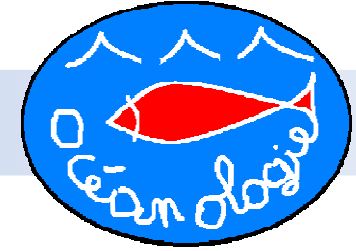




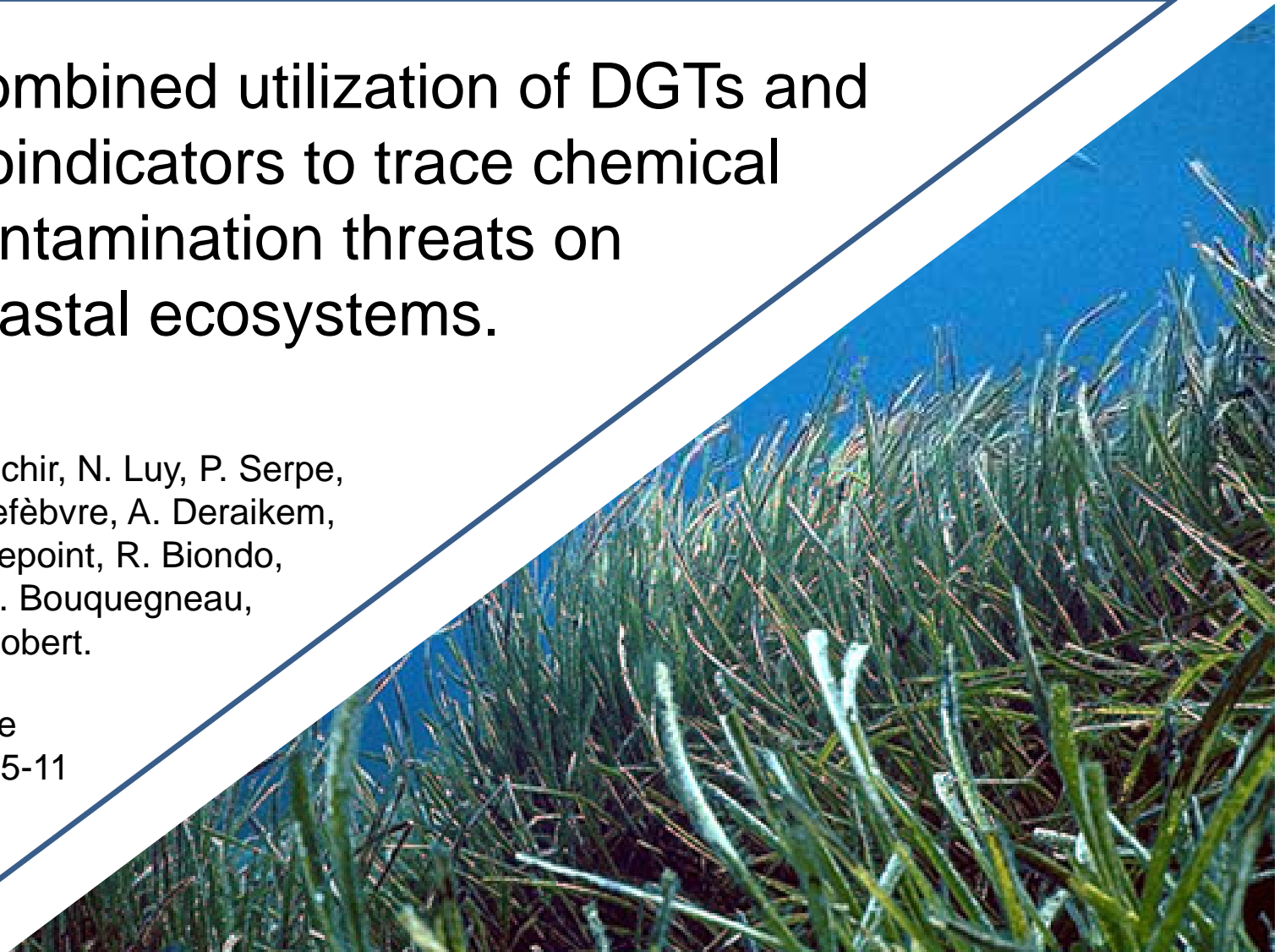
 MARE



Combined utilization of DGTs and bioindicators to trace chemical contamination threats on coastal ecosystems.

J. Richir, N. Luy, P. Serpe,
L. Lefèbvre, A. Deraikem,
G. Lepoint, R. Biondo,
J.-M. Bouquegneau,
S. Gobert.

Liège
03-05-11





Introduction



Direct measurements in seawater :

- ❖ low, punctual and fluctuating concentrations;
- ❖ preconcentrations;
- ❖ bioaccessible fraction?



Ecotoxicology :

bioindicators =
organisms accumulating
pollutants to levels
representative of their
habitat pollution status.



