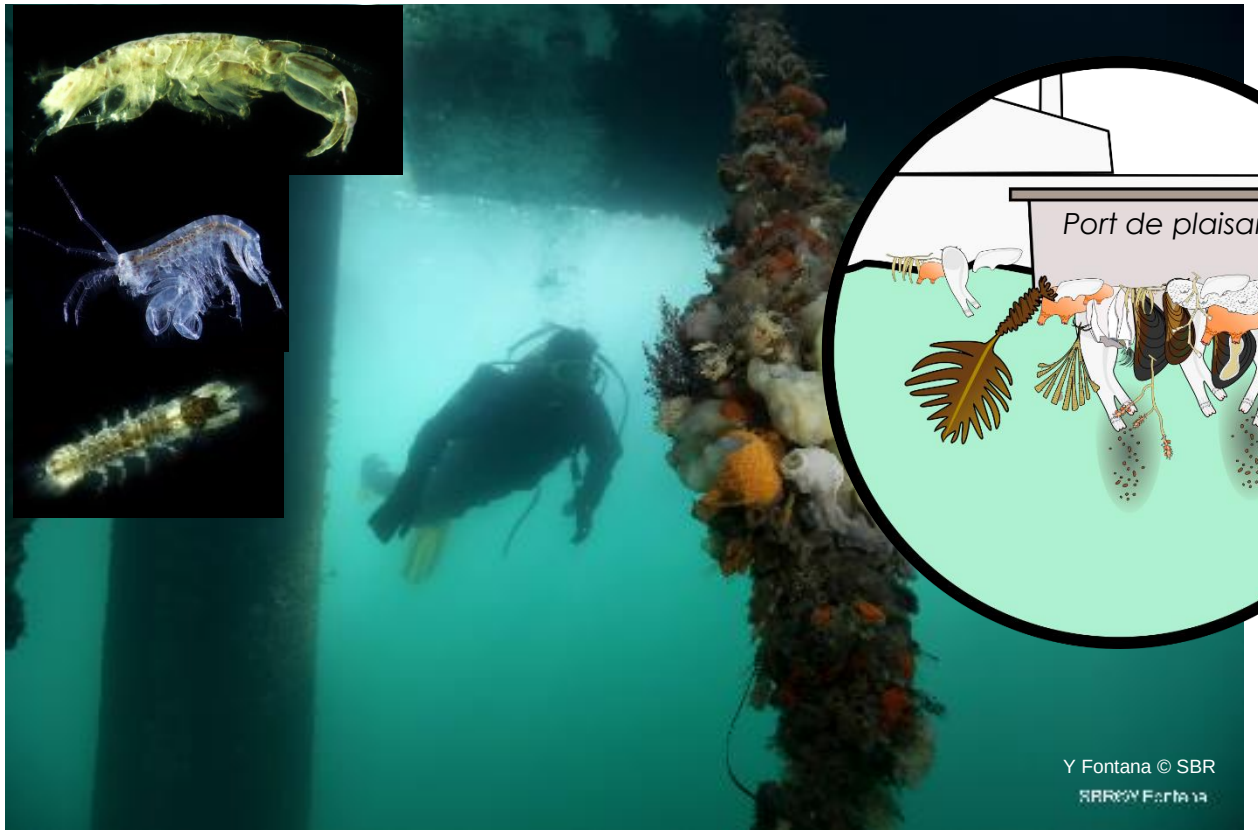
Fig. 1 | Examples of ocean sprawl considered by Bugnot et al. a, The Royal Albert Dock and Royal Liver Building in Liverpool. Built on reclaimed mudflats from 1700 onwards, at their 1960s peak dock basins stretched >15 km along the Mersey estuary. The mid-nineteenth century Royal Albert Dock, redundant for shipping since the 1970s, became the centrepiece of an ambitious urban renewal scheme. **b**, The dock basin is managed by mixing, with aeration allowing dense naturally settling mussels to bio-filter the dock basin's water volume every 1–2 days, creating a healthy and diverse but synthetic ecosystem[1]. **c**,**d**, Nearby at Crosby Beach, one of Antony Gormley's 100 brass statues (Another Place) (**c**), itself covered with marine life[6] (**d**), looks out to a wind farm. Offshore wind farms can exclude seabed damage from towed fishing gear. Credit: Louise B. Firth (**a**–**d**).



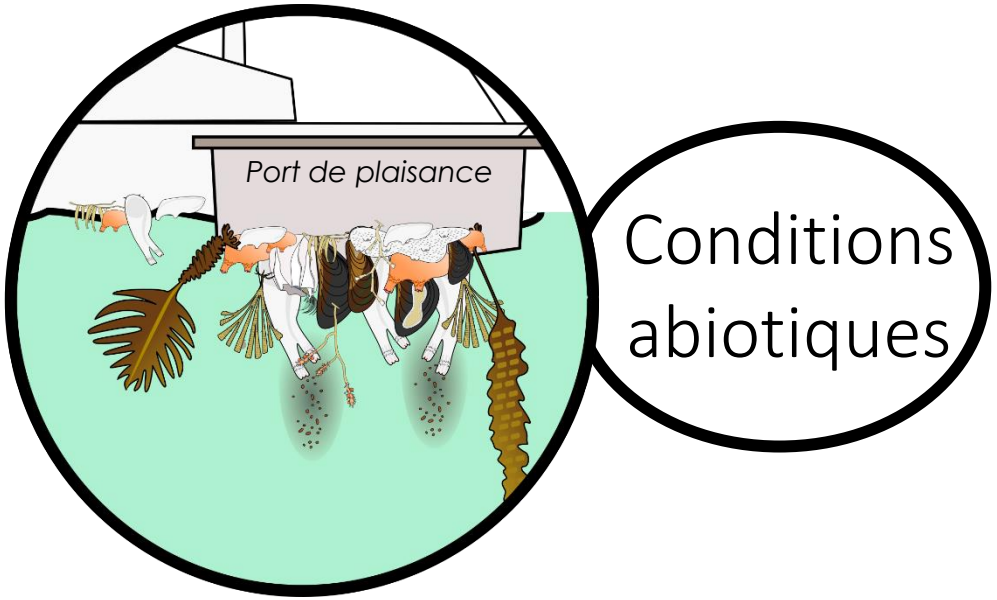
W. Thomas © SBR

… pour de nouveaux assemblages d’espèces…





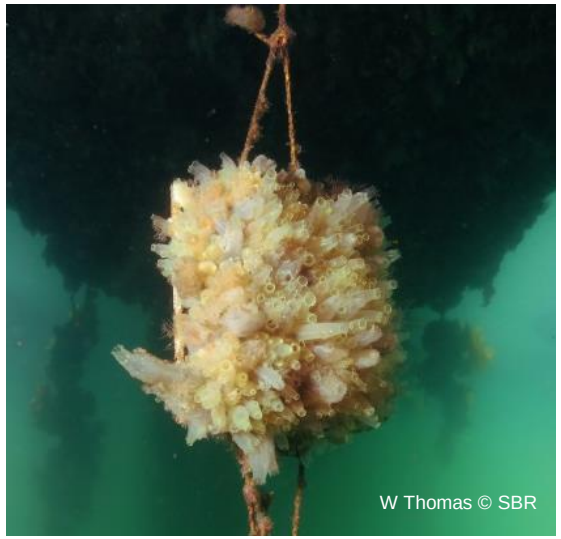
… un fonctionnement particulier, et généralement peu compris



