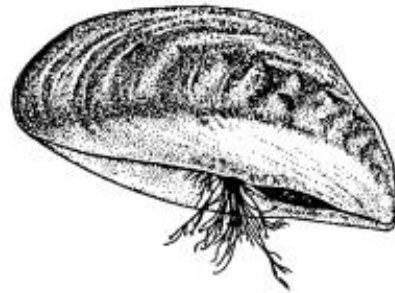

Towards a better understanding of the ecophysiology and impact of quagga mussels in Lake Geneva

Stéphan Jacquet

Jean-Nicolas Beisel, Viet Tran-Khac, Jonathan Grimond,
Leana Revirand, Erwin Reymondet, Jean-Philippe Jenny





The threats associated to invasive alien species (IAS) are a worldwide issue



It is a large-scale phenomenon, which is intensifying

It is often recognised as the 2nd cause of biodiversity loss

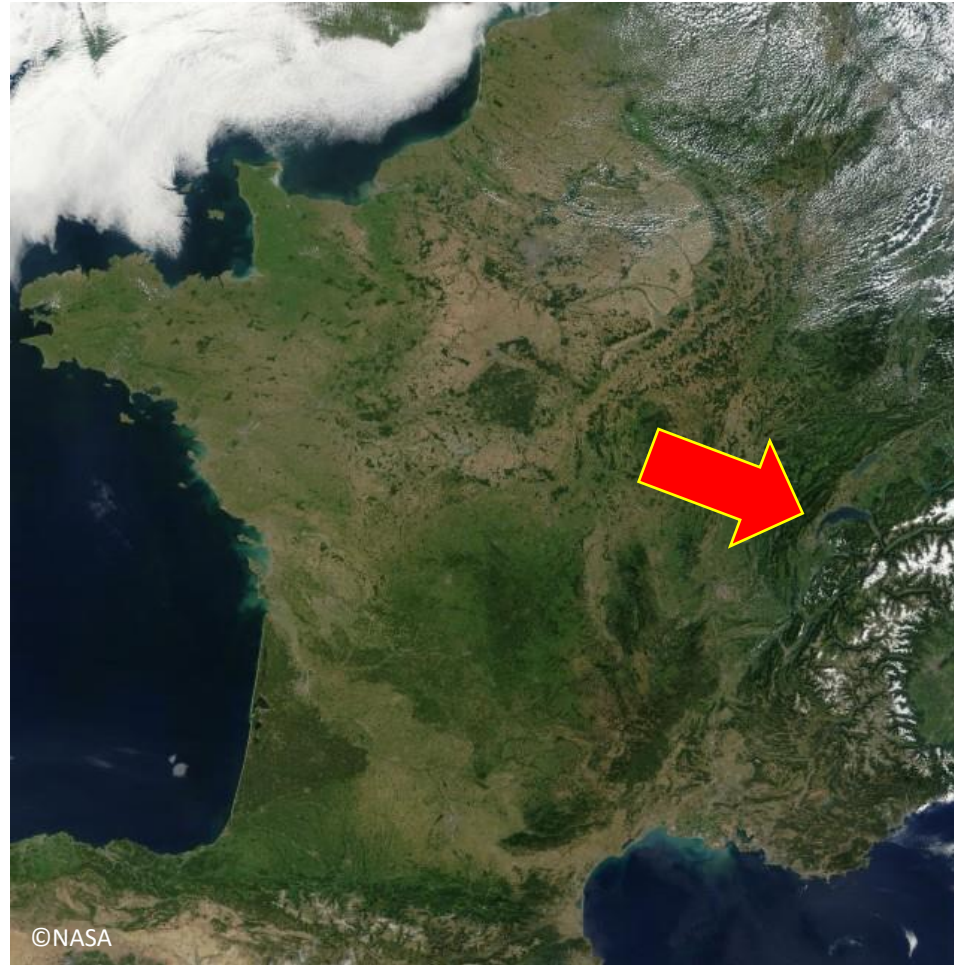
It can result in serious ecological and management problems

Economic impacts (costs) can be important

Etc...



Lake Geneva makes no exception and have welcomed a variety of alien species,
invasive or not

