Effect of a rubble ecotop on steel slag reinforced dikes

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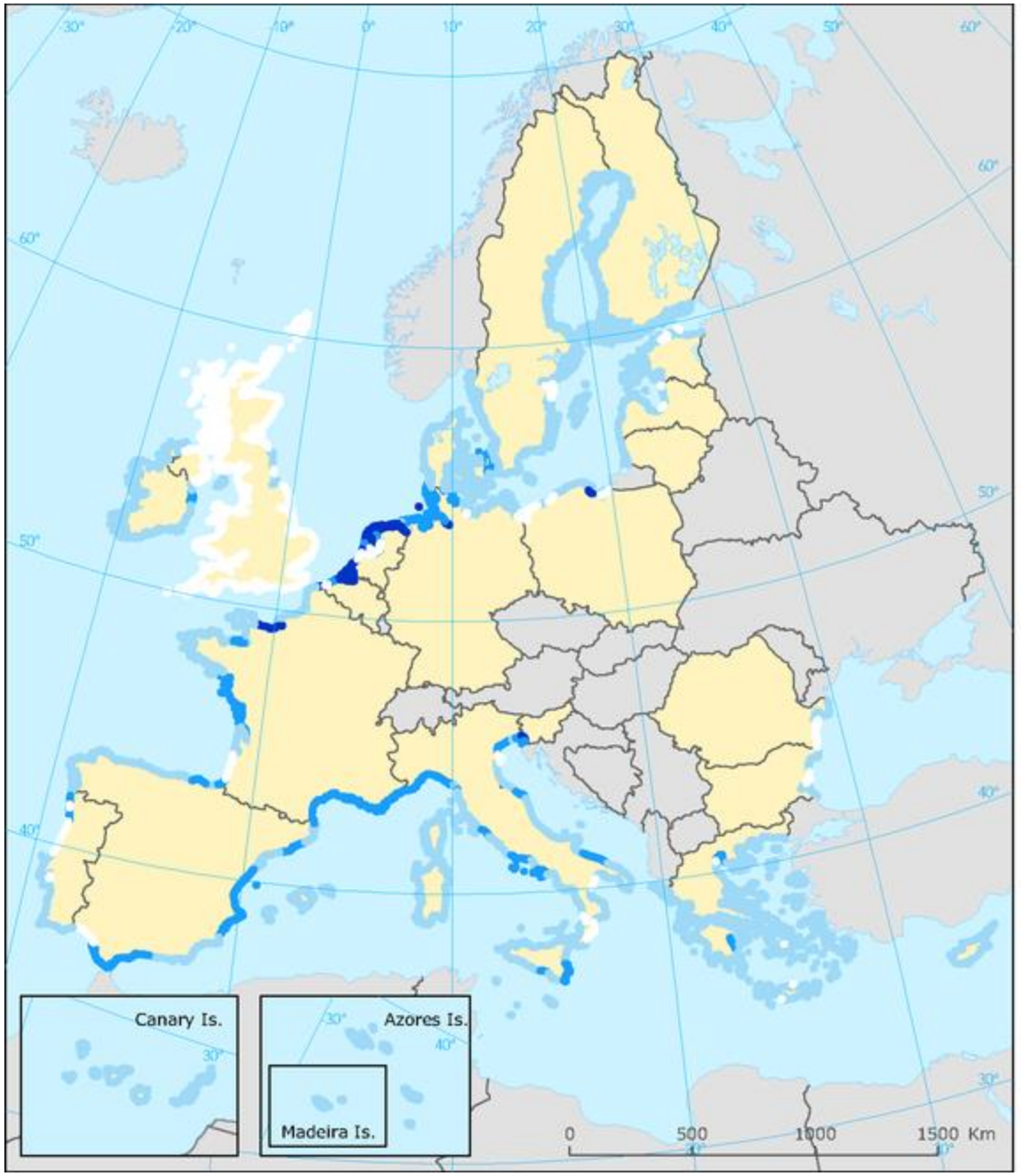
Nina
COASTAL AND MARINE MANAGEMENT
Laila
WATER MANAGEMENT

The underwater lab

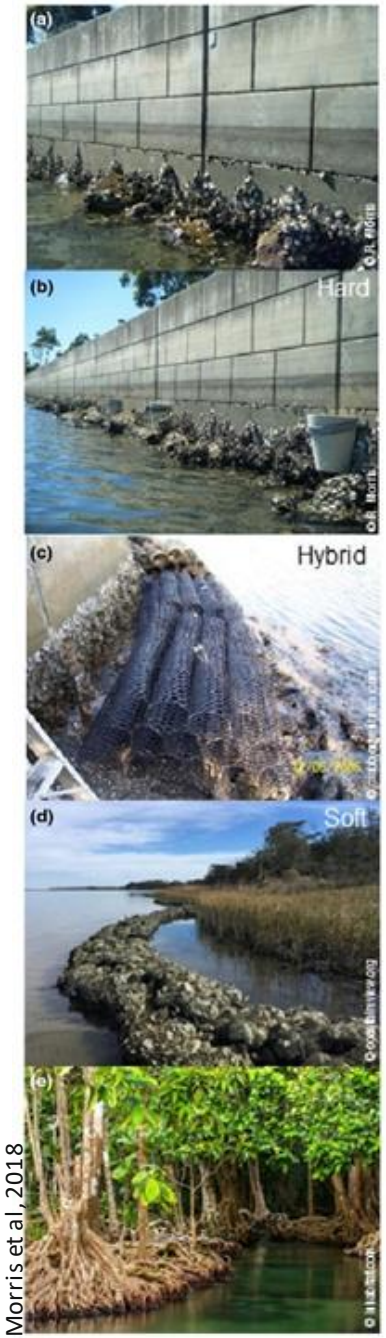
Investigating whether the subtidal application of a rubble ecotop on a dike reinforced with steel slag is an effective way of meeting habitat targets

https://www.eea.europa.eu/data-and-maps/figures/percentage-of-artificial-coastline-length-by-nuts3-regions-2004/map-12-final-coastal-areas.eps/image_large



Problem

- Ocean sprawl
- Eco-engineering solutions on hard constructions
- Need of more information about the subtidal area



Morris et al, 2018

GREY INFRASTRUCTURE

Hard solutions, e.g.

- seawalls
- dikes
- breakwaters

HYBRID INFRASTRUCTURE

Combination of grey and green infrastructure, e.g.

- seawall with salt marshes in front

ENVIRONMENT-FRIENDLY GREY INFRASTRUCTURE

Ecologically enhanced hard solutions, e.g.

- vegetated revetments
- use of natural materials

SOFT INFRASTRUCTURE

Soft solutions, e.g.

- shore nourishments
- ecosystem engineering (salt marshes, mangrove forests, dunes, etc.)