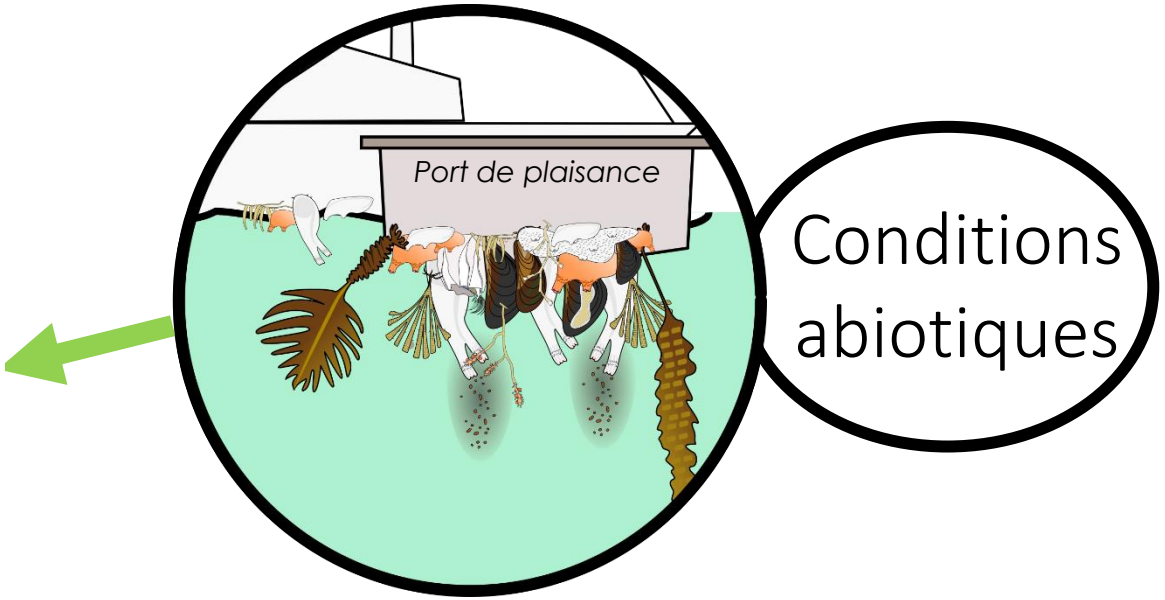
e.g. Dafforn et al. 2009 Div Distrib, Gauff et al. 2022 Biol Inv

… un fonctionnement particulier, et généralement peu compris

… des tendances généralement admises :



Faune sessile



Espèces tolérantes ou opportunistes, résilientes aux stress (multiples), à relativement faible durée de vie

e.g. Dafforn et al. 2009 Div Distrib

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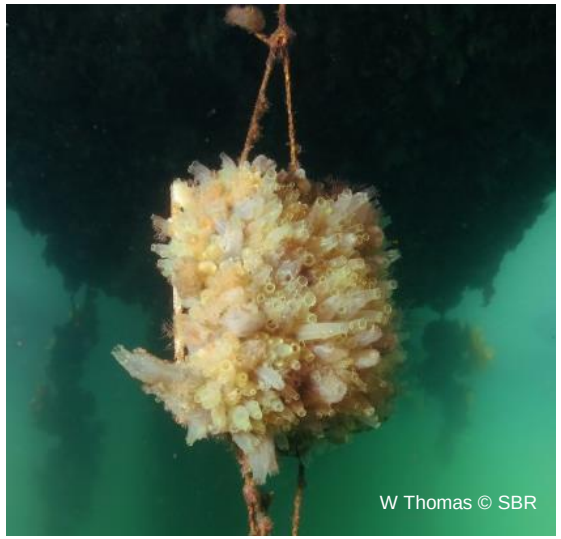
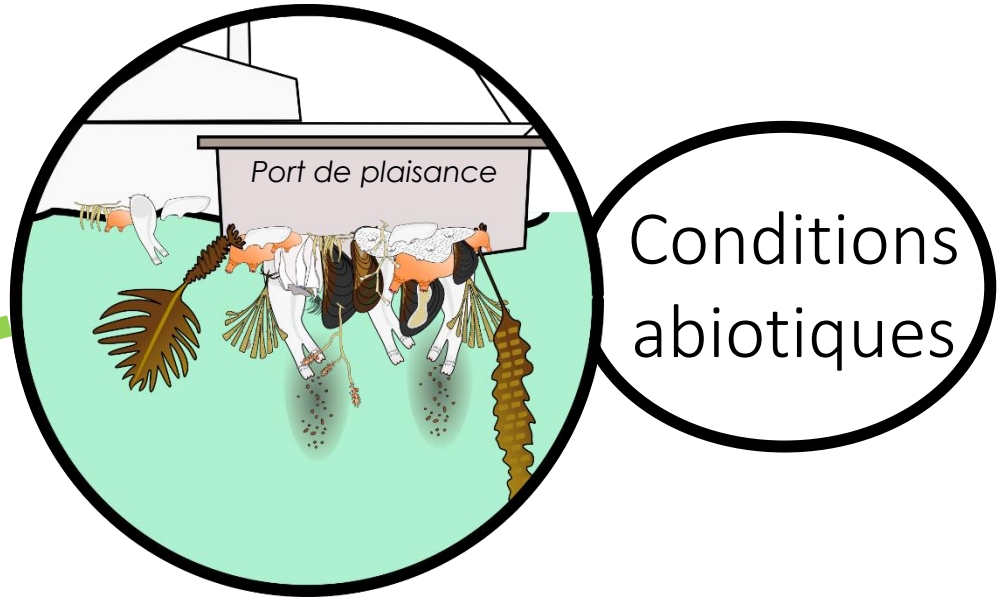


Faune sessile



Espèces tolérantes ou opportunistes, résilientes aux stress (multiples), à relativement faible durée de vie