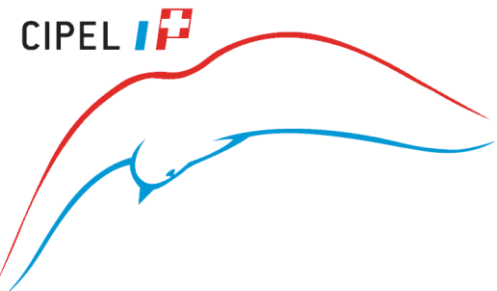


$S = 580 \text{ Km}^2$

$L_{\text{max}} = 72,3 \text{ km}$

$D_{\text{max}} = 309 \text{ m}$

$V = 89 \text{ km}^3$



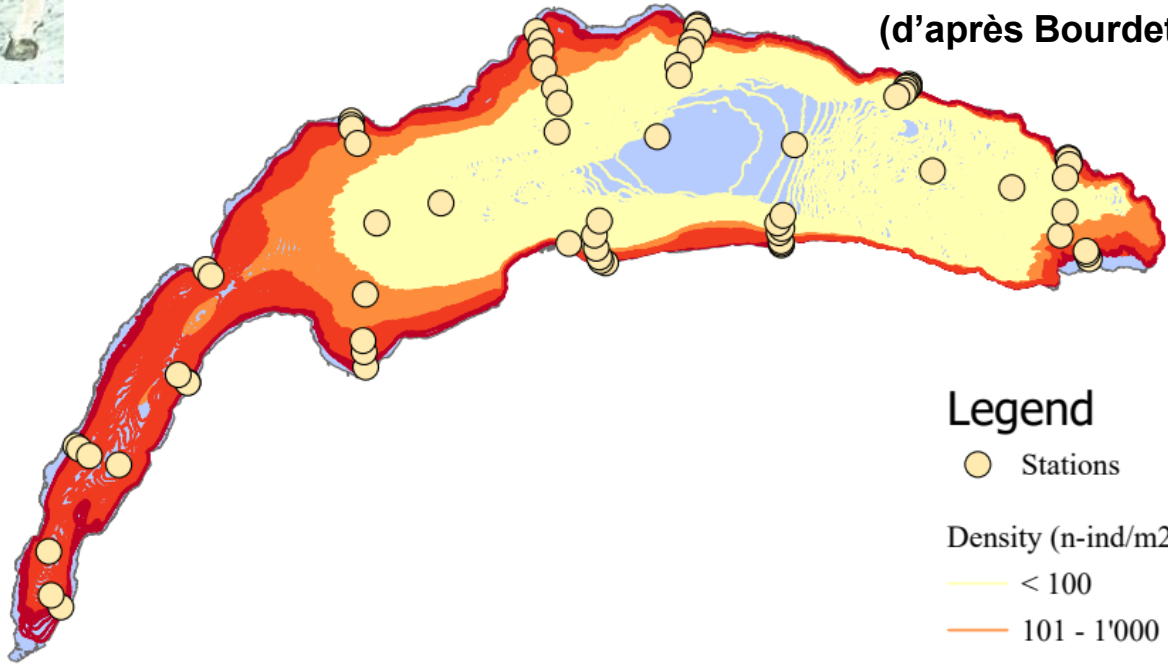
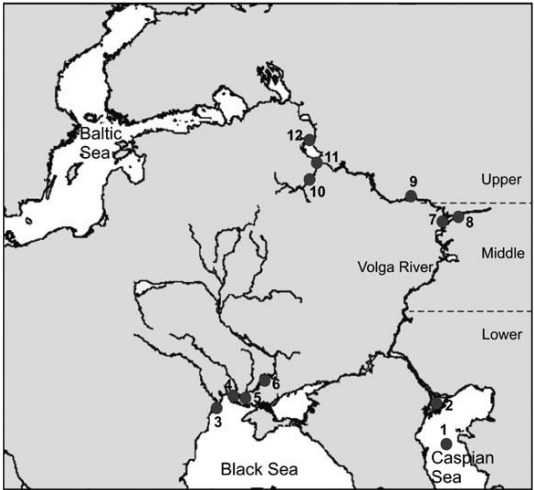
The last major IAS that has colonized the entire lake is the quagga mussel



2015

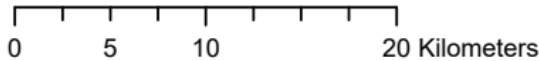


2022
(d'après Bourdet)



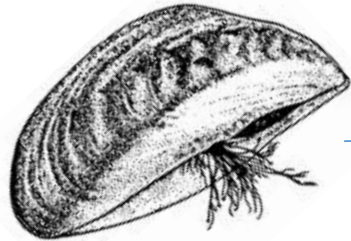
Legend

- Stations
- Density (n-ind/m2)
 - < 100
 - 101 - 1'000
 - 1'001 - 10'000
 - > 10'000





**High
biomass**



**Important
filtration activity**



This small mollusk (can) have major impacts in biodiversity and lake functioning

increases water clarity

allows for deeper and stronger light penetration

leads to more stable and longer thermal stratification of water?

leads to a decrease in the amount of oxygen on the bottom

induces a release of phosphorus from the sediment

increases the risk of algal blooms?

Cannibalizes some of the energy and food needed by the pelagic food web

Negatively affects whitefish production?

Causes millions of dollars/euros in damage to water supply systems and clogs their pipes



Hence, we are conducting different research programs on this aggressive bivalve



What is the (evolution of) quantitative importance and distribution of the animal ?

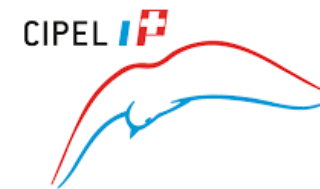
What are the in situ growth rates and 3D evolution of mussel aggregates?

What is its filtration capacity?