GREEN / NATURE-BASED INFRASTRUCTURE

Schoonees et al. 2019

On the way to green infrastructure

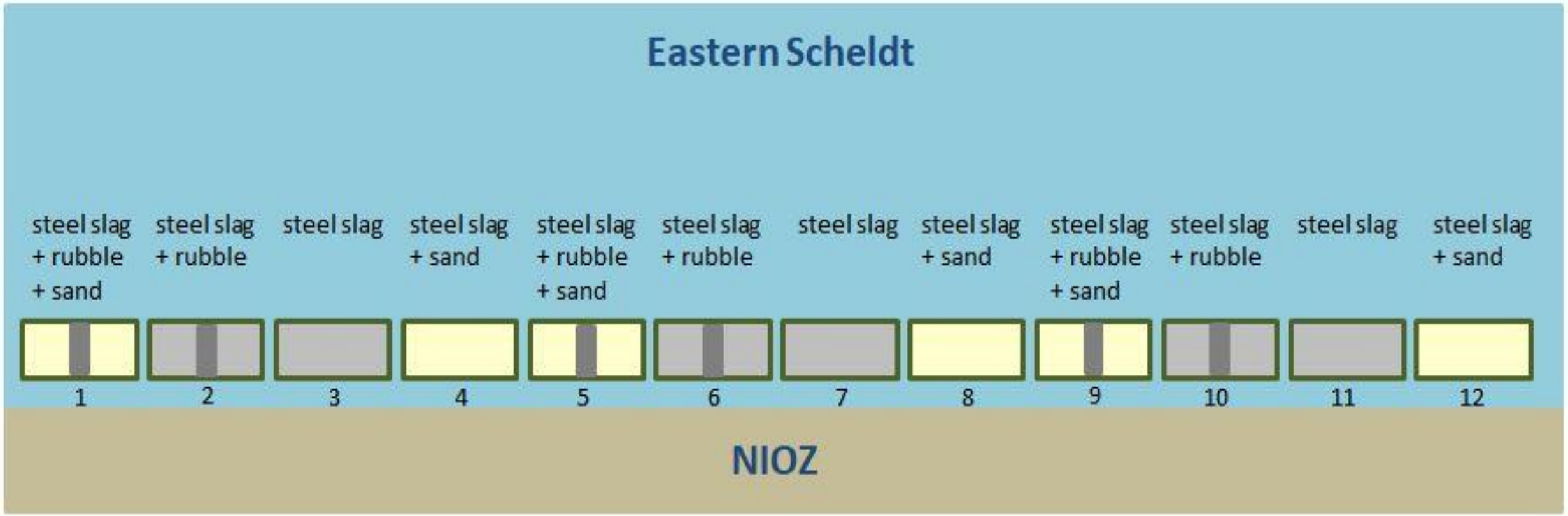
Research question

TO WHAT EXTEND DO DIFFERENT ECOLOGICALLY ENHANCED HARD SOLUTIONS EFFECT THE SUBTIDAL BENTHIC FAUNA ON STEEL SLAG REINFORCED DIKES IN THE EASTERN SCHELDT?