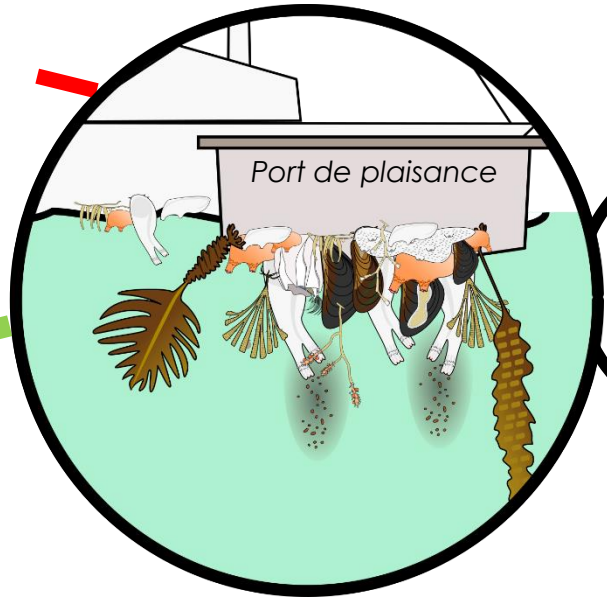
Communautés principalement hétérotrophes.

e.g. Malerba et al. 2019 Front Ecol Env

… un fonctionnement particulier, et généralement peu compris

Mégafaune prédatrice

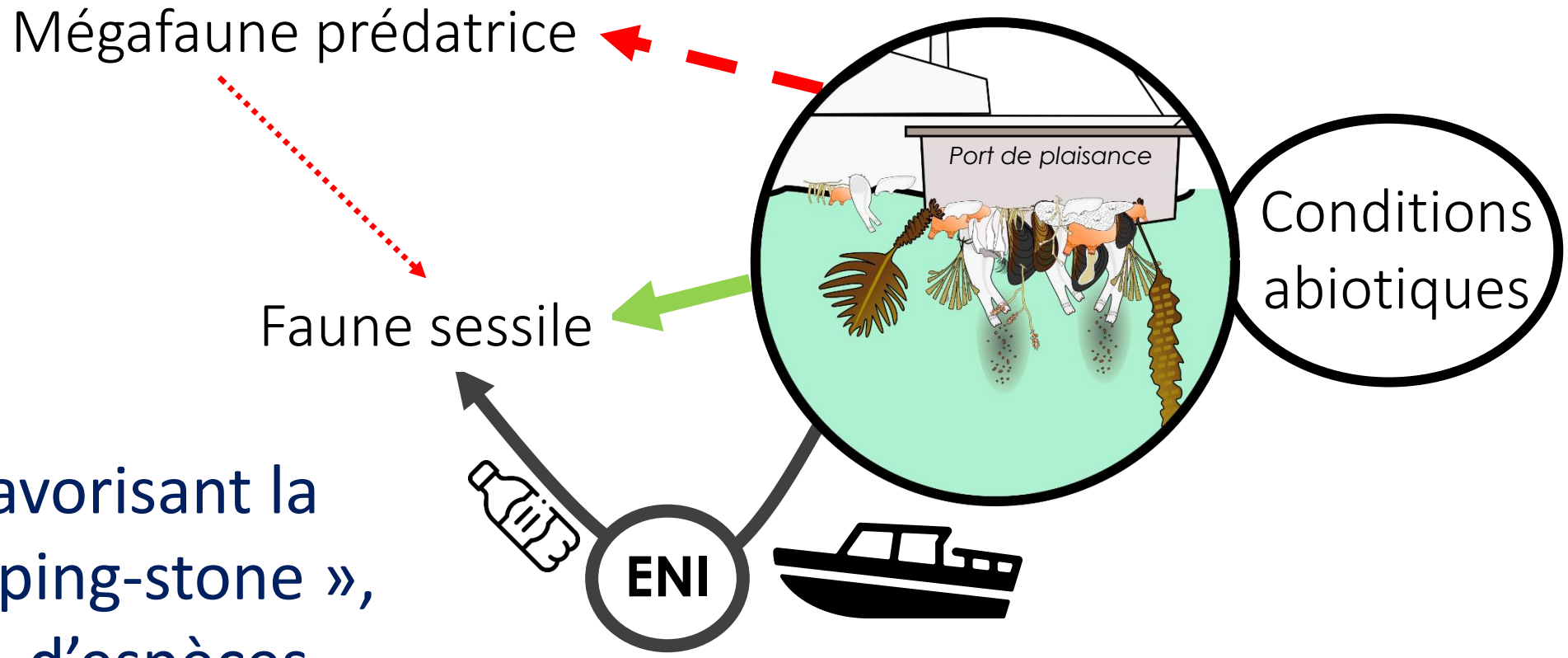
Faune sessile



Conditions abiotiques

e.g. Giachetti et al 2020 JEMBE, Ashton et al. 2023 Science

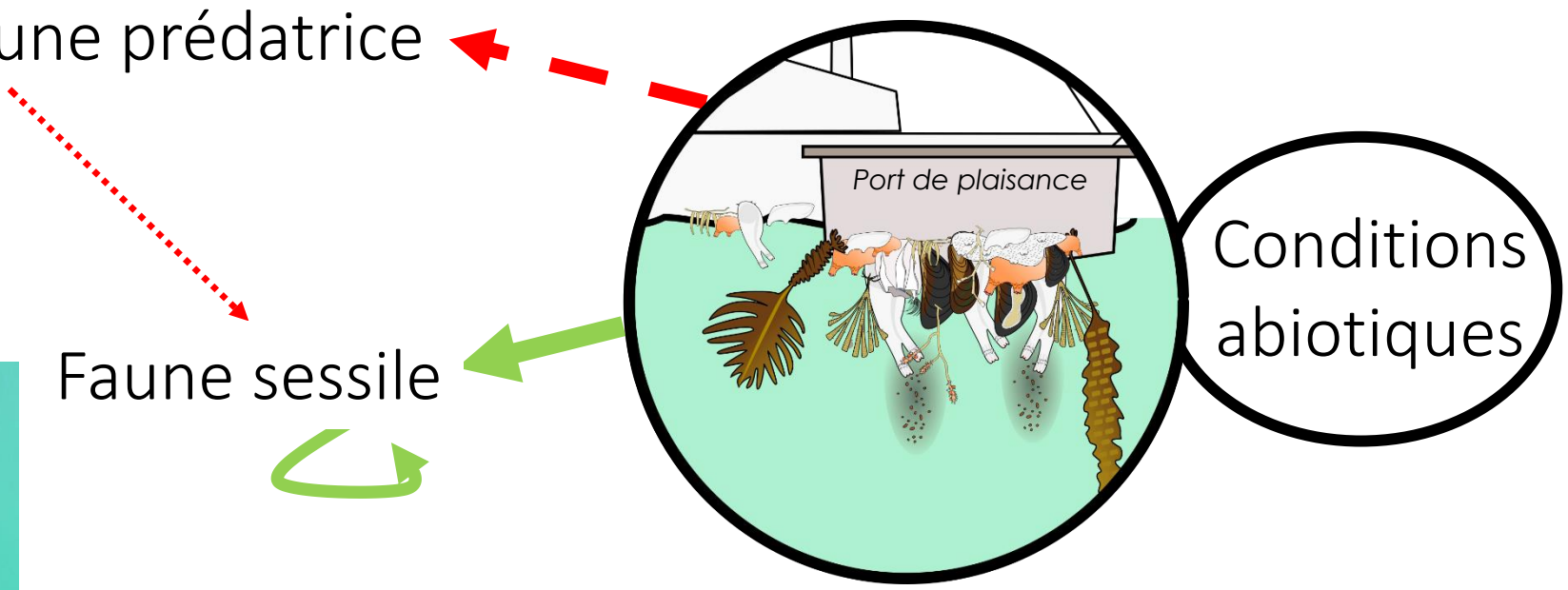
… un fonctionnement particulier, et généralement peu compris