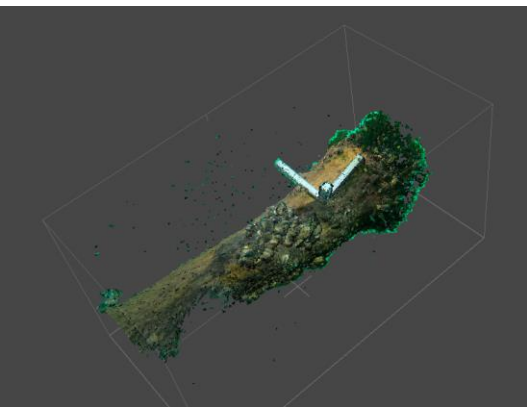
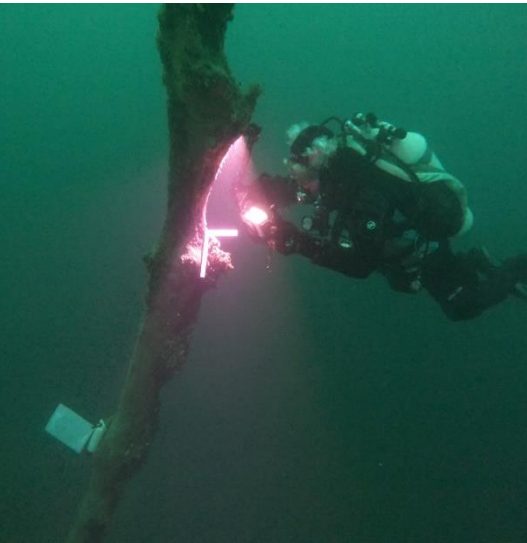
What are the impacts (on biodiversity, biogeochemical aspects, or ecological functioning)?

INRAE



anr

Focus 1 : Measuring in situ growth rates



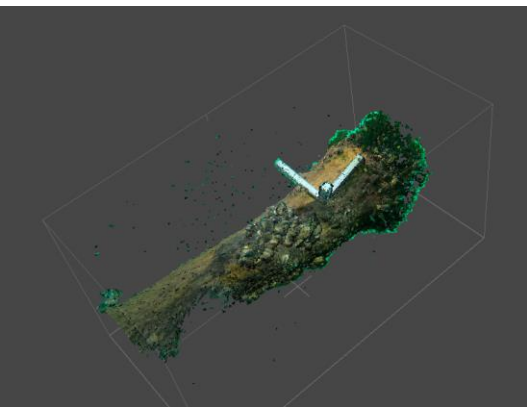
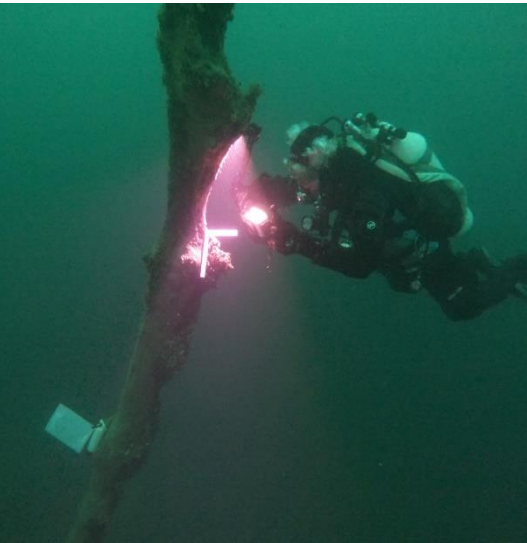
aggregates with a variety of individual size