Posidonia oceanica



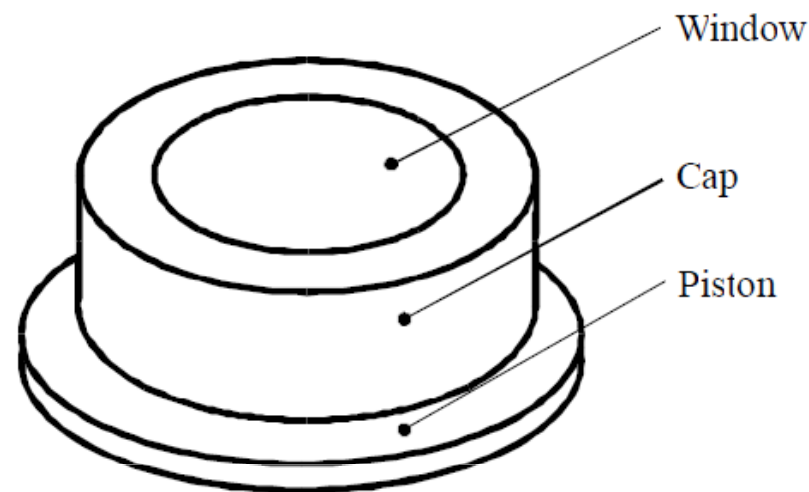
Mytilus galloprovincialis



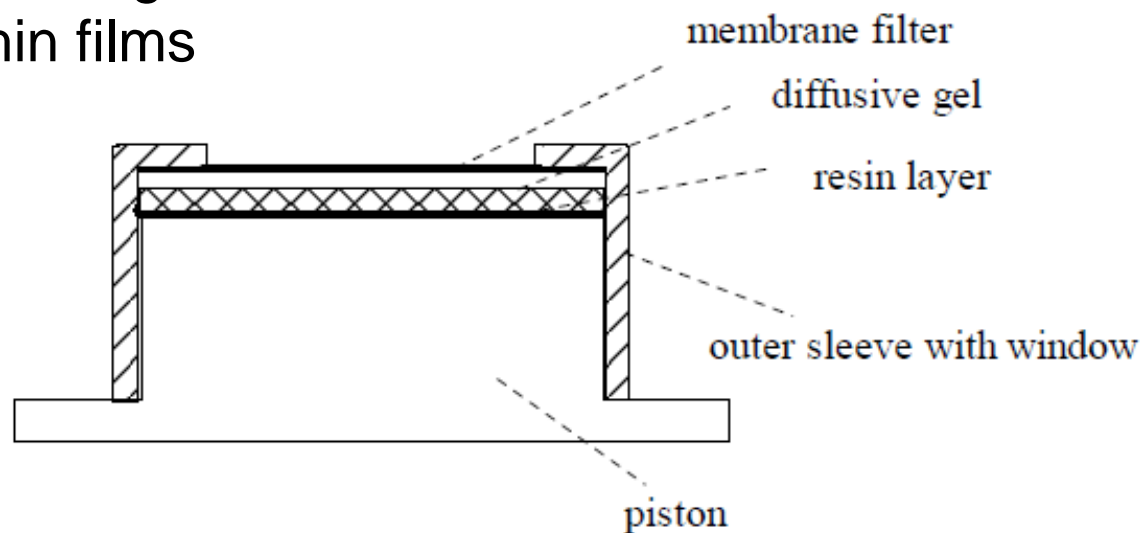
Introduction



Davison and Zhang (1994).
*In situ speciation
measurements of trace
components in natural
waters using thin-film gels.*
Nature. 367: 546-548.
(Lancaster University, UK)



DGT = diffusive gradients
in thin films

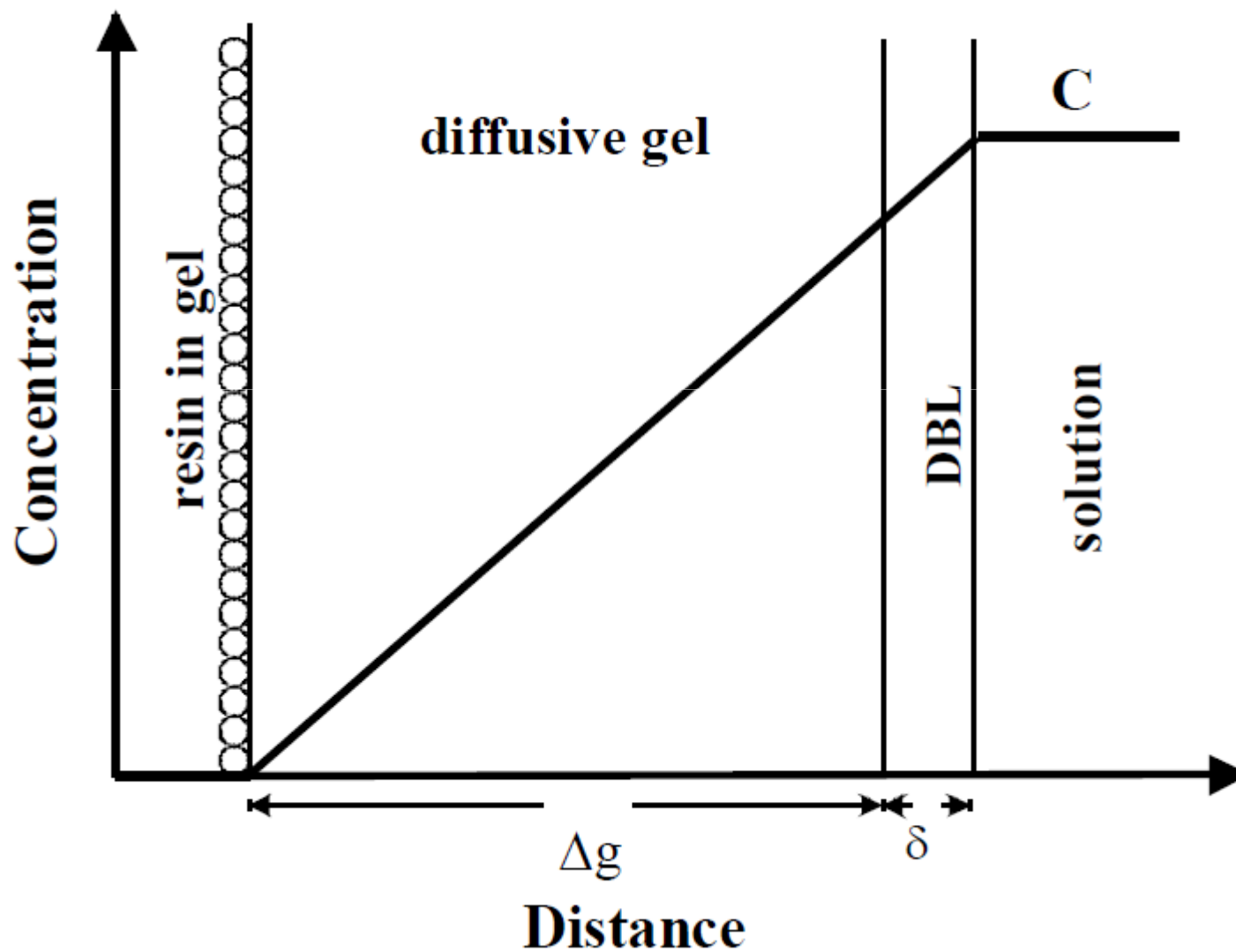




Introduction



Z O - H C C D O R - H Z -

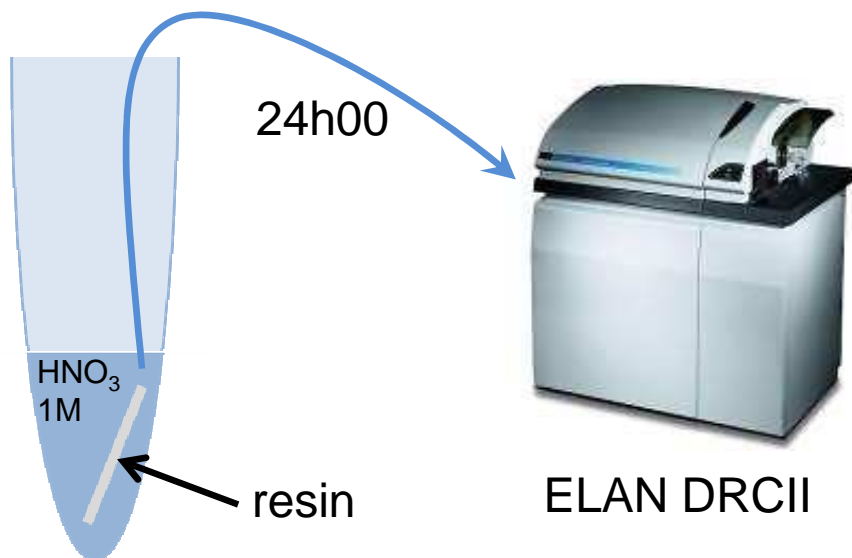




Introduction

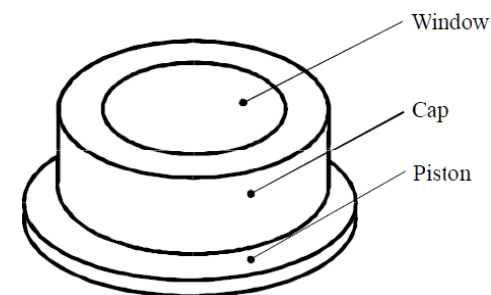


I
N
T
R
O
D
U
C
T
I
O
N



$$M = C_e (V_{\text{HNO}_3} + V_{\text{gel}}) / f_e$$

$$C_{\text{DGT}} = M \Delta g / (D t A)$$



Temp. (°C)	D (E-6 cm ² /sec) of Pb
...	...
19	6.79
20	6.99
21	7.19
22	7.40
23	7.61
...	...