Des substrats favorisant la dispersion « stepping-stone », et en cascades, d'espèces non-indigènes

e.g. Dafforn et al. 2009 Div Distrib, Leclerc et al. 2020, 2023 Div Distrib

… un fonctionnement particulier, et généralement peu compris



… des cascades de type « habitat » notamment

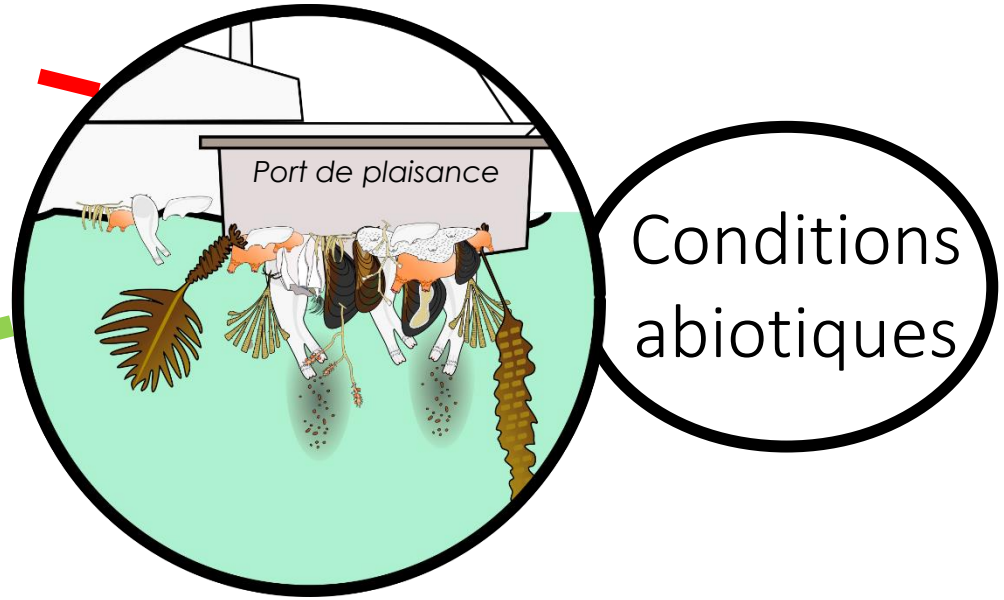
e.g. Stachowicz et al 2002 Ecology

… un fonctionnement particulier, et généralement peu compris

Mégafaune prédatrice

Macrofaune mobile

Faune sessile



… des cascades de type « habitat » notamment

e.g. Sellheim et al. 2010 MEPS, e.g. Leclerc & Viard 2018 Ecol Evol

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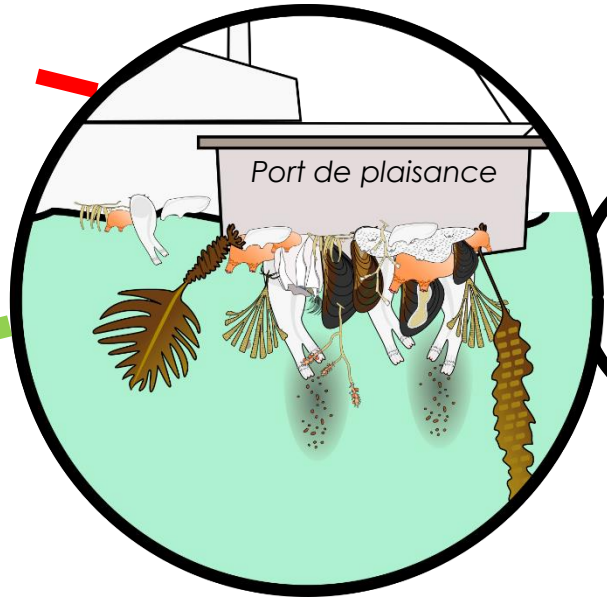
Mégafaune prédatrice

Macrofaune mobile

Faune sessile



Conditions abiotiques

e.g. Nydam & Stachowicz 2007 MEPS, Rius et al. 2014 J Anim Ecol

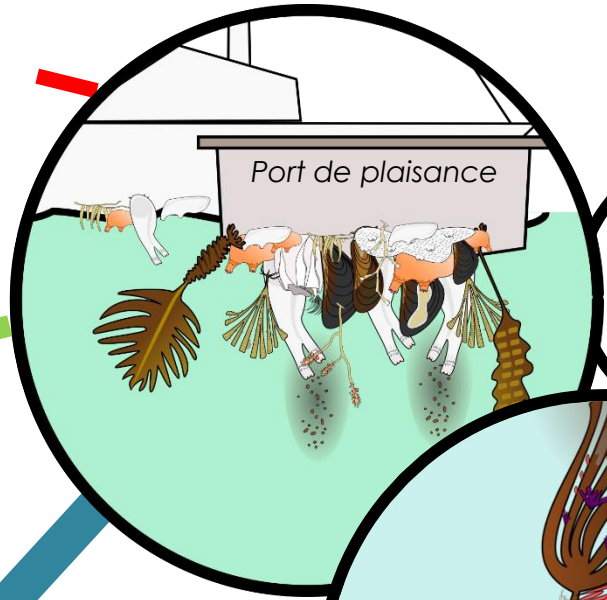
… un fonctionnement particulier, et généralement peu compris

Mégafaune prédatrice

Macrofaune mobile

Faune sessile

?



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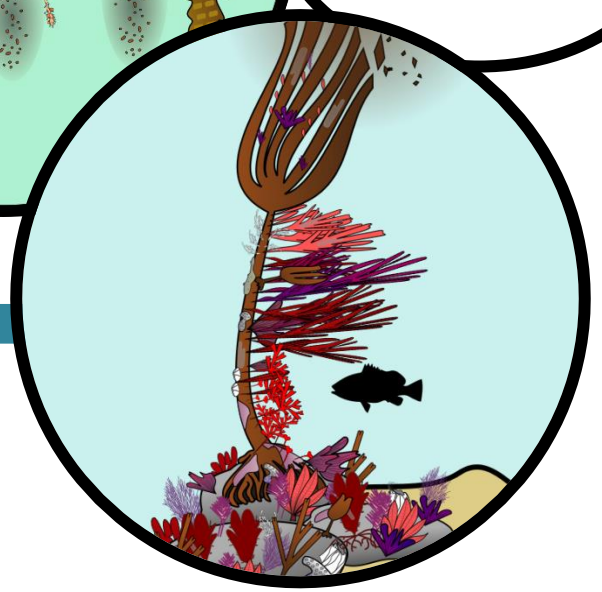