Natural vs artificial support

different environmental conditions



Focus 1 : Measuring in situ growth rates

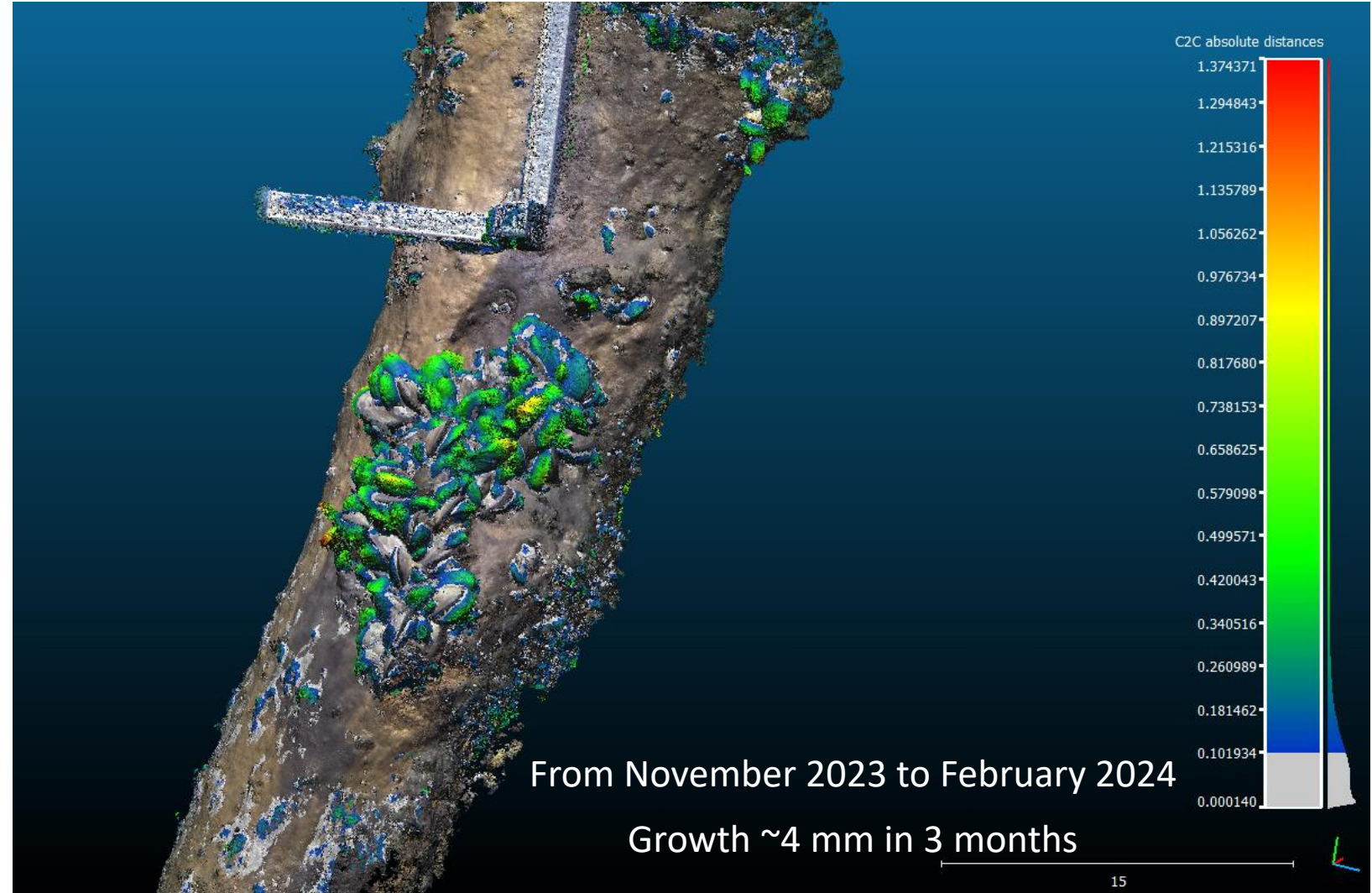
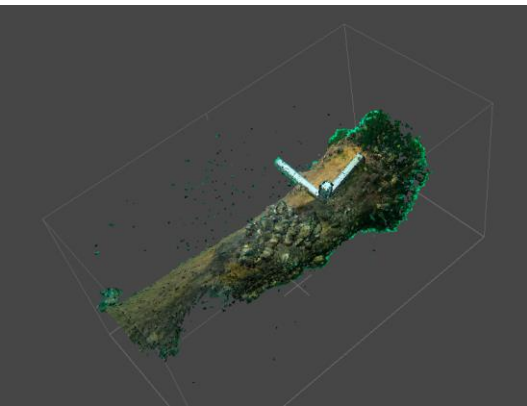


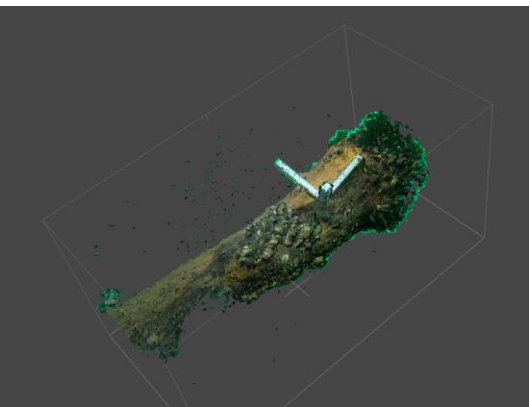
MetaShape (Model construction - Structure from motion generation)

MeshLab (Scaling and Filtering)