- M: mass of metal accumulated
- C_e: [metal] in HNO₃ 1M
- V_{gel}: Vol. of resin gel (0.15 ml)
- f_e: elution factor (0.8)
- C_{DGT}: [metal] measured by DGT
- Δg: thickness of the diffusive gel (0.08mm) + thickness of the filter membrane (0.14 mm)
- D: Diffusion coefficient of metal in the gel
- t: deployment time (sec)
- A: exposure area (3.14 cm²)



Field applications



**A
P
P
L
I
C
A
T
I
O
N
S**



Field applications



A
P
P
L
I
C
A
T
I
O
N
S





Field applications



A
P
P
L
I
C
A
T
I
O
N
S





Seasonal variations of *P. oceanica* [Cd]



A
P
P
L
I
C
A
T
I
O
N
S

1



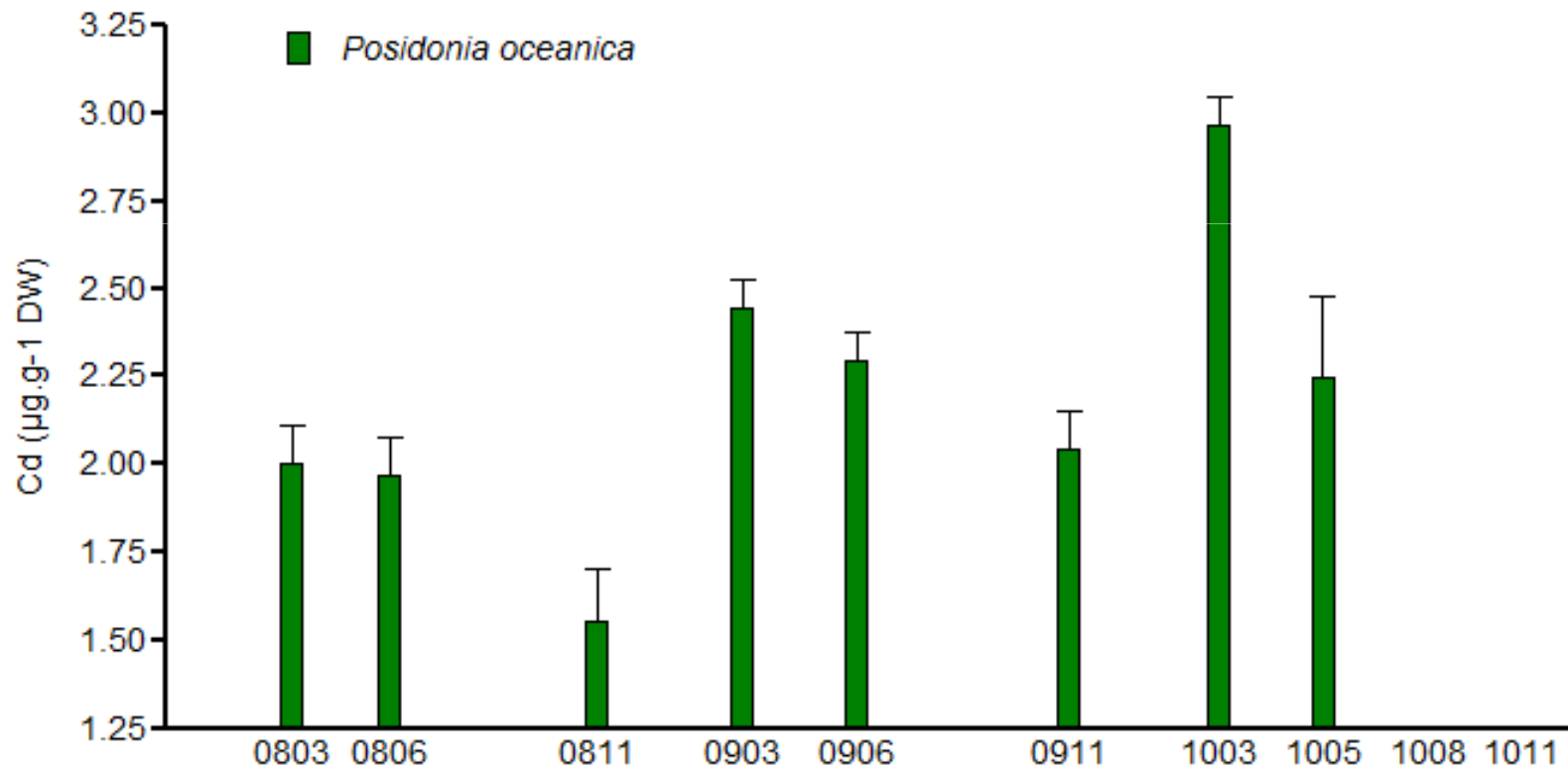


Seasonal variations of *P. oceanica* [Cd]