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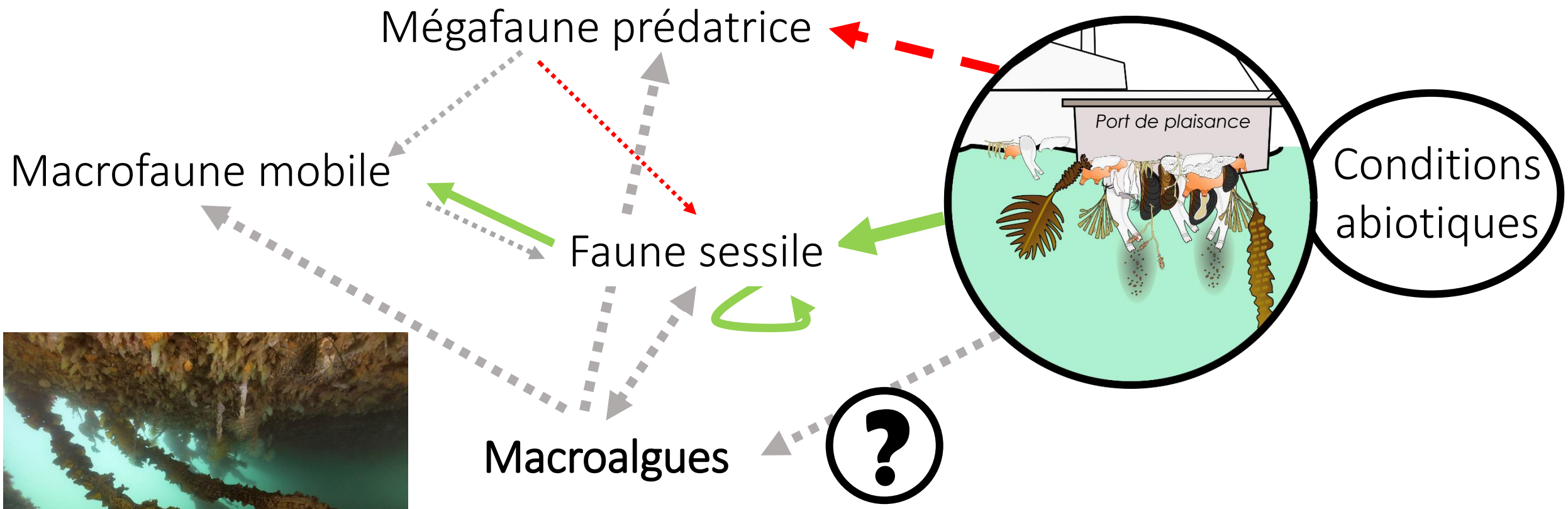

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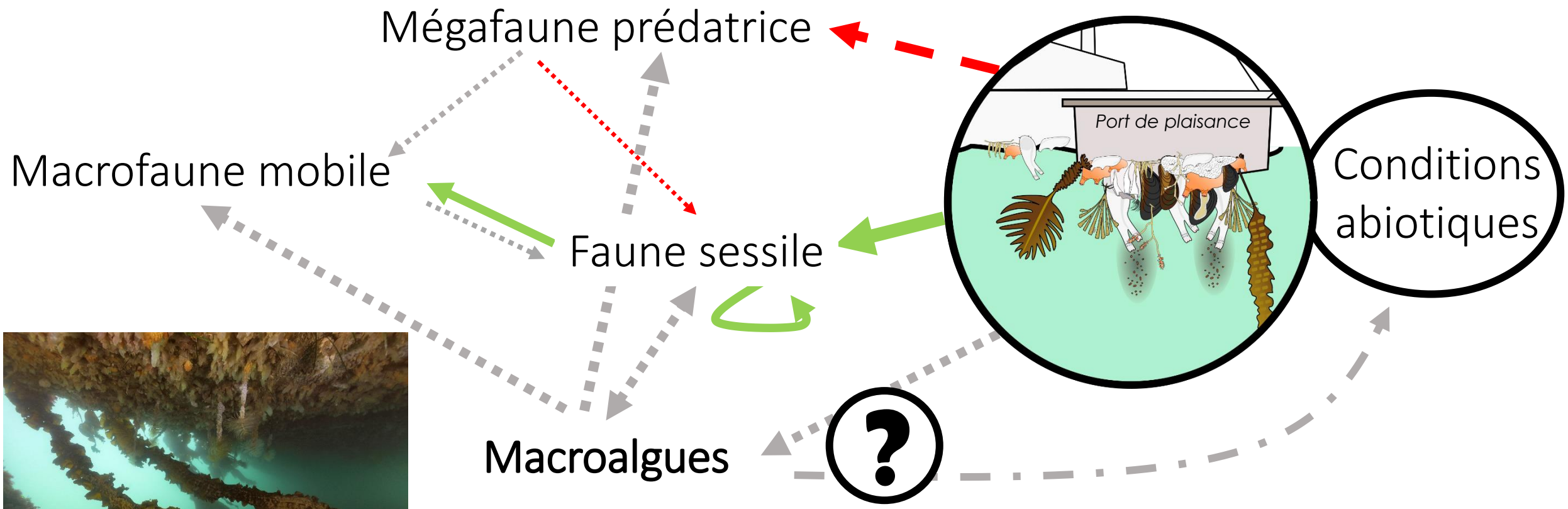