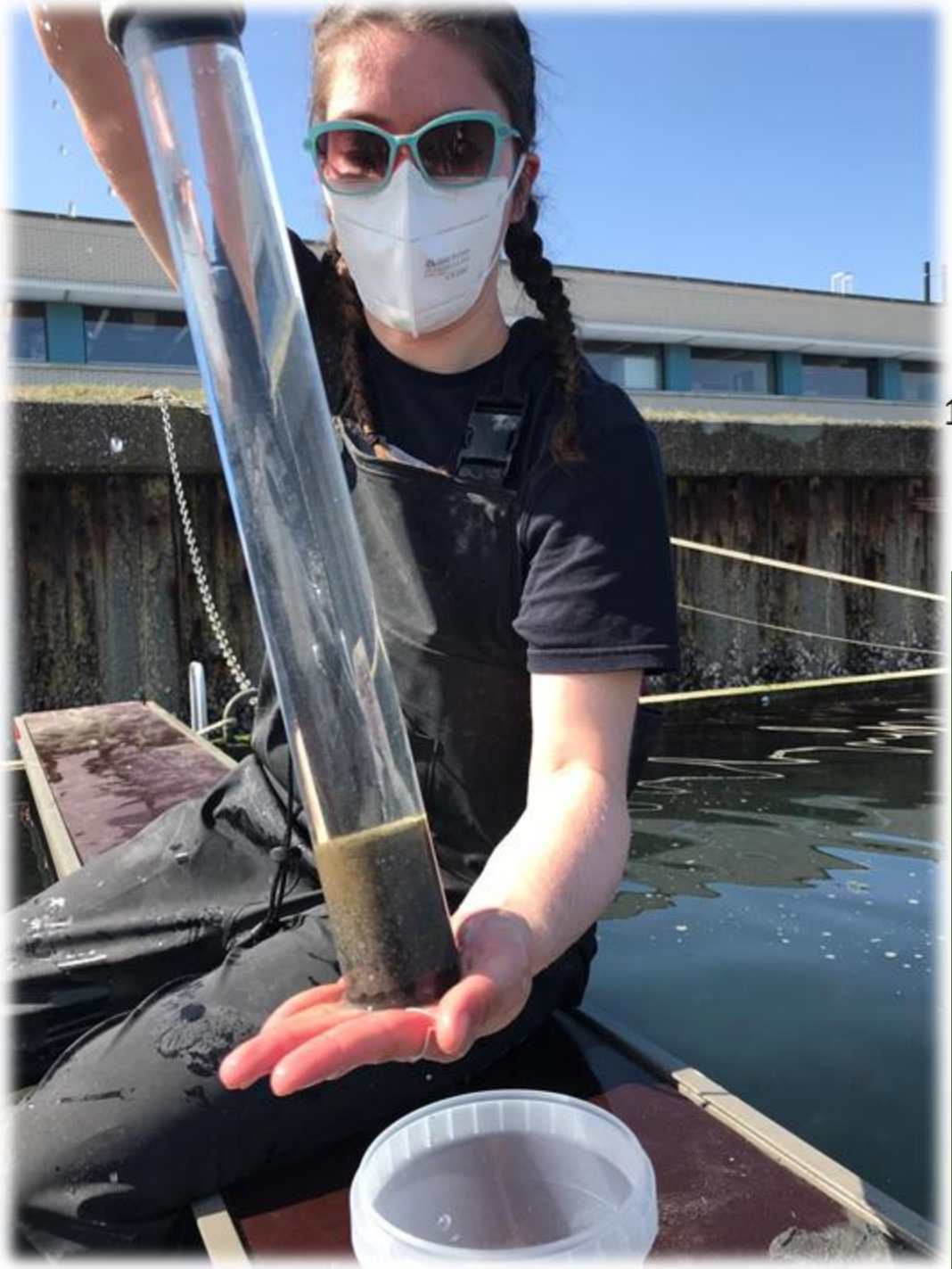
Eastern Scheldt

NATURA 2000

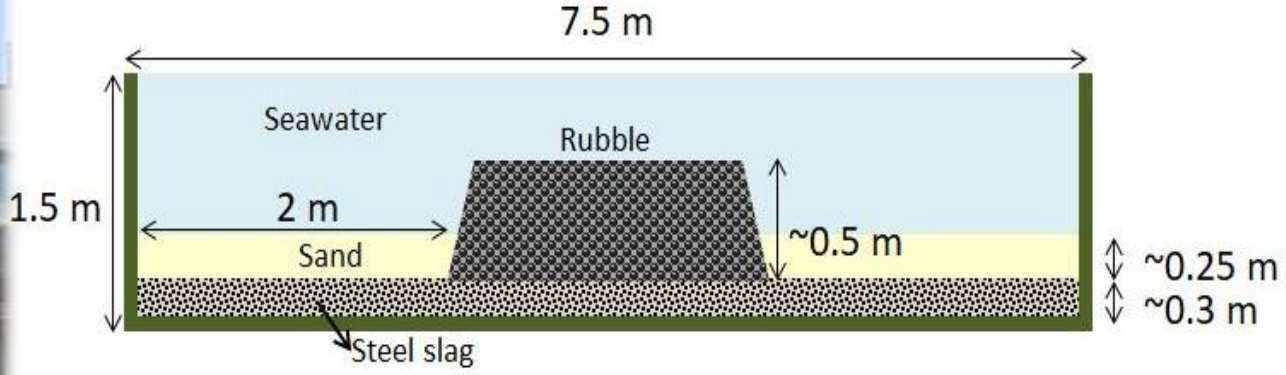
The experimental set up

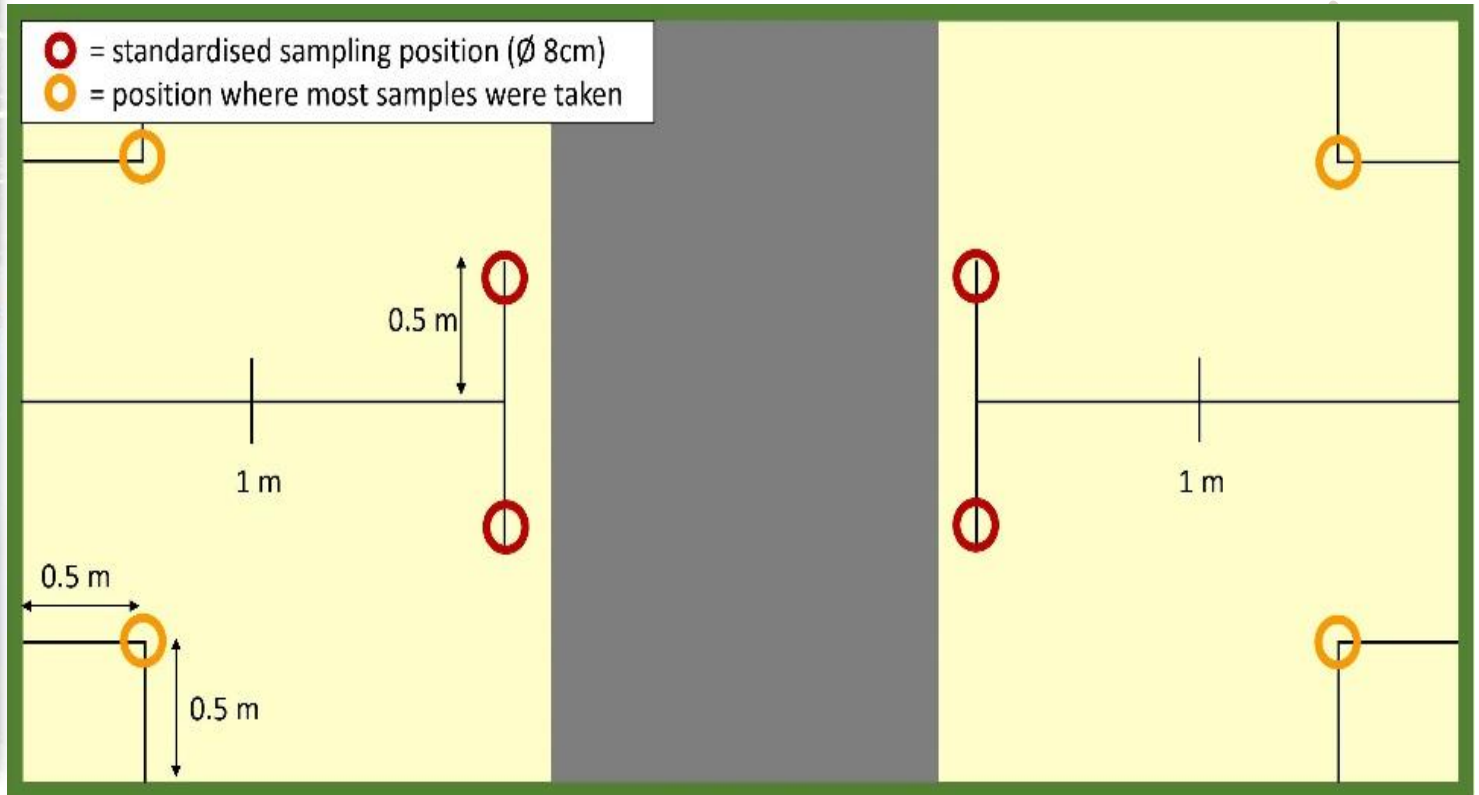


Sediment sampling

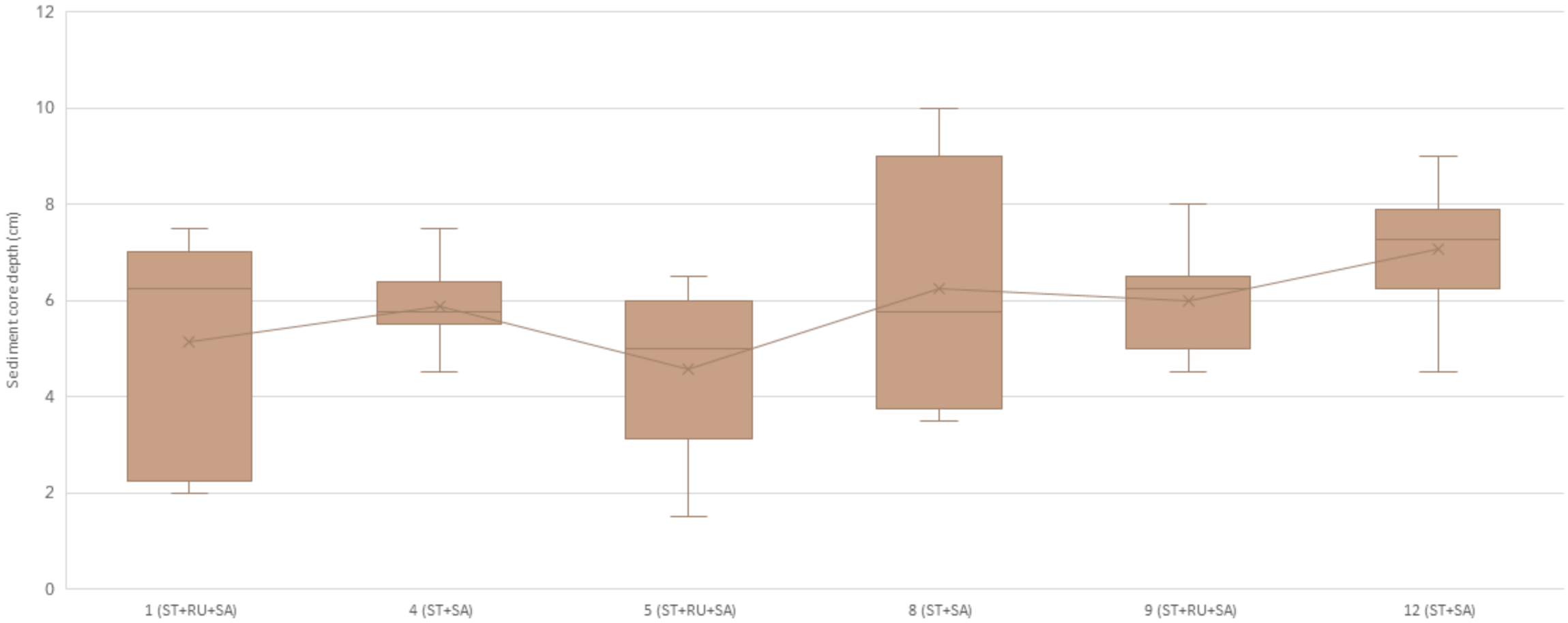