A
P
P
L
I
C
A
T
I
O
N
S

1



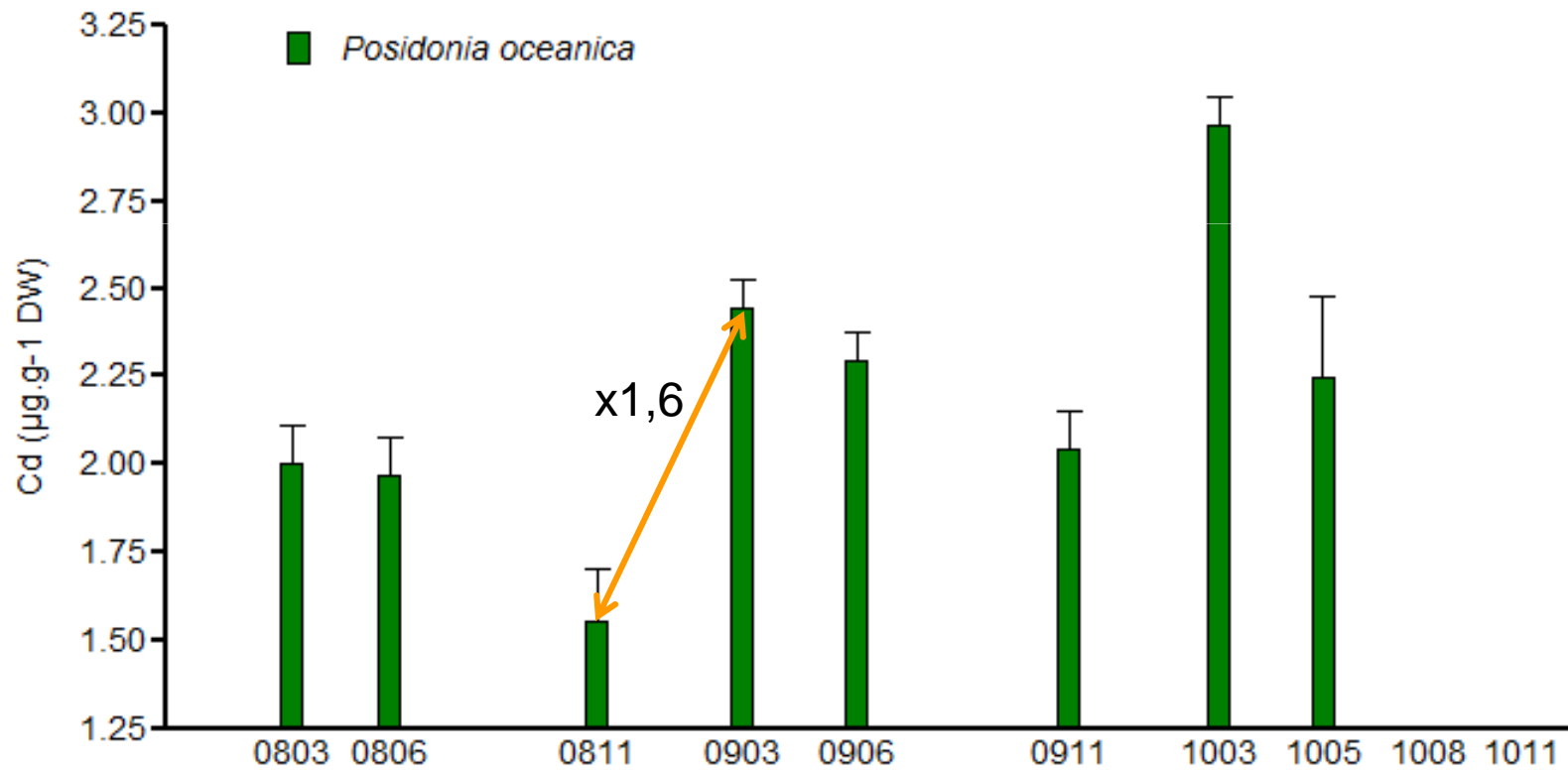


Seasonal variations of *P. oceanica* [Cd]



A
P
P
L
I
C
A
T
I
O
N
S

1



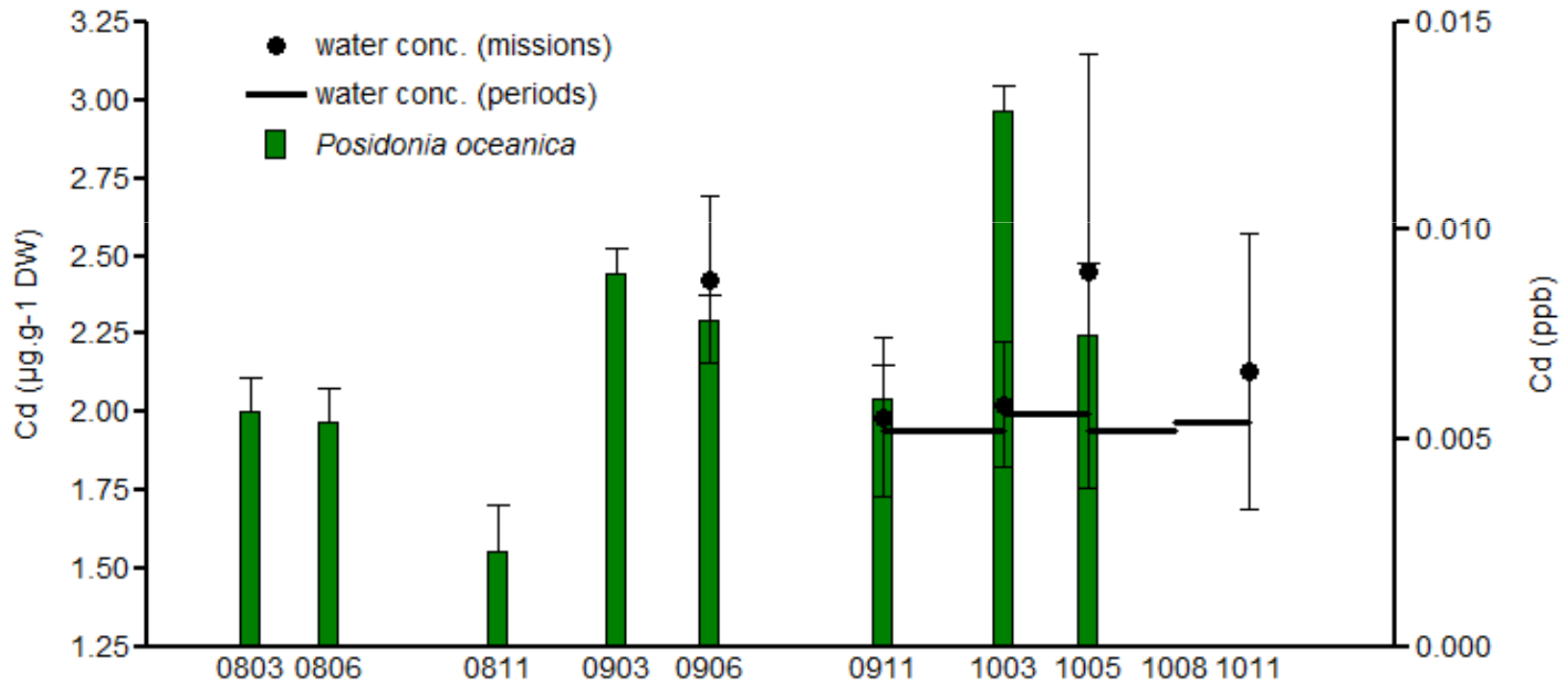


Seasonal variations of *P. oceanica* [Cd]



A
P
P
L
I
C
A
T
I
O
N
S

1





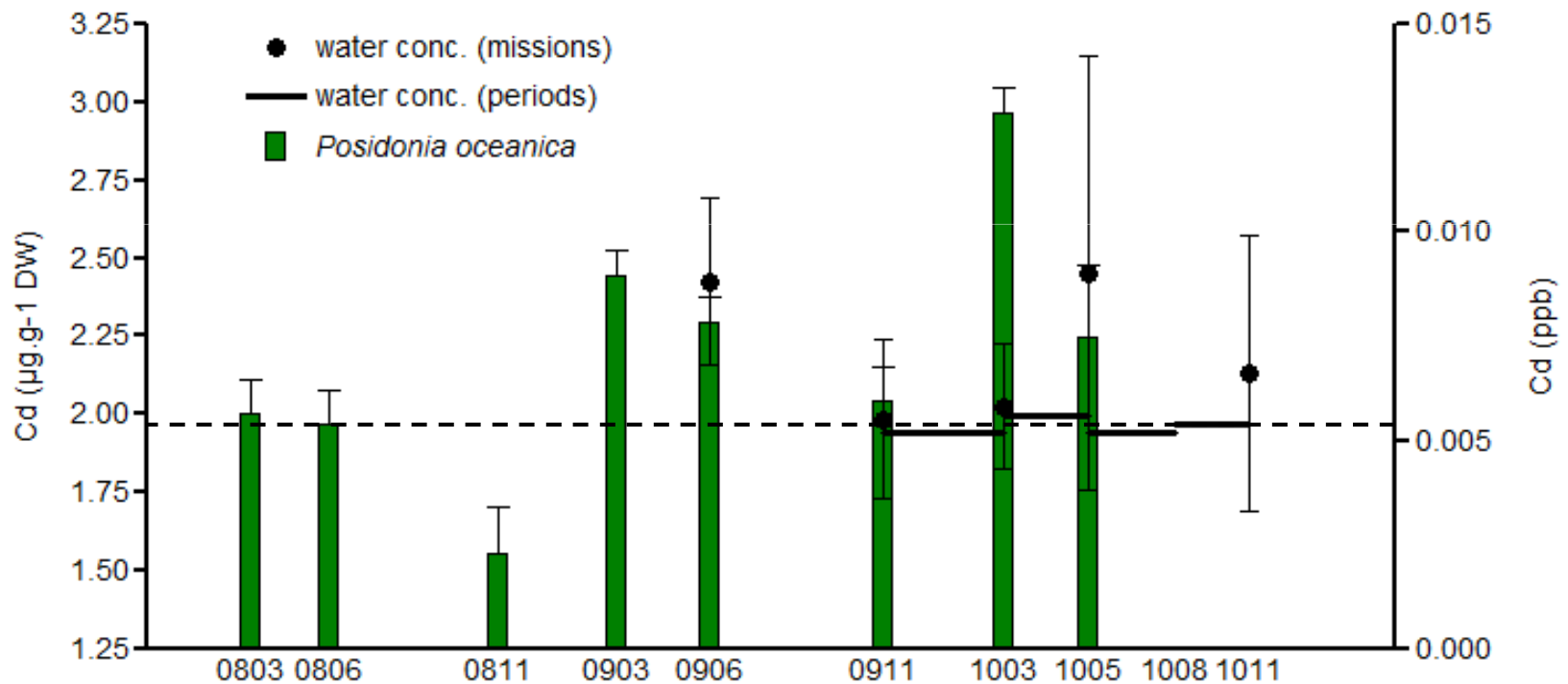
Seasonal variations of *P. oceanica* [Cd]