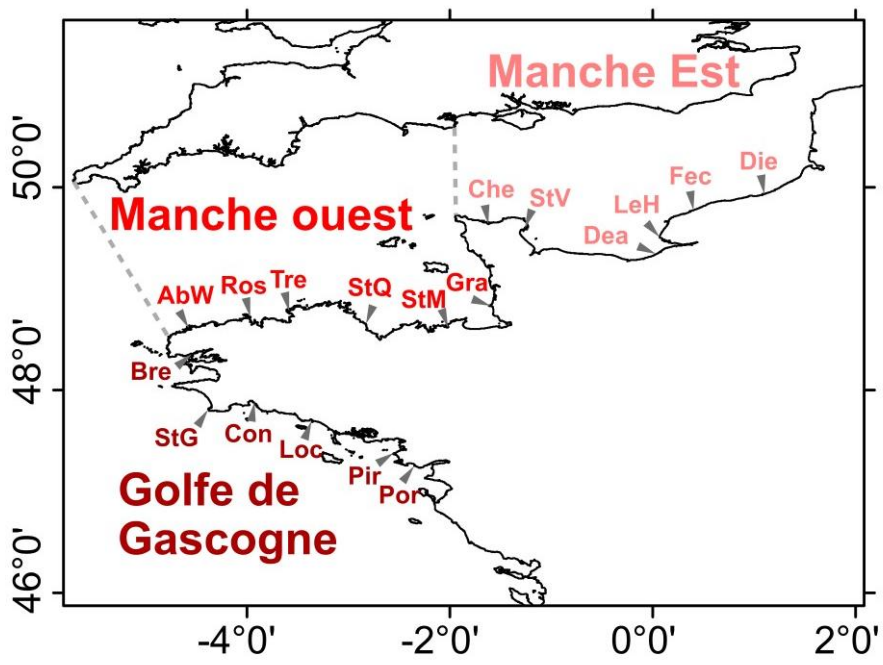
Questions

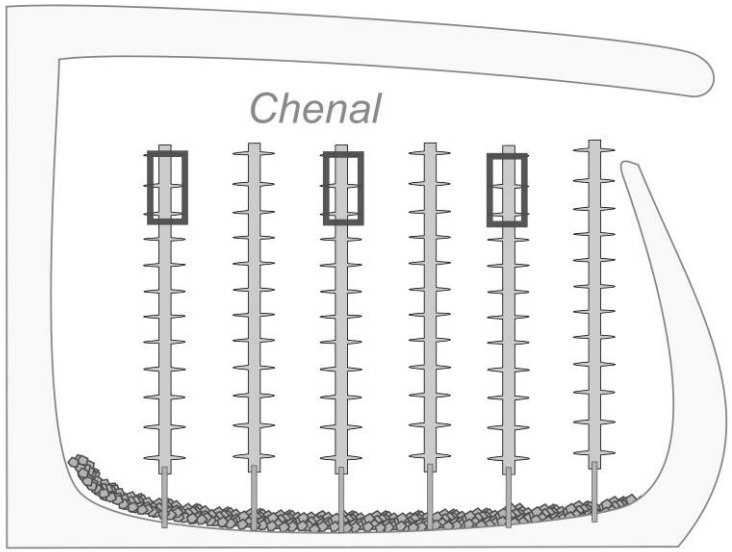
- Comment se distribuent les macroalgues des ports de plaisance dans l'espace (à de multiples échelles)?
- Ont-elles une influence sur les communautés associées à ces nouveaux habitats (et leur fonctionnement)?
- Peuvent-elles y fournir des services écosystémiques?