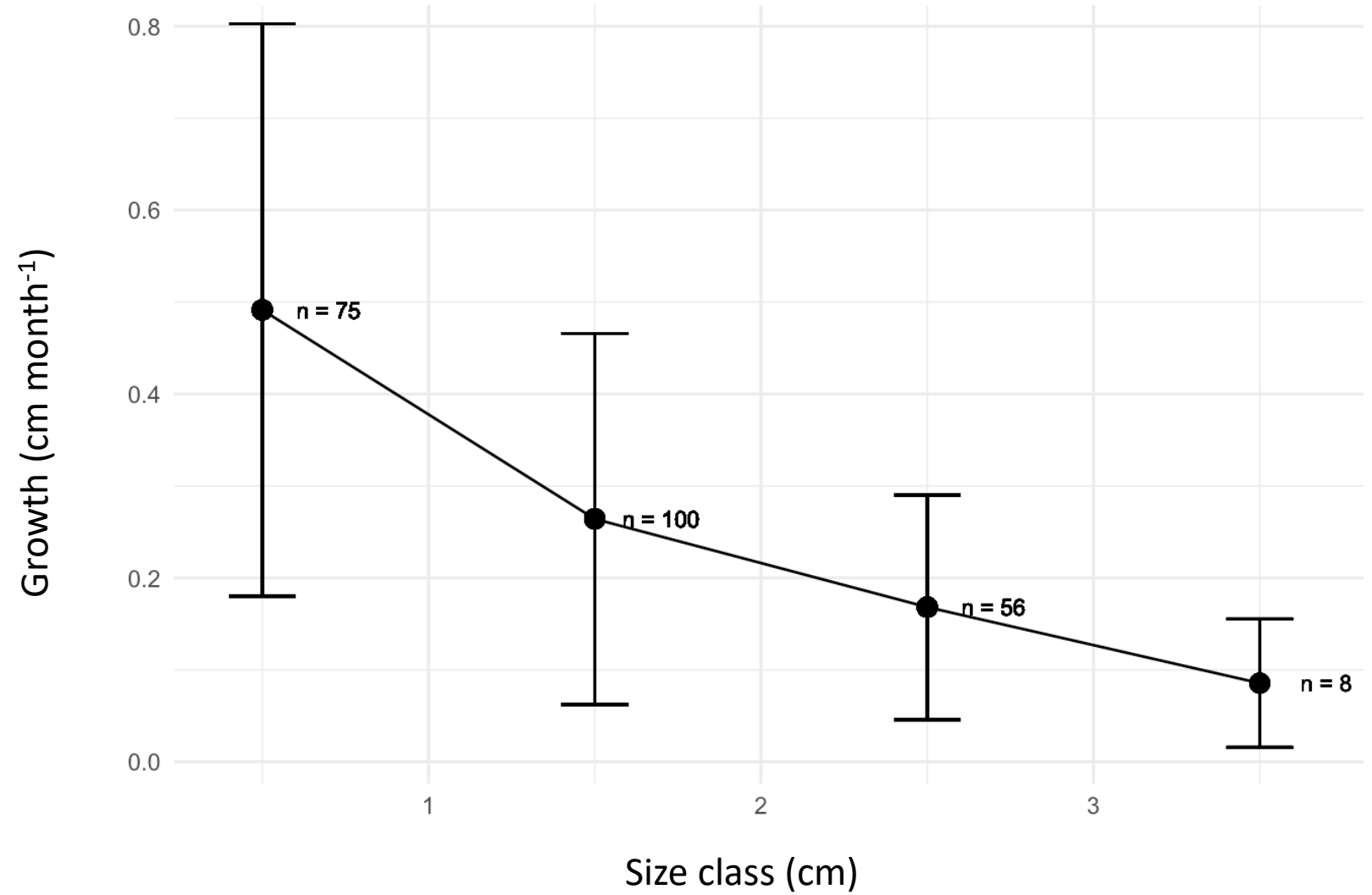
CloudCompare (Object measurement and comparison)

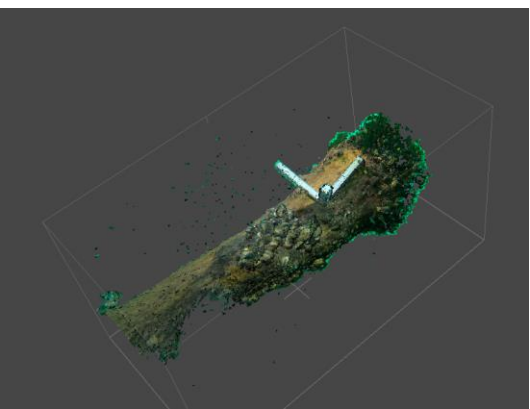
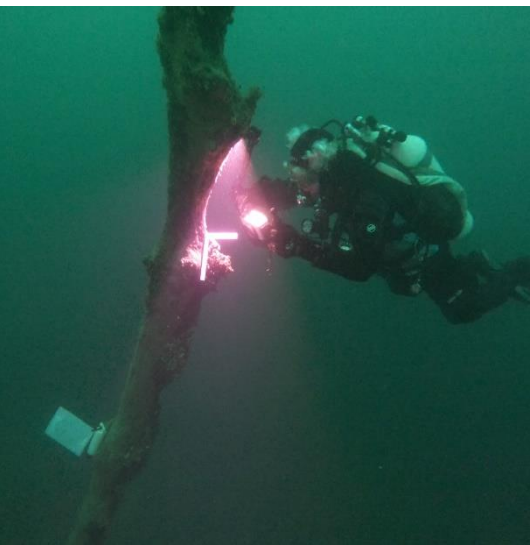
Focus 1 : Measuring in situ growth rates