Posidonia oceanica > 10^{5-6} times > water

A
P
P
L
I
C
A
T
I
O
N
S

1





In situ TE contamination of *P. oceanica* bed



A
P
P
L
I
C
A
T
I
O
N
S

2



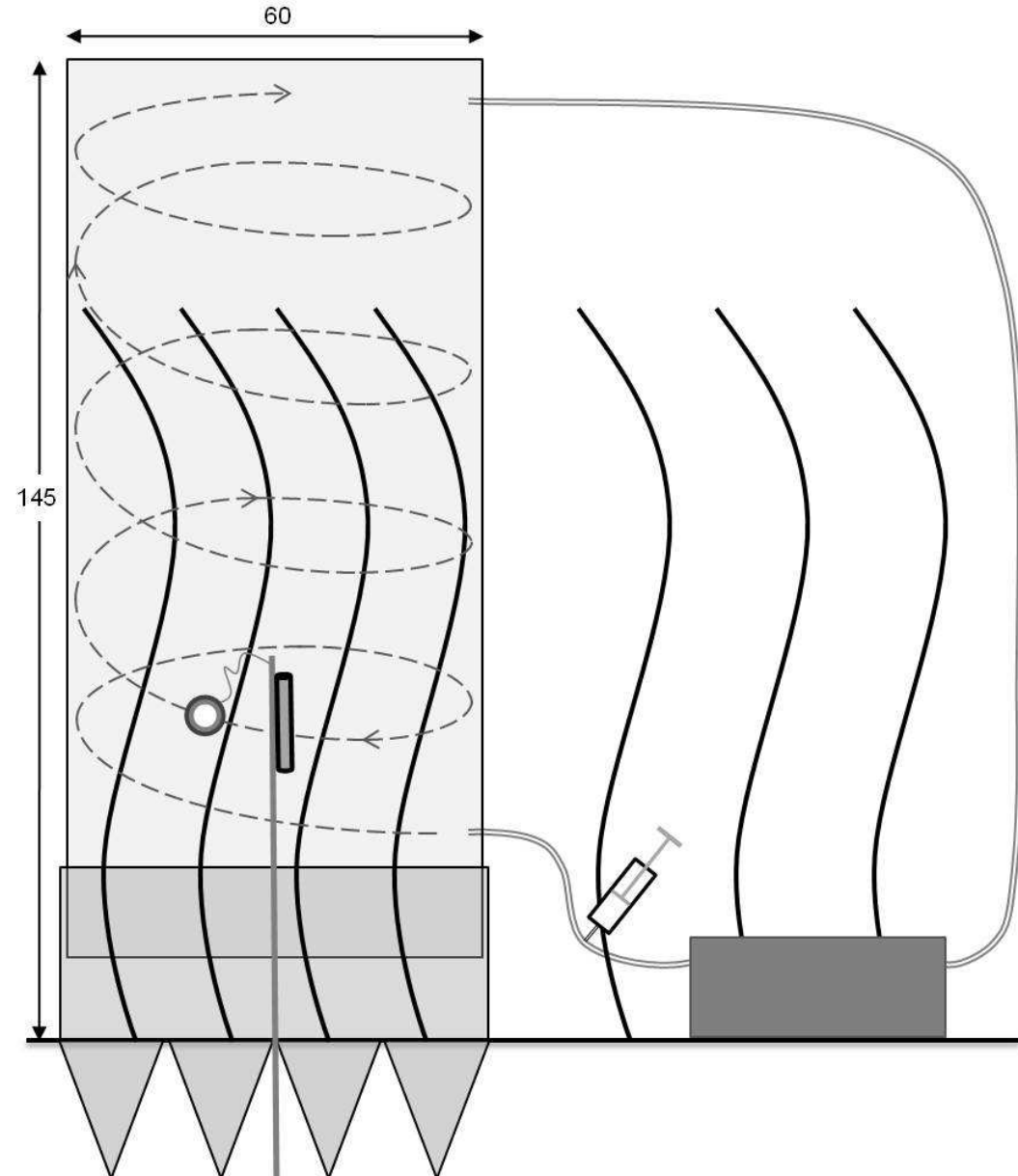
In situ TE contamination of *P. oceanica* bed



A
P
P
L
I
C
A
T
I
O
N
S

2

- 6 days of contamination;
- 15 TE (Pb, Co, Ag, Al, Mn, etc.);
- 410L bell-shaped mesocosm;
- Contamination every 12 hours (9am-9pm);
- 15 days of decontamination.