1

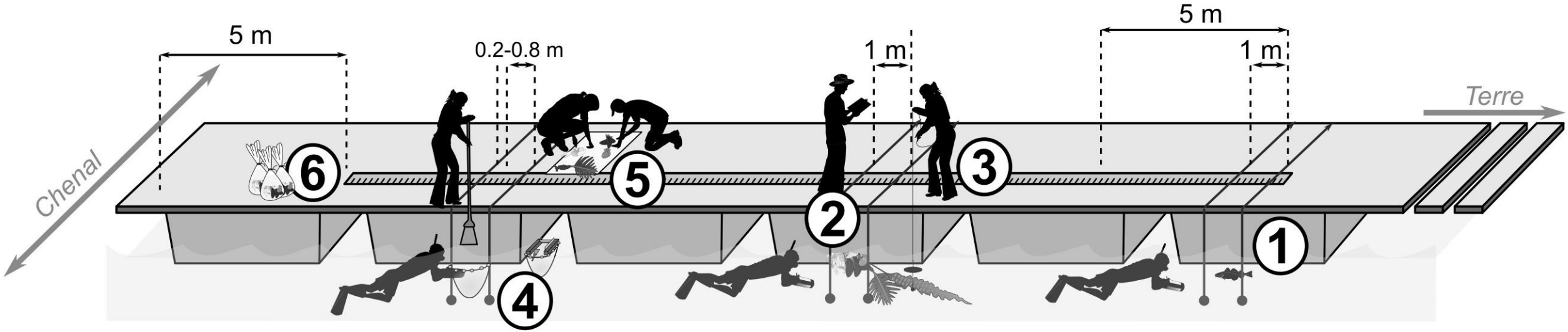
2

Volet 1 Variations spatiales des communautés





3 Regions > 18 Ports > 54 Pontoons > 162 Stations



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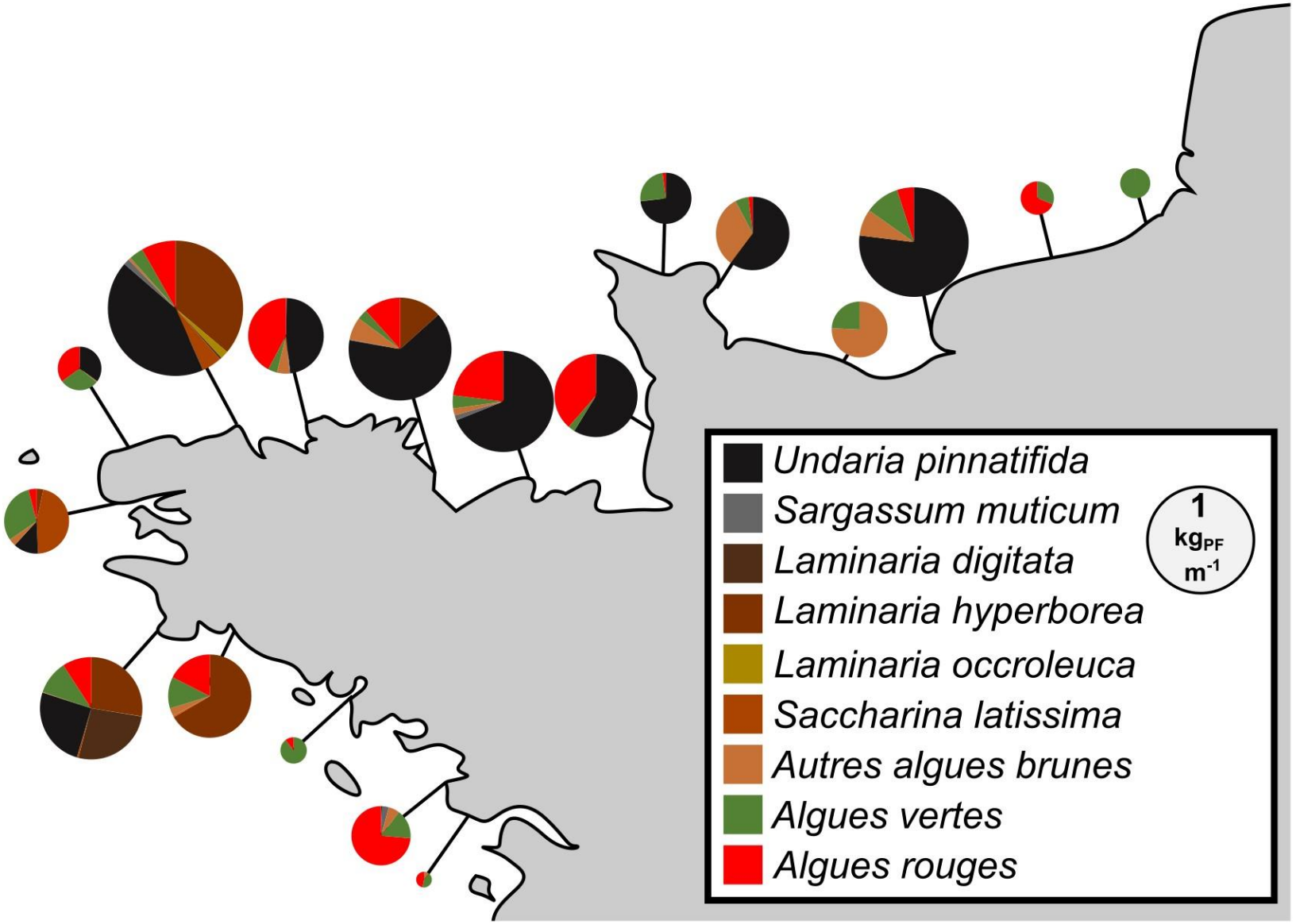
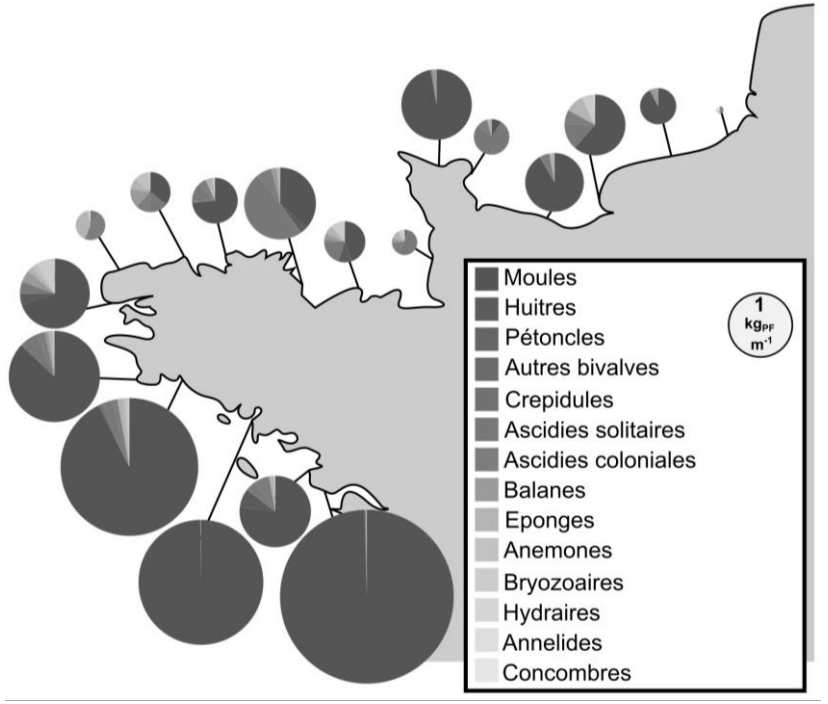
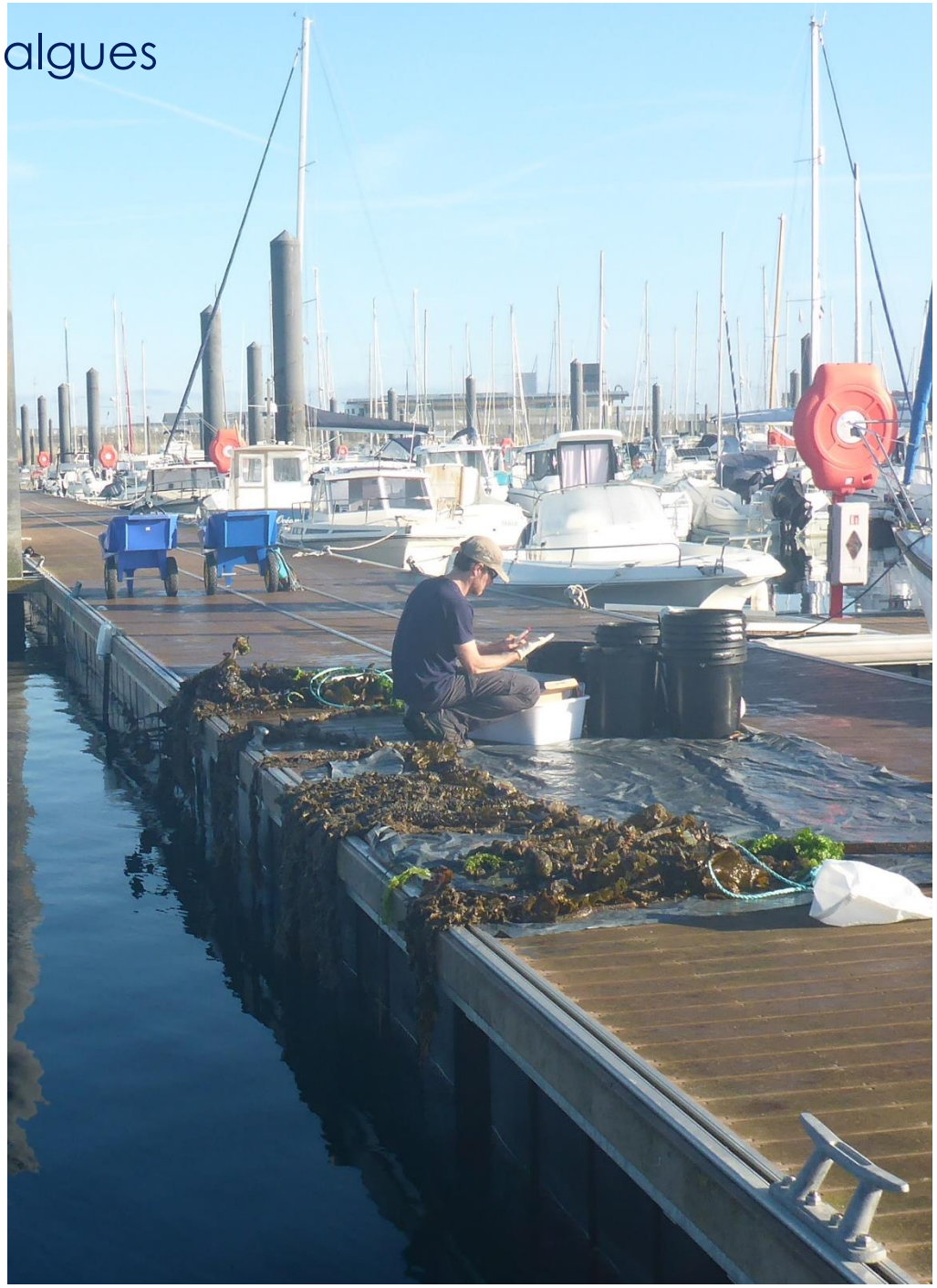