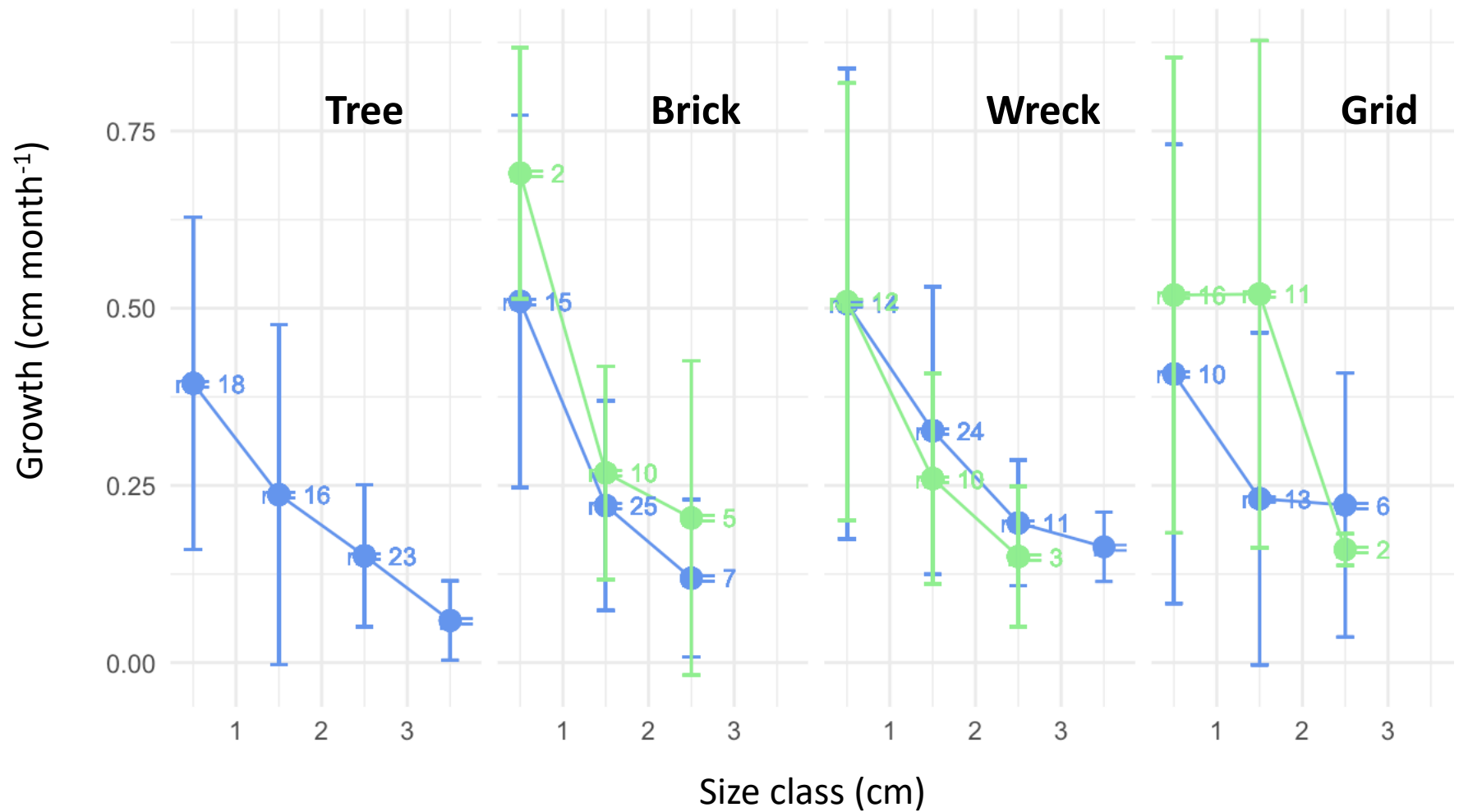
Focus 1 : Measuring in situ growth rates



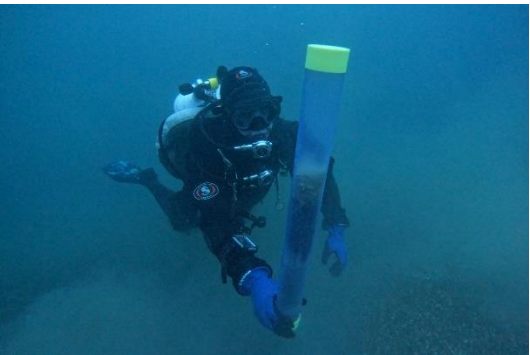
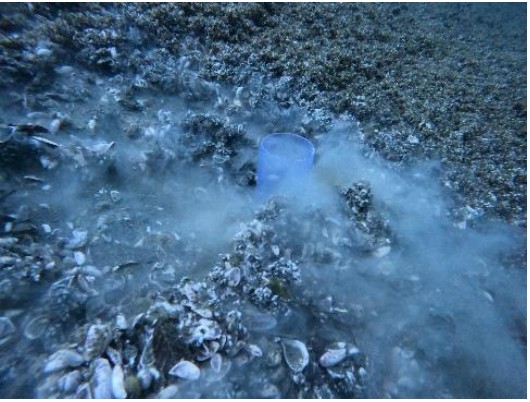