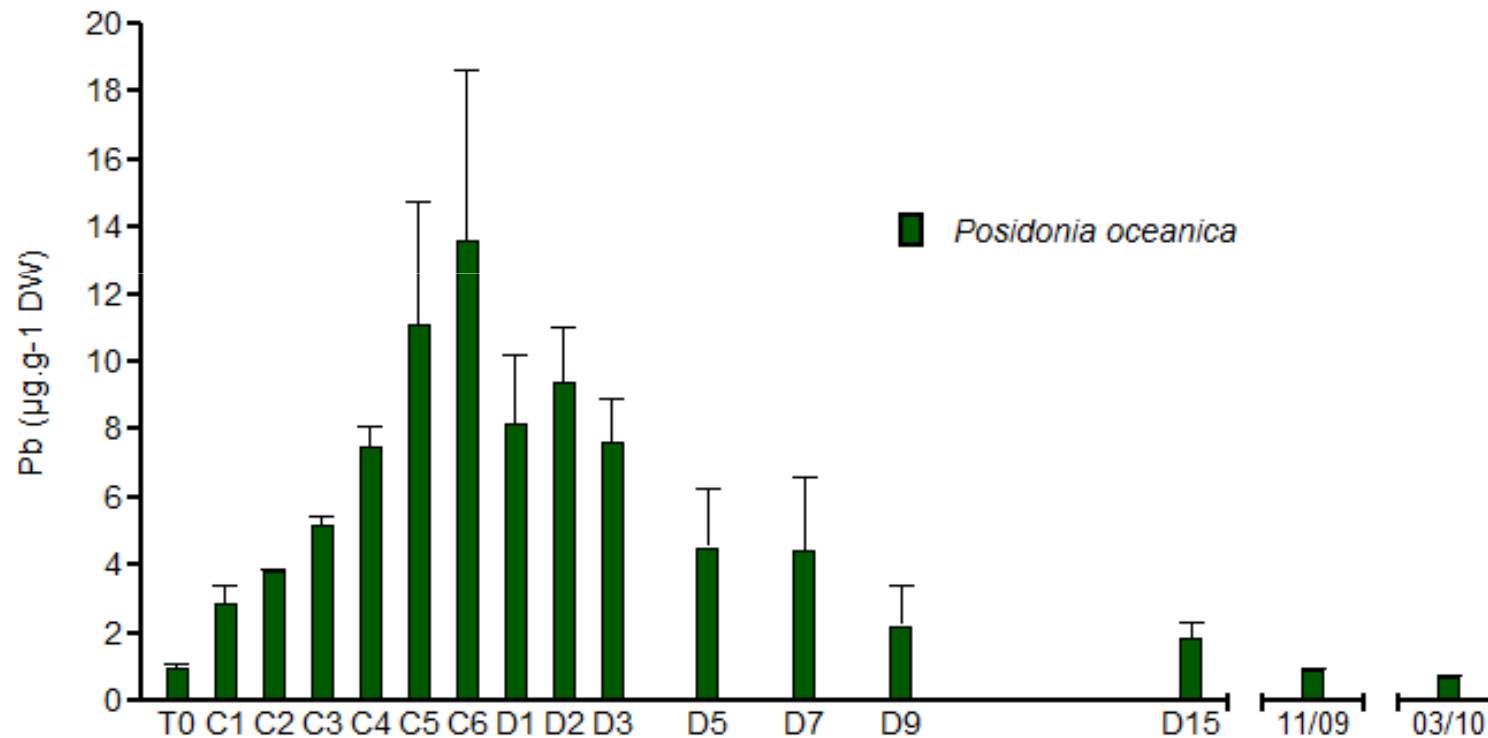


Pb contamination



seawater average [Pb] : 0.143 ppb

contamination level : 5 ppb





Pb contamination

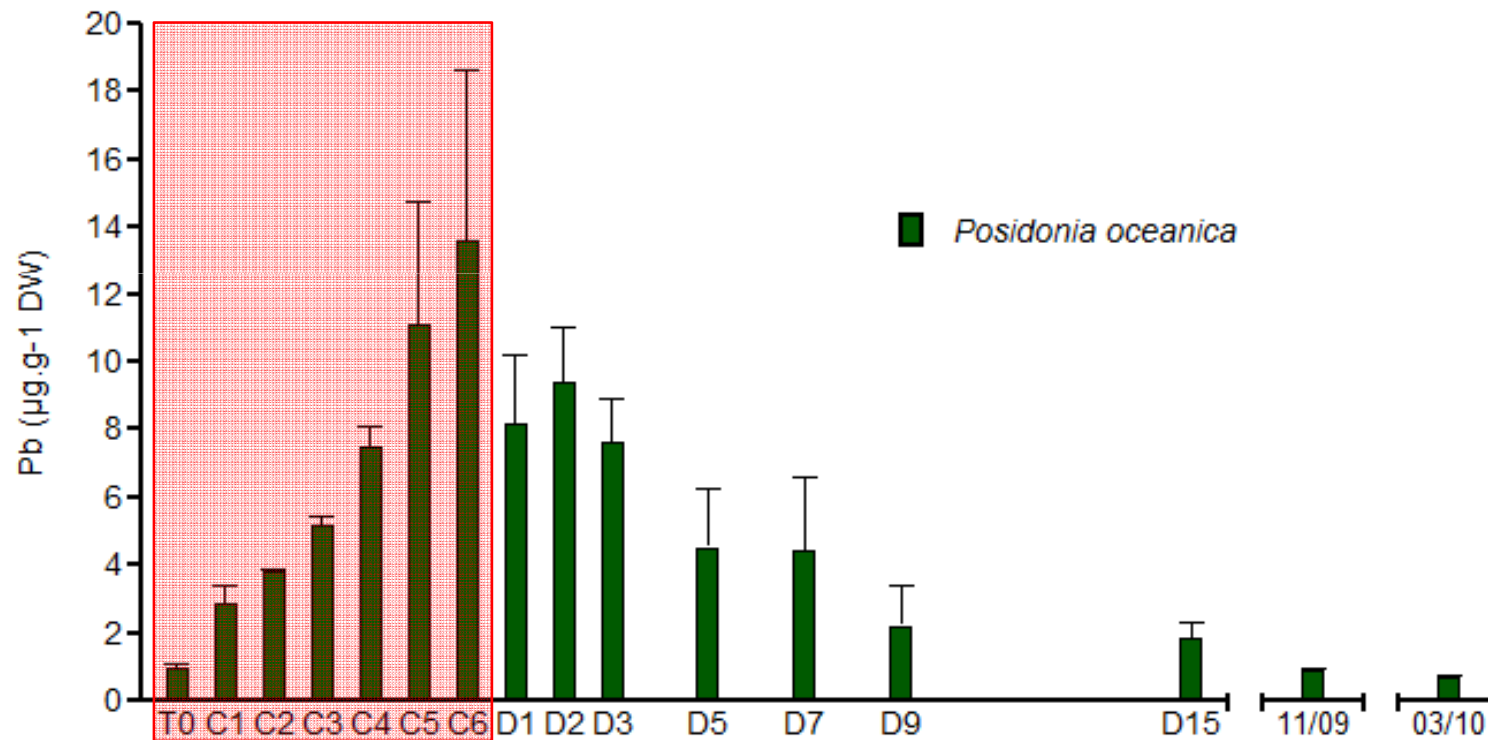


seawater average [Pb] : 0.143 ppb

contamination level : 5 ppb

A
P
P
L
I
C
A
T
I
O
N
S

2