Sampling

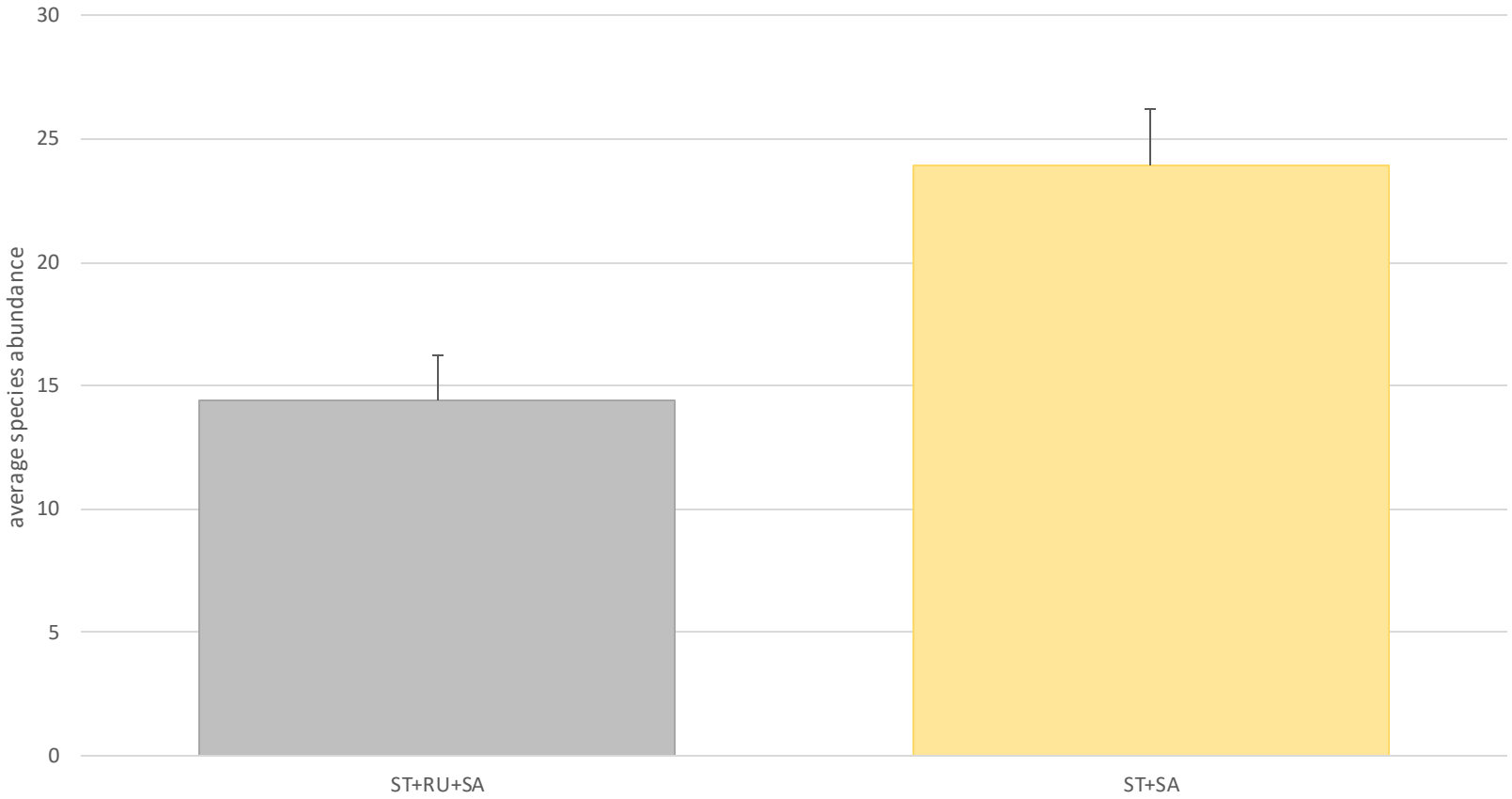

7.5 m
Seawater
Rubble
1.5 m
2 m
~0.5 m
Sand
~0.25 m
~0.3 m
Steel slag


= standardised sampling position (Ø 8cm)
= position where most samples were taken
0.5 m
1 m
1 m
0.5 m
0.5 m