Focus 1 : Measuring in situ growth rates

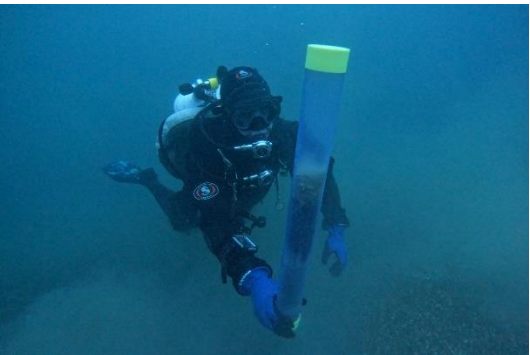
- Winter
- Spring



Focus 2 : Assessing some biogeochemical impacts



Focus 2 : Assessing some biogeochemical impacts

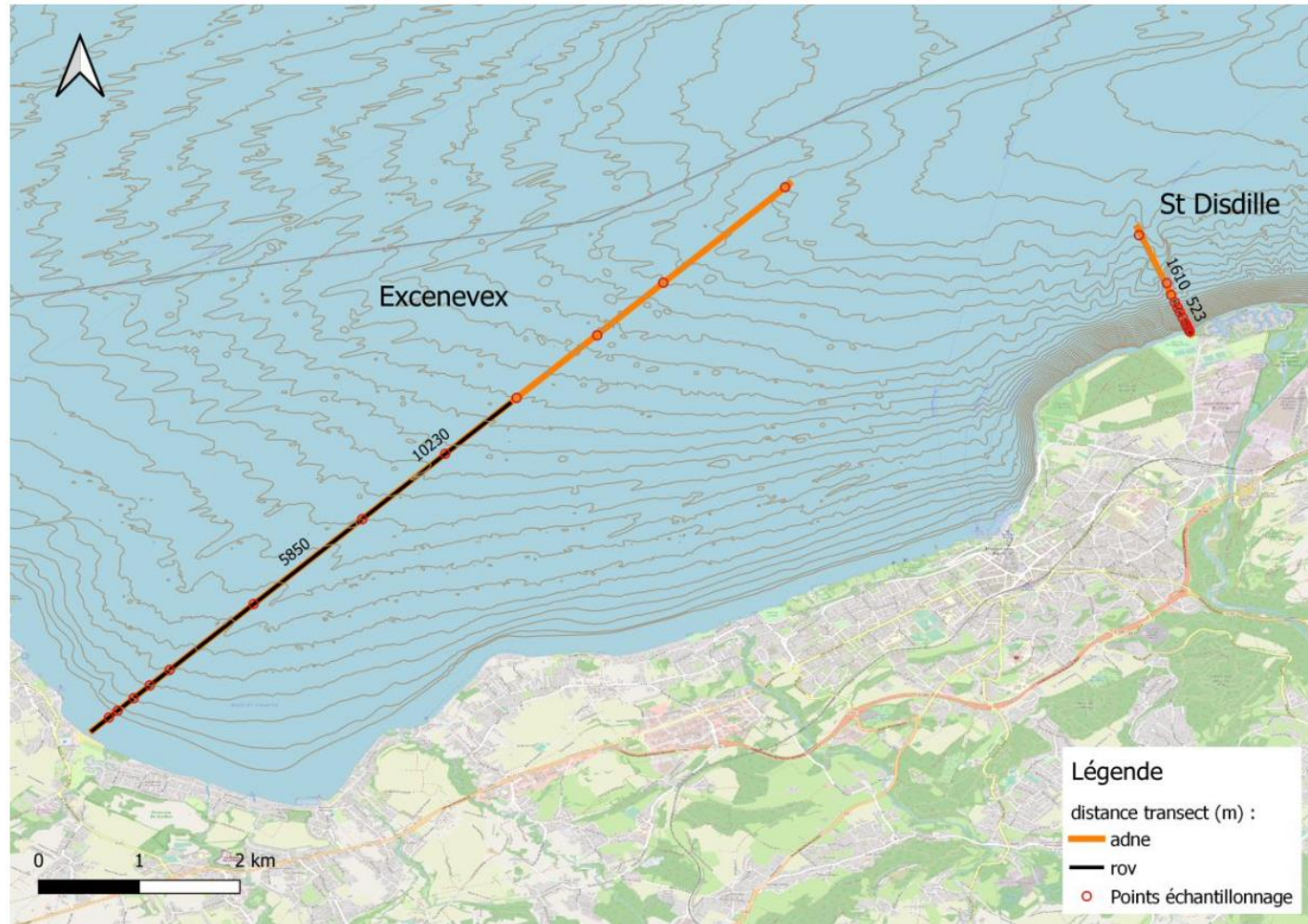
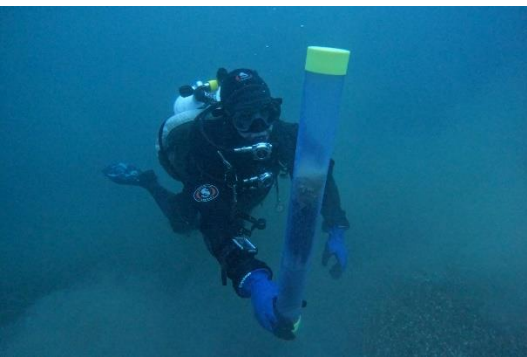
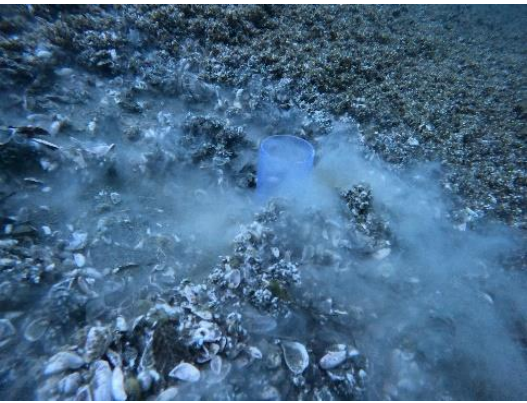


What is the impact of quagga on oxygen concentration at the sediment-water interface?