Pb contamination

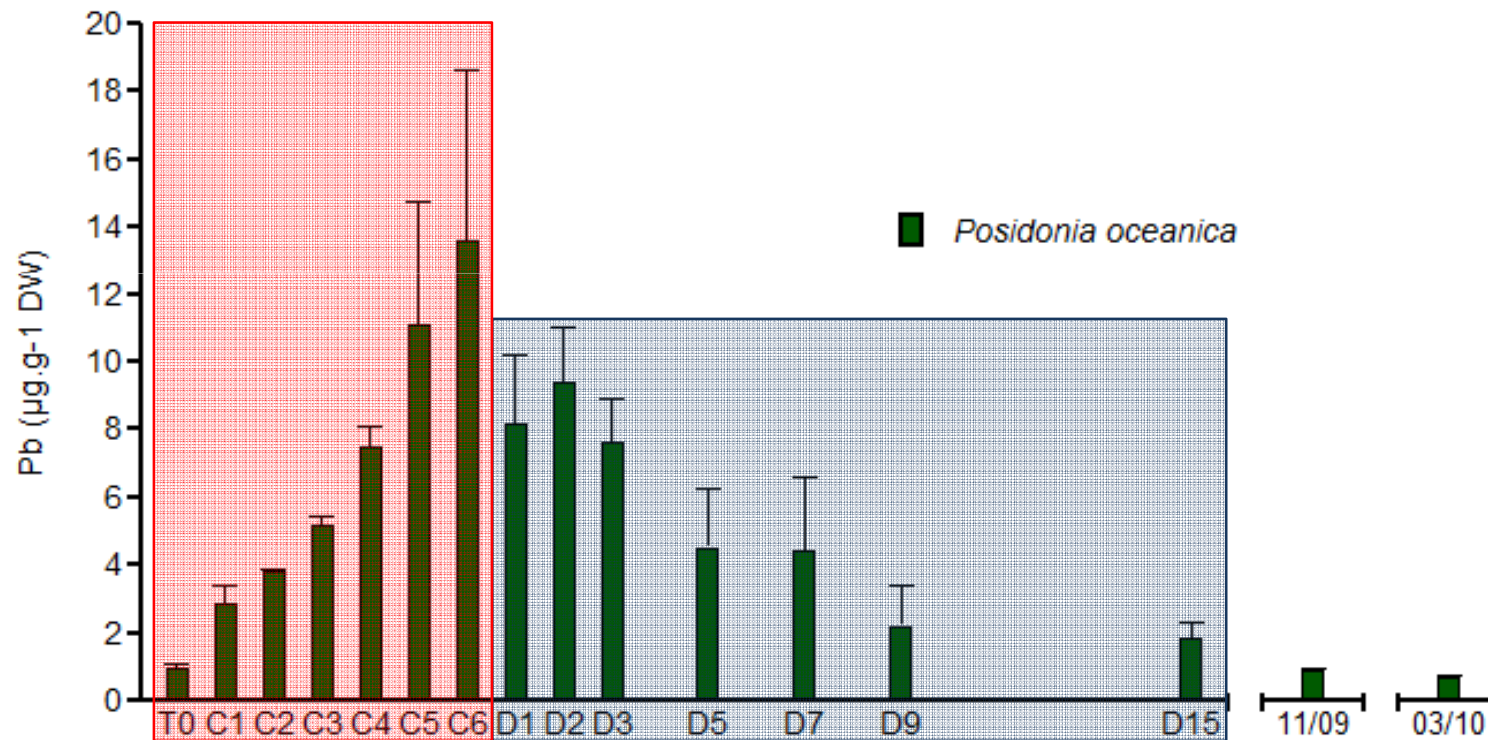


seawater average [Pb] : 0.143 ppb

contamination level : 5 ppb

A
P
P
L
I
C
A
T
I
O
N
S

2





Pb contamination

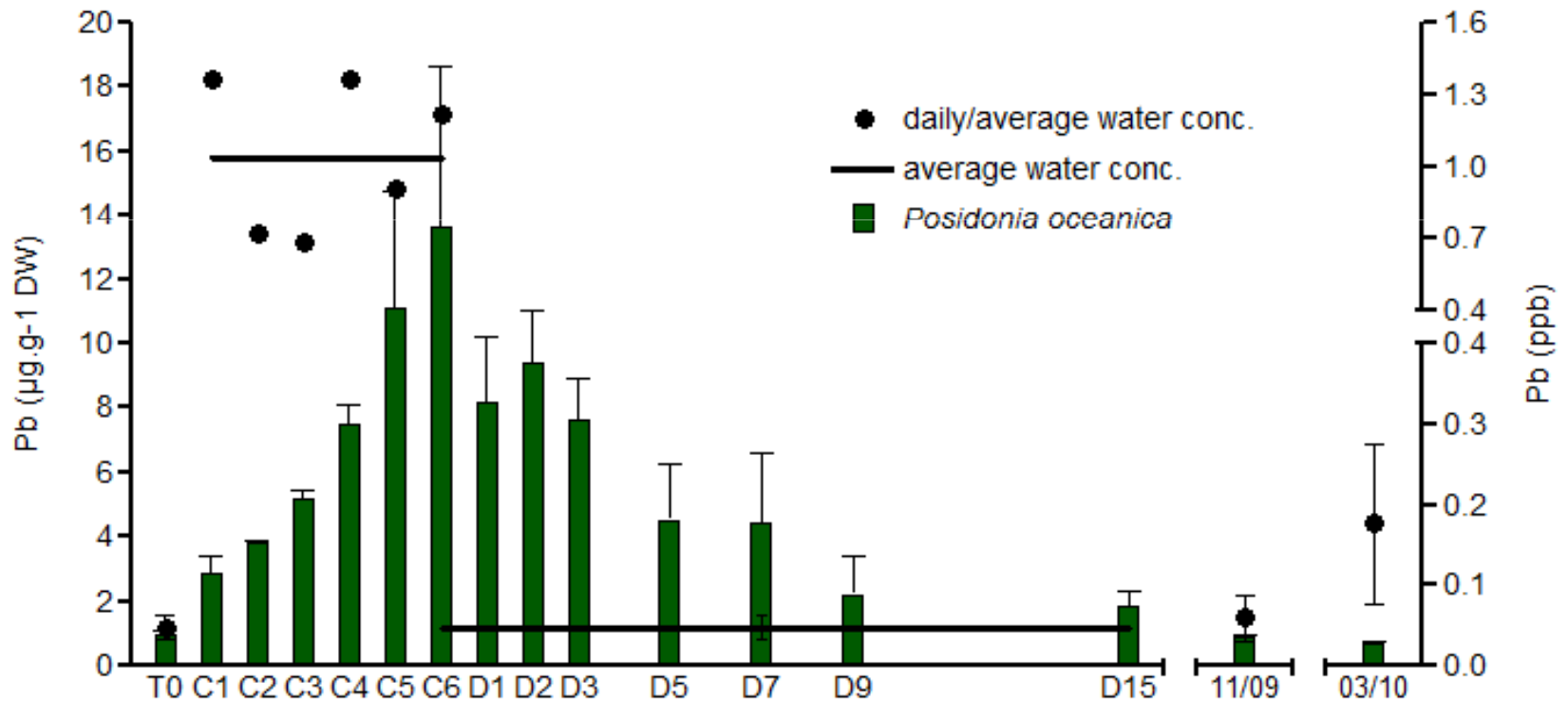


seawater average [Pb] : 0.047 ppb

contamination level : 1.040 ppb (5 ppb)