Sample processing

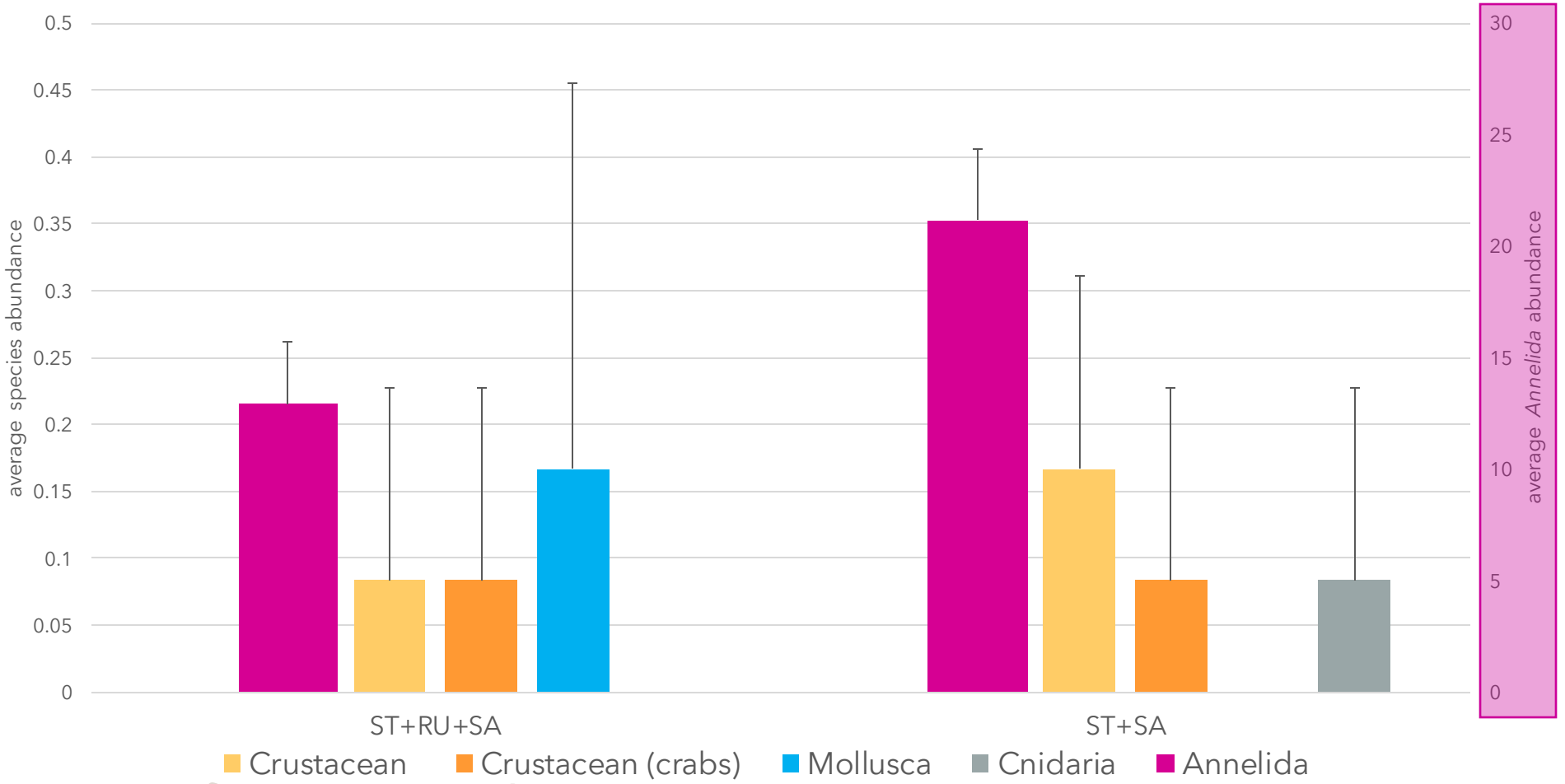


Sediment core depth



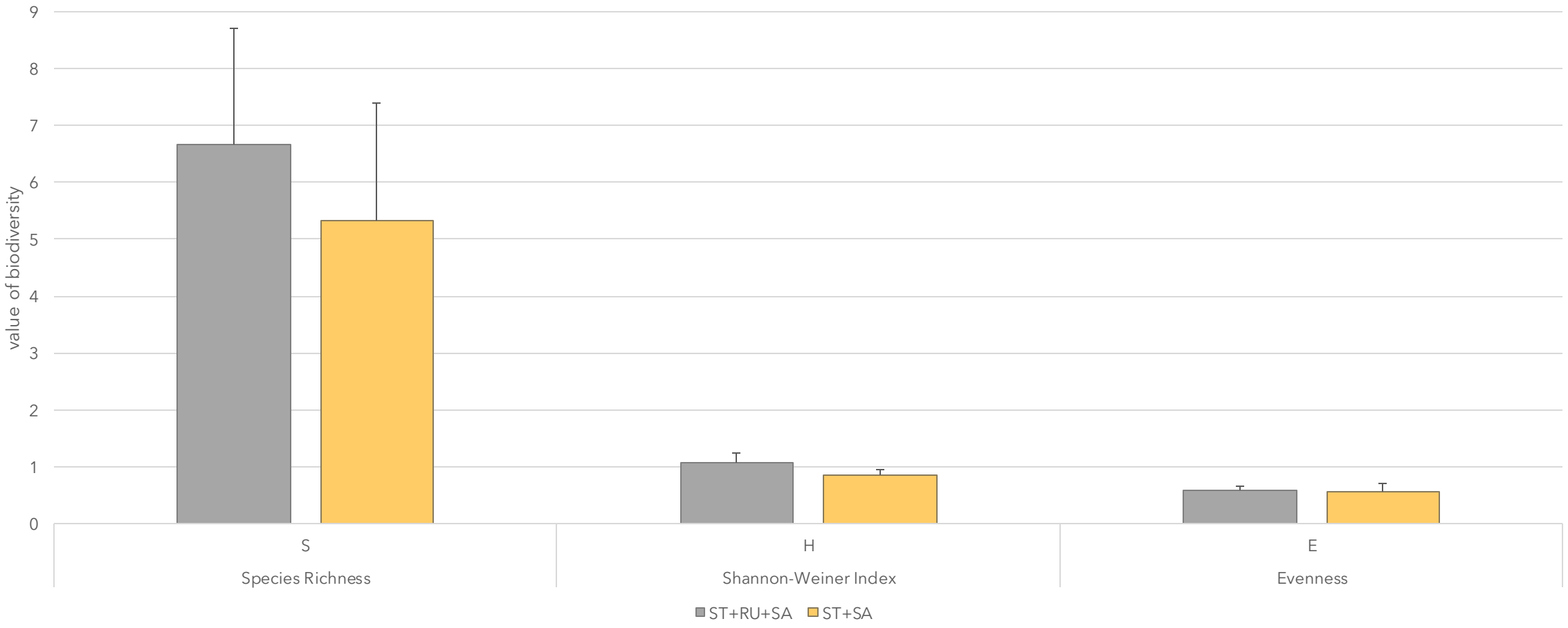
Average species abundance

PER TREATMENT

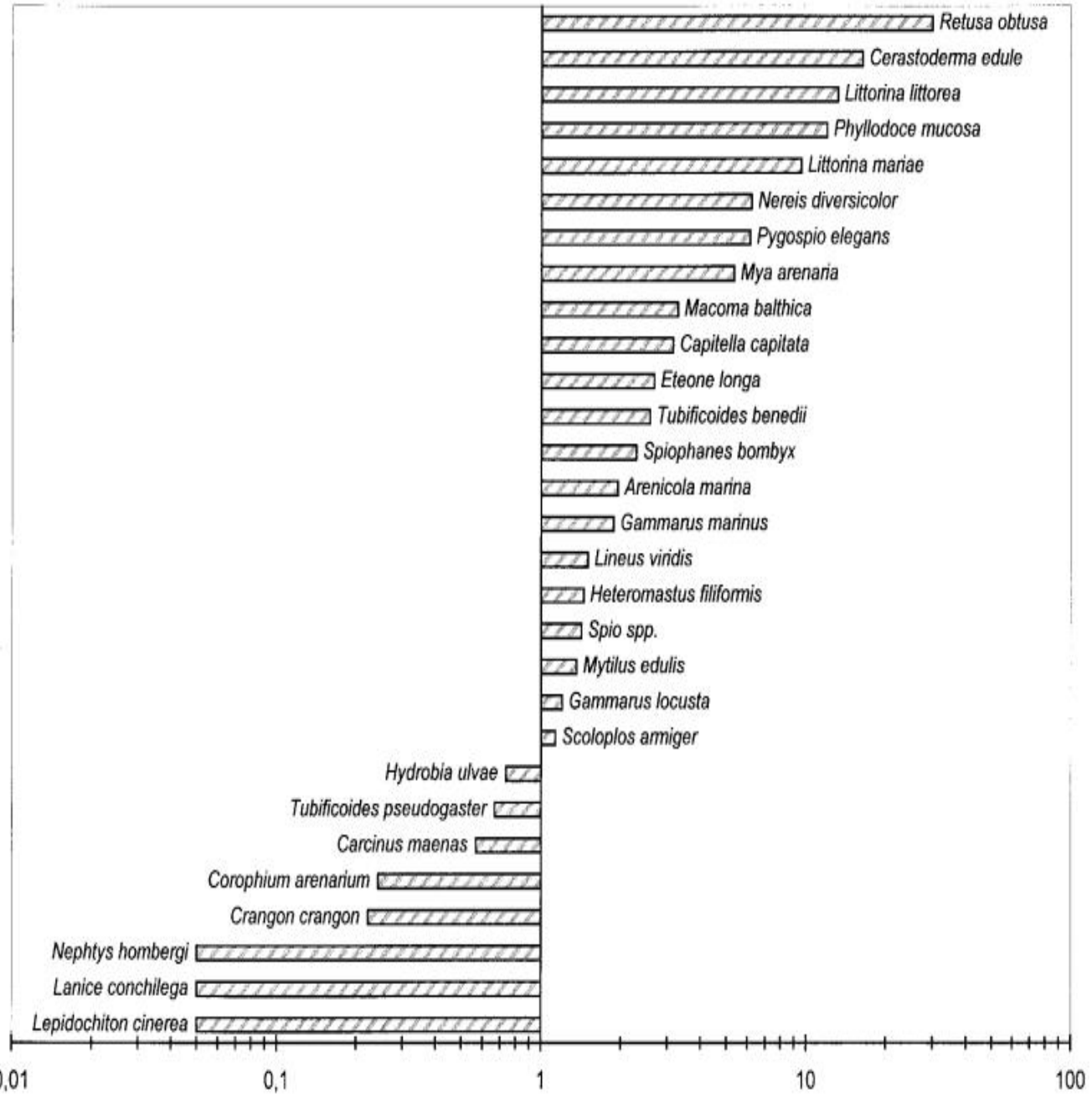


Average abundance of species groups

ANNELIDA ARE SHOWN ON SECONDARY Y-AXIS



Biodiversity measures



Discussion & Conclusion

- POLYCHAETA AND ENVIRONMENTAL HEALTH
- NON-NATIVE SPECIES
- SAMPLING