What is the "influence" of quagga in sediment carbon sequestration?

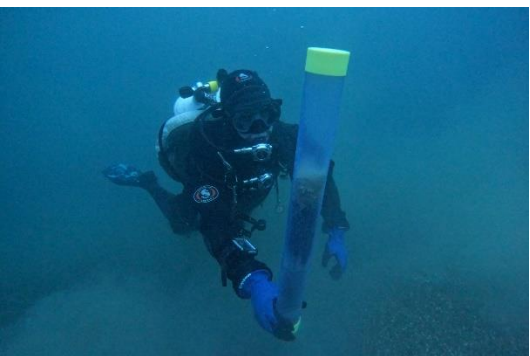
What amounts of C, N and P are found in dead shells and in the sediment matrix to estimate the rate of formation of elemental stocks and benthification processes?

Focus 2 : Assessing some biogeochemical impacts

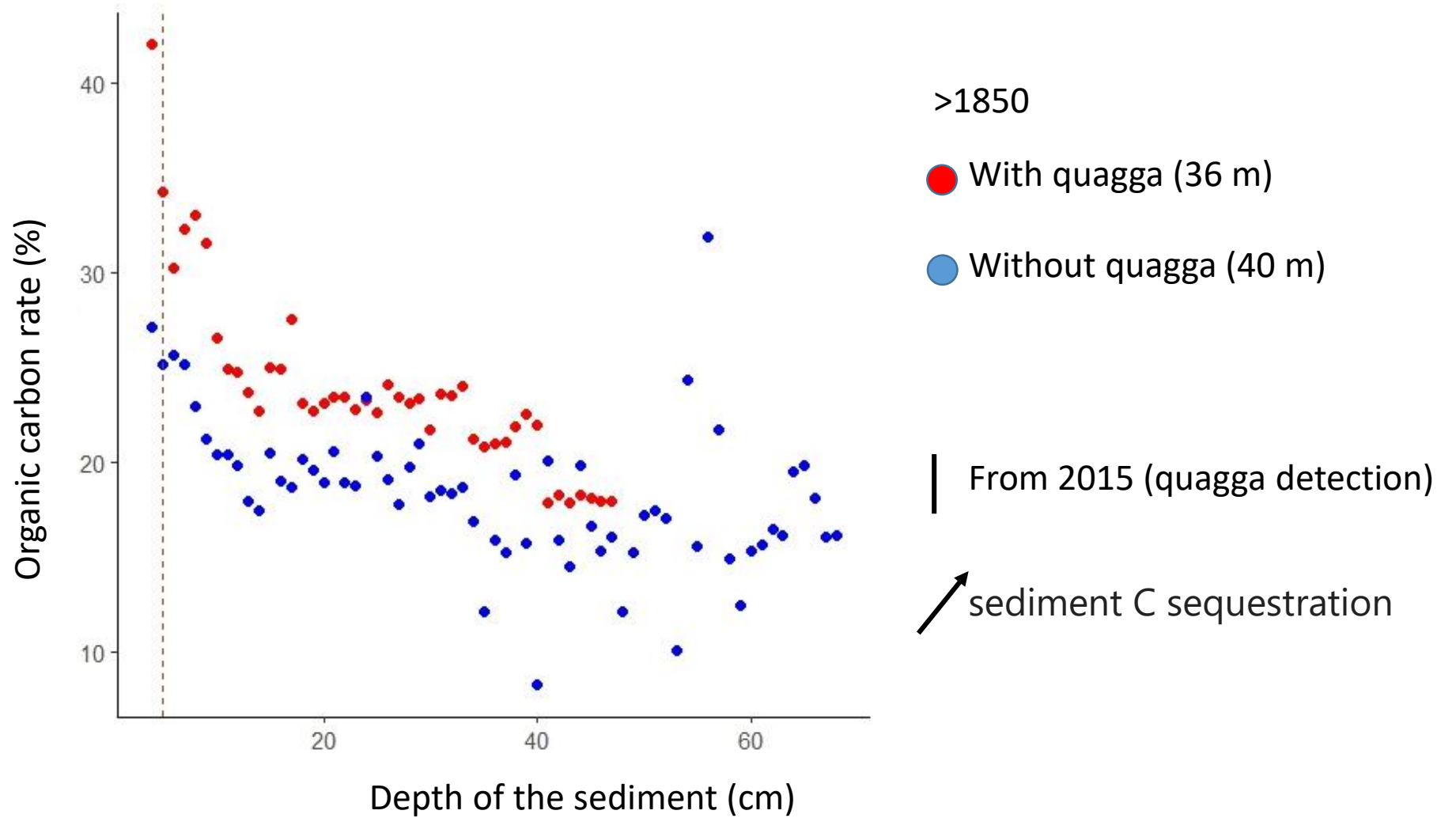


14-15 February 2024 :

- 25 cores St Disdille
- 17 cores Excenevex



Focus 2 : Assessing some biogeochemical impacts



Higher C sink

Modifications of decomposition and/or mineralisation processes & nutrient recycling

Impact on biological productivity and water quality



Thank you for your attention