A
P
P
L
I
C
A
T
I
O
N
S

2





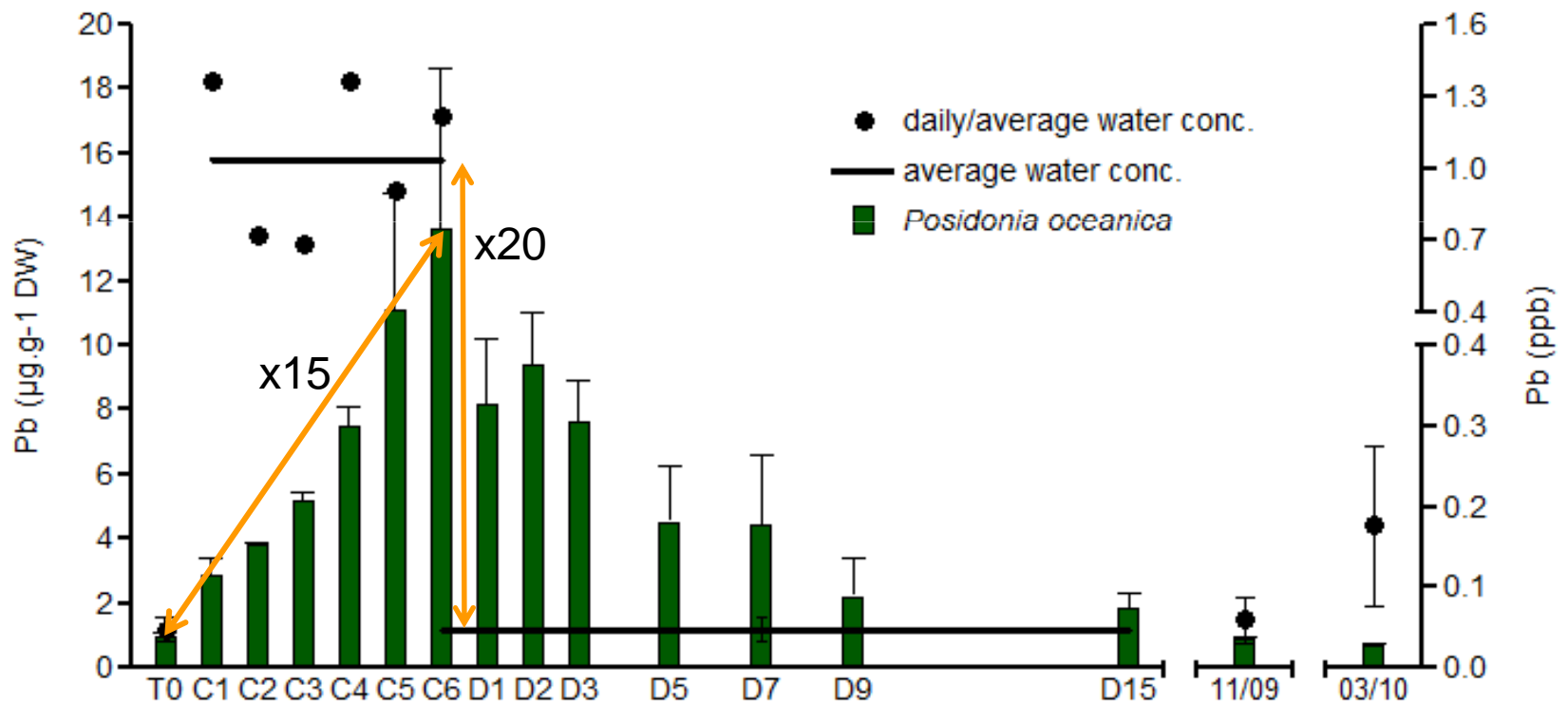
Pb contamination

seawater average [Pb] : 0.047 ppb

contamination level : 1.040 ppb (5 ppb)

A
P
P
L
I
C
A
T
I
O
N
S

2





Mussel caging



**A
P
P
L
I
C
A
T
I
O
N
S**

3

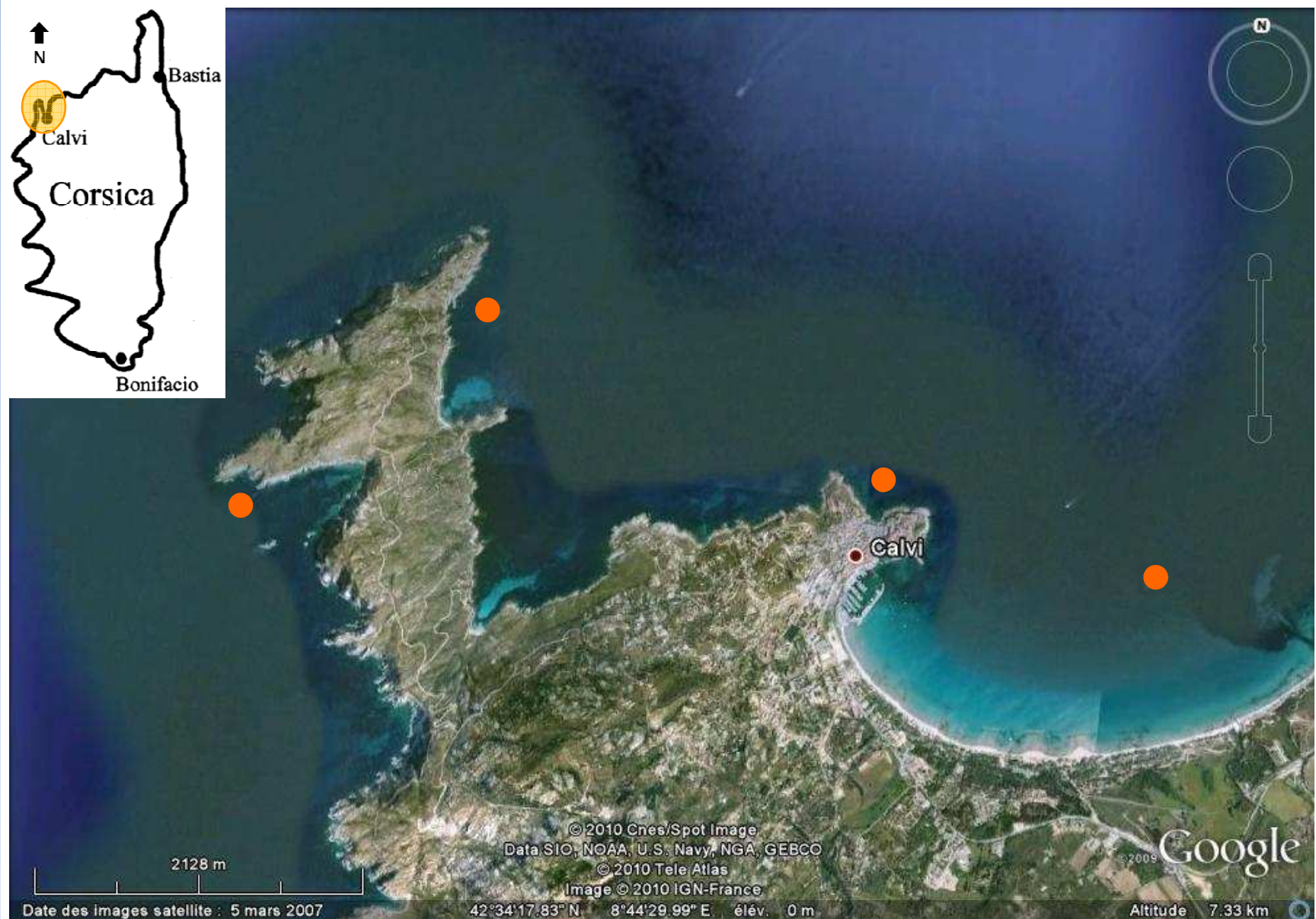