  SEDIMENT DEPTH & TIME OF SAMPLING

RUBBLE ECOTOP

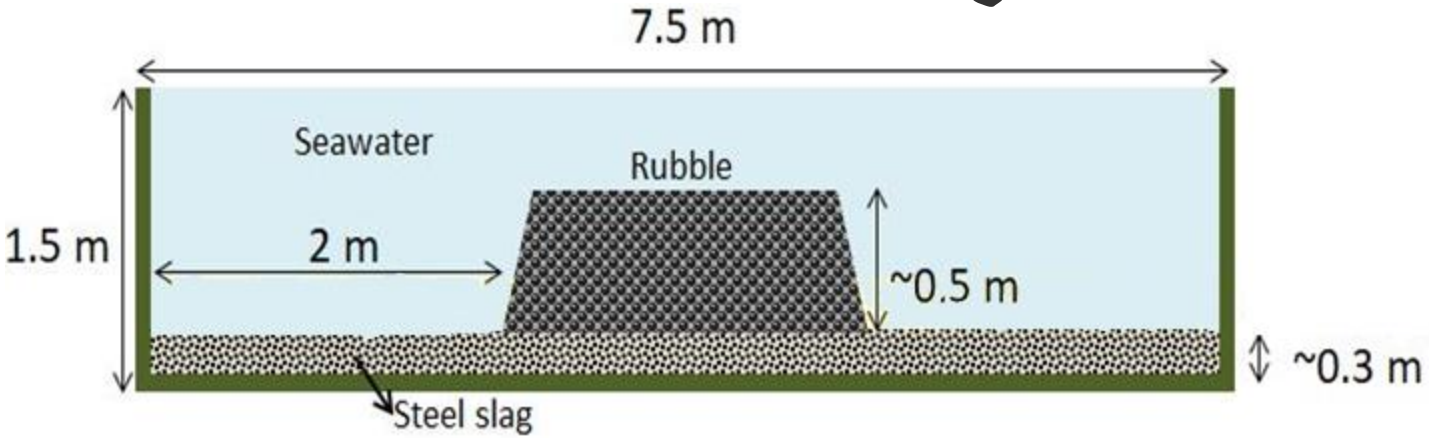
+ BIODIVERSITY

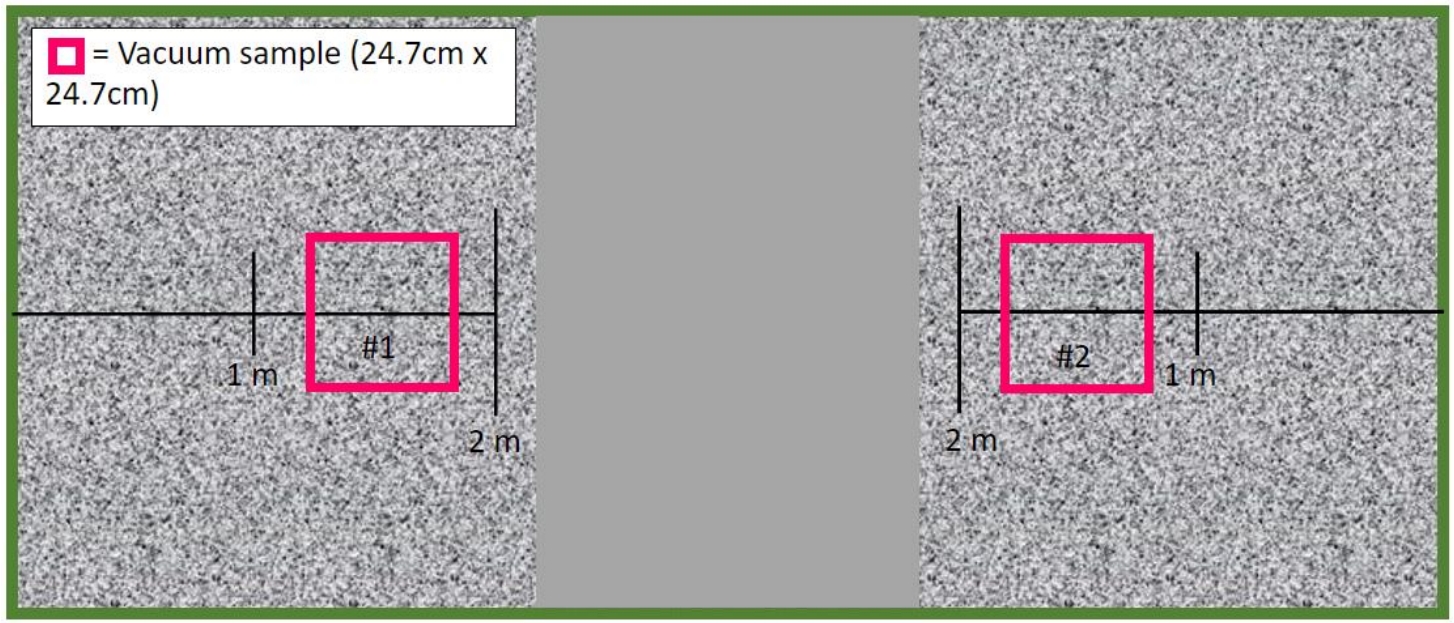
- SPECIES ABUNDANCE

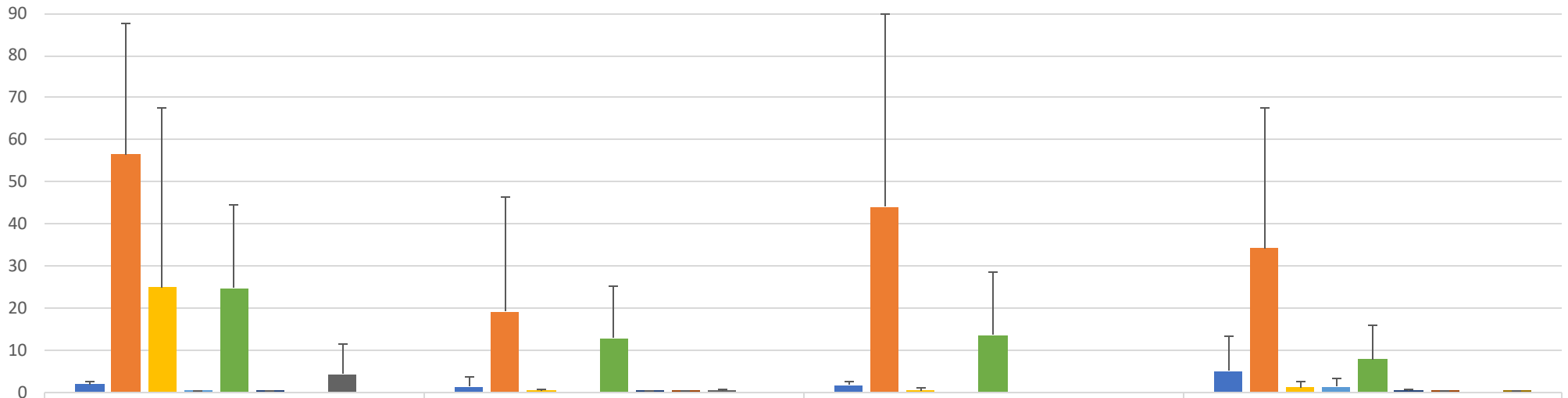
Steel slag sampling

Sampling


MARINE SYSTEMS


7.5 m
Seawater
Rubble
1.5 m
2 m
~0.5 m
~0.3 m
Steel slag

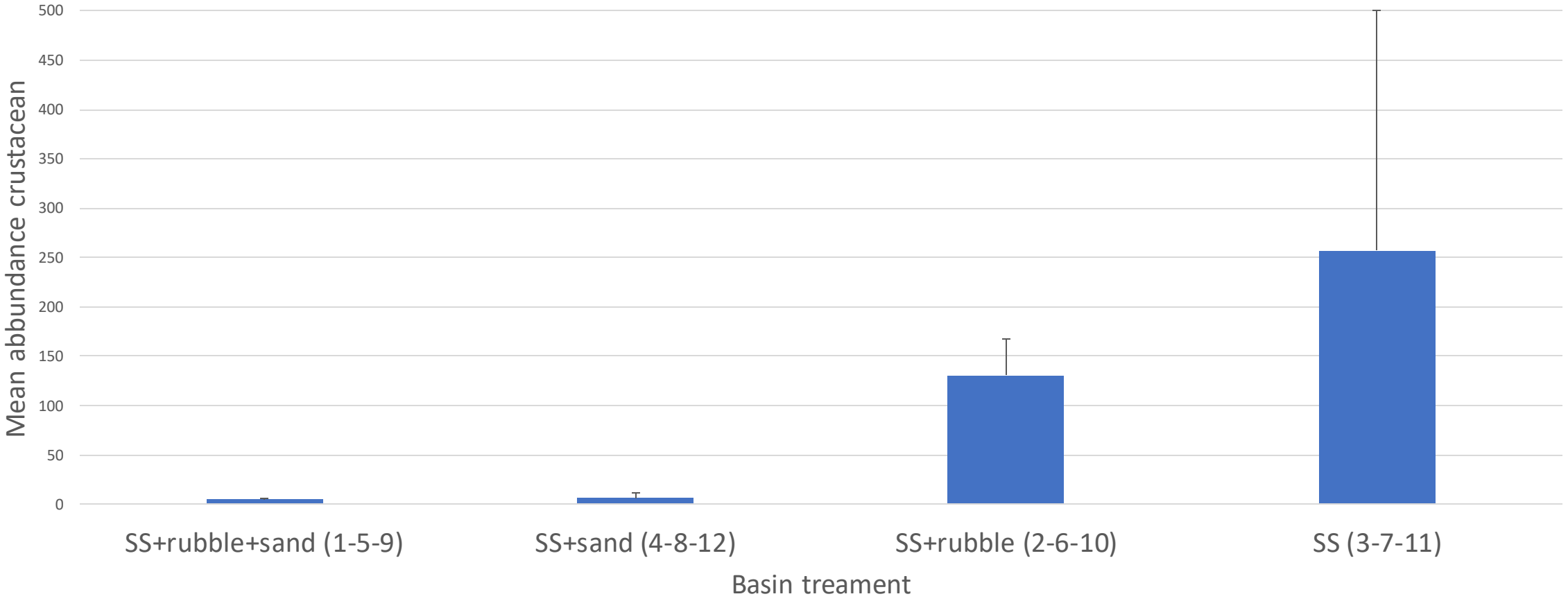

= Vacuum sample (24.7cm x 24.7cm)
#1
1 m
2 m
#2
1 m
2 m

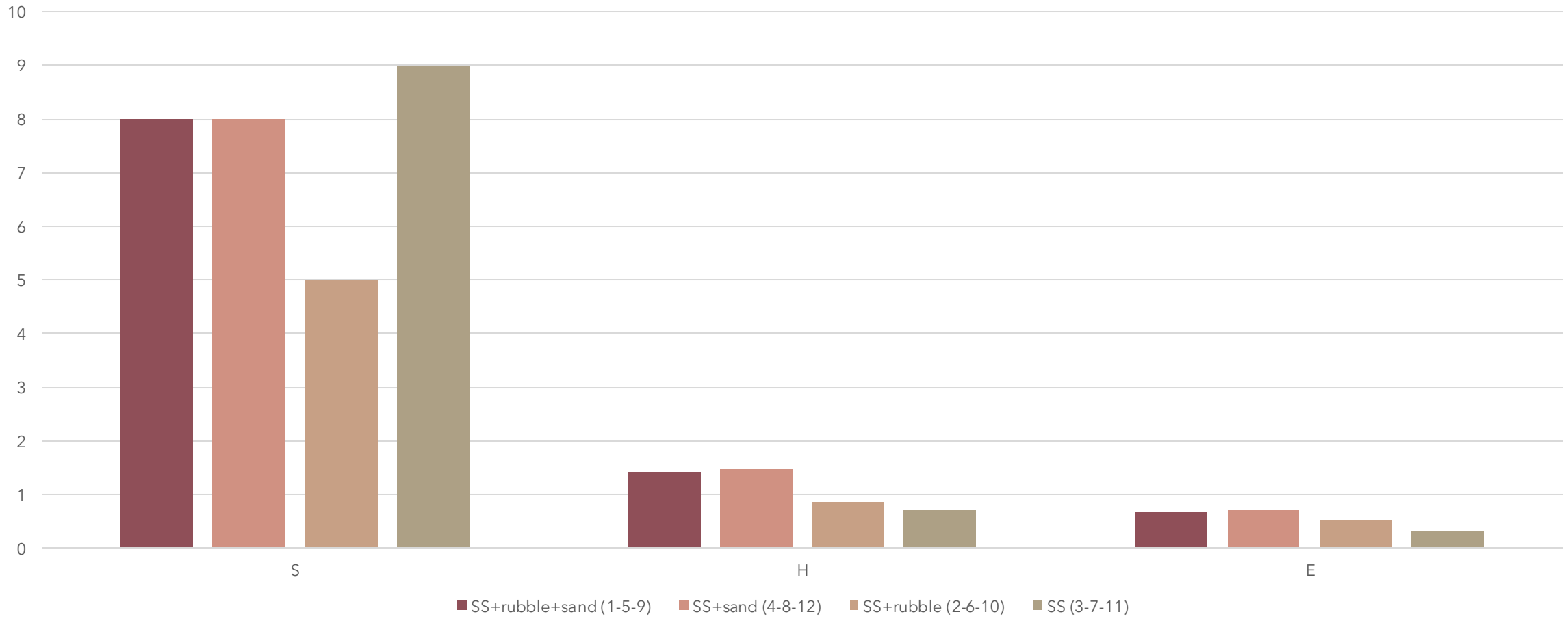


	SS+rubble+sand (1-5-9)	SS+sand (4-8-12)	SS+rubble (2-6-10)	SS (3-7-11)
worms	2.00	1.33	1.83	5.17
worms (spirorbis)	56.50	19.17	44.00	34.33
Crustacean (crabs)	25.00	0.33	0.50	1.17
Crustacean (palaemonidae)	0.17	0.00	0.00	1.33
Crustacean (barnacles)	24.83	12.83	13.67	7.83
Fish (Goby)	0.17	0.17	0.00	0.33
Tunicate	0.00	0.17	0.00	0.17
Porifera (sponges)	4.33	0.33	0.00	0.00
Platyhelminthes	0.00	0.00	0.00	0.17