Volet 2 Performances et fonctions associées aux macroalgues



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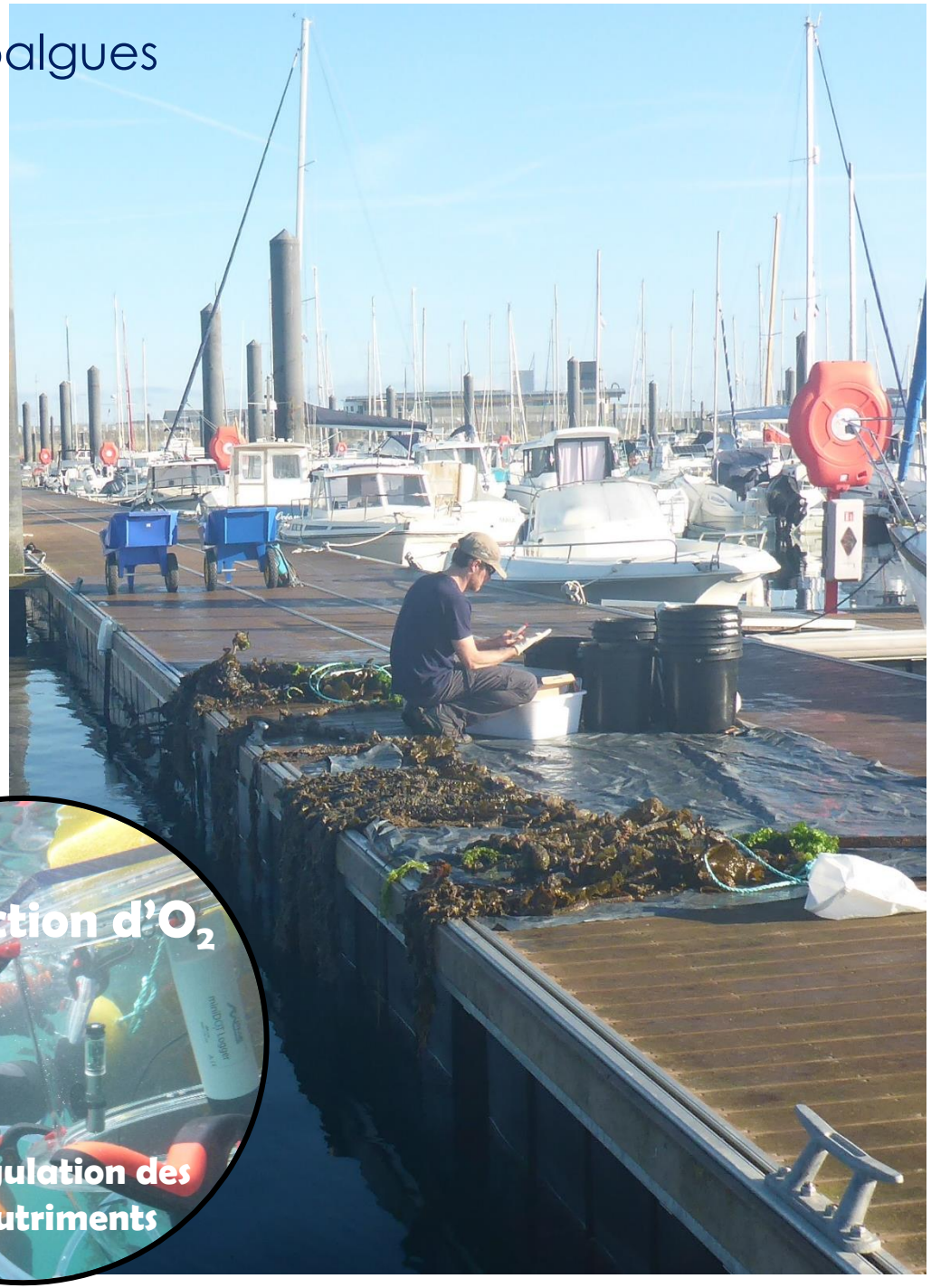
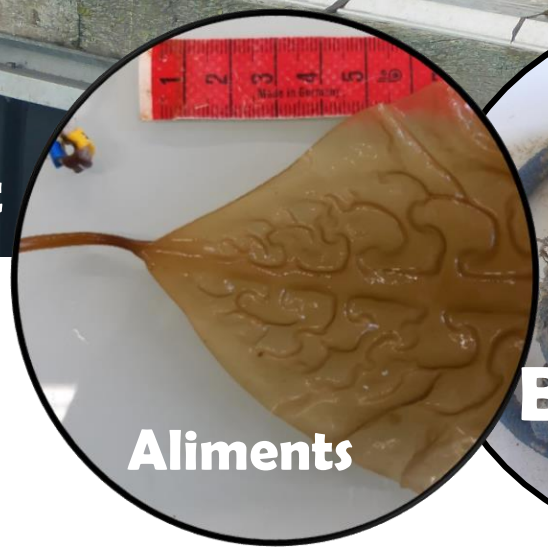
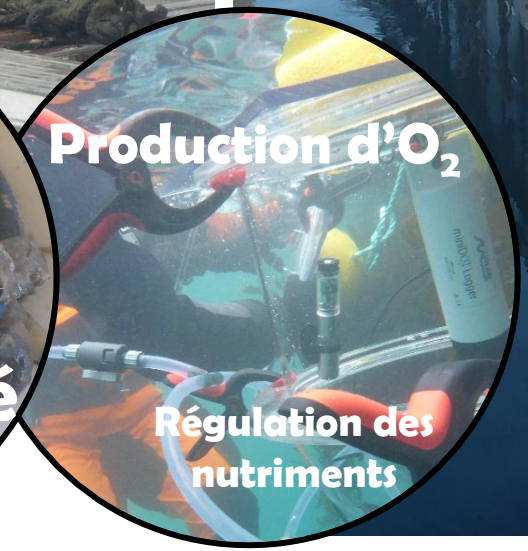




Habitat

Aliments

Biodiversité



Production d'O_2

Régulation des nutriments

Mersi Braz !

Maéva Gonzalez, Elea Gonthier, Tom Le Gall, Jean-Philippe Pezy, Aurore Raoux, Simon Dittami, François Thomas, Aurélien Baud, Dan Potin, Jean-François Arbona, Sarah Bureau, Gwenn Tanguy, Erwan Legeay, Noel Guidal, Eric Macé, Arnaud Perrey, Yann Fontana, Wilfried Thomas, Mathieu Camusat, Céline Houbin, Marine Moal, Caroline Broudin, Stéphane Loisel, Romain Crec'hriou, Laure Sevin, Claire Daguin-Thiébaut, Aline Migné, Jérome Coudret, Mathilde Charbonnelle, Clara Duval, Jean-Baptiste Valerdi, Ferdinand Schlicklin, Basile Robbe, Robin Van Paemelen, Marielle Guichoux, Suzie Humbert, Yuna Tauzia, Fabienne Rigaut-Jalabert, Céline Houbin, Dominique Davoult, Suzie Humbert, Cécile Massé, Philippe Potin, Karen Filbee-Dexter, Thomas Wernberg, Laurent Lévêque, Frédérique Viard, Eric Thiébaut



… mais aussi tou.te.s les gentil.le.s « maitre.sse.s » de ports !