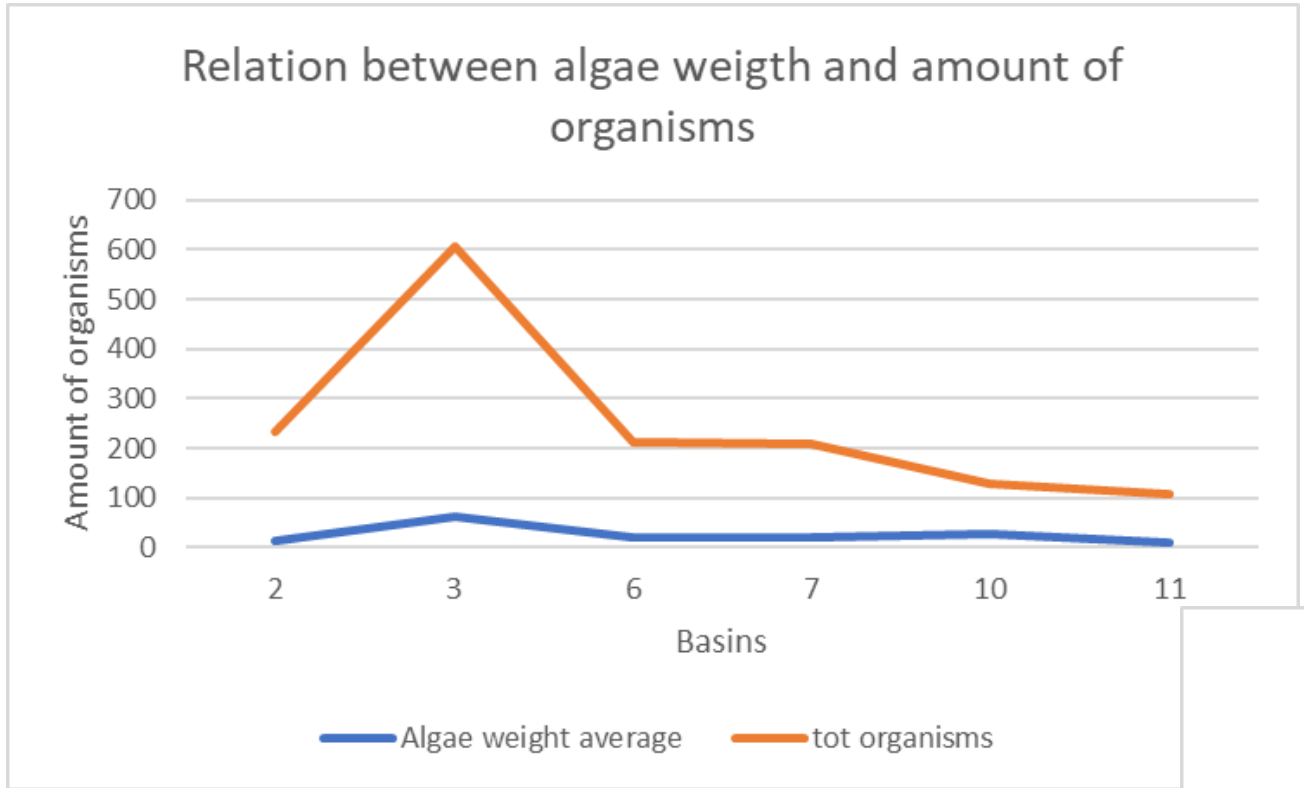
Steel slag and sediment samples comparison

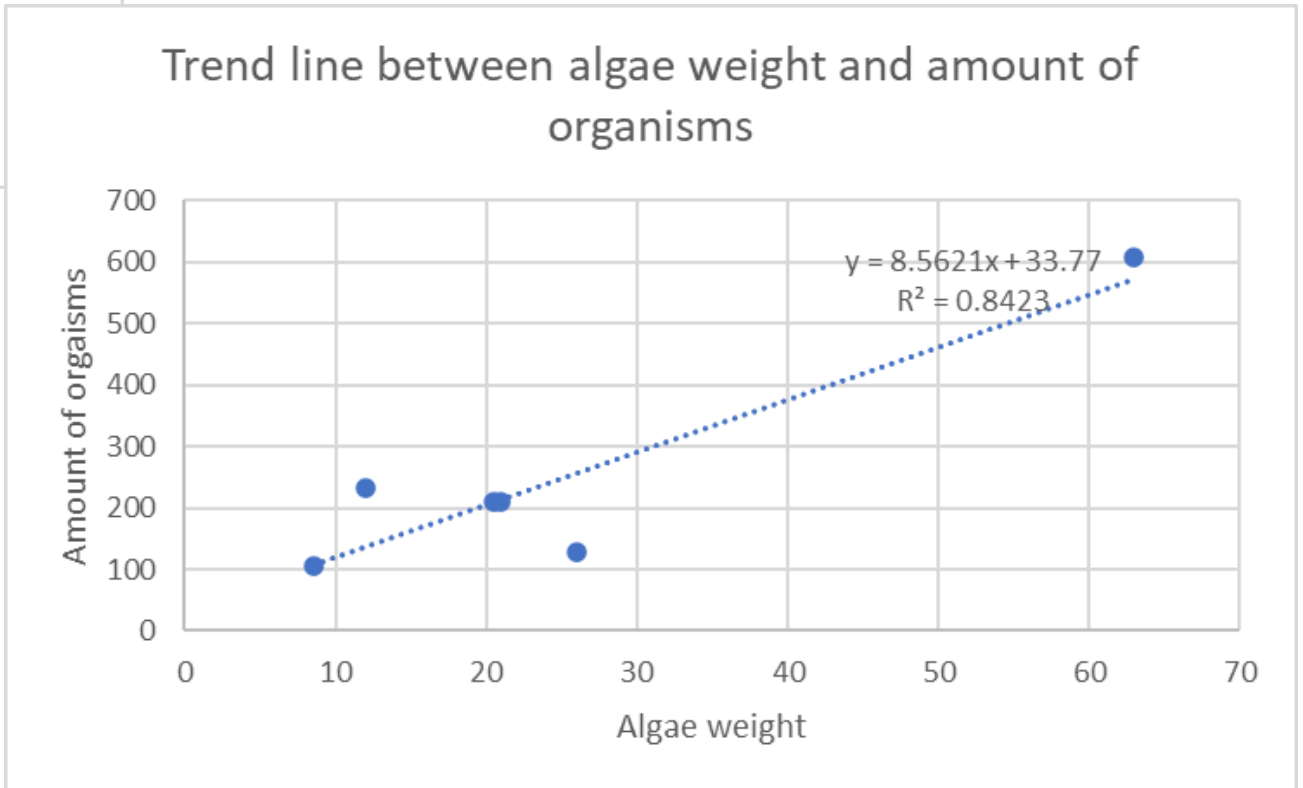
Crustacean in steel slag and sediment





Shannon-Weiner index, Evenness, Richness per treatment


Relation between algae weigth and amount of organisms
Amount of organisms
700
600
500
400
300
200
100
0
2
3
6
7
10
11
Basins
Algae weight average
tot organisms


Trend line between algae weight and amount of organisms
Amount of orgaisms
700
600
500
400
300
200
100
0
y = 8.5621x + 33.77
R² = 0.8423
0
10
20
30
40
50
60
70
Algae weight

Discussion & Conclusion

- SPECIES FOUND
- METHOD
- METHOD IMPROVEMENT

RUBBLE ECOTOP

+ STEEL SLAG

- SEDIMENT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Thank you for your attention!
QUESTIONS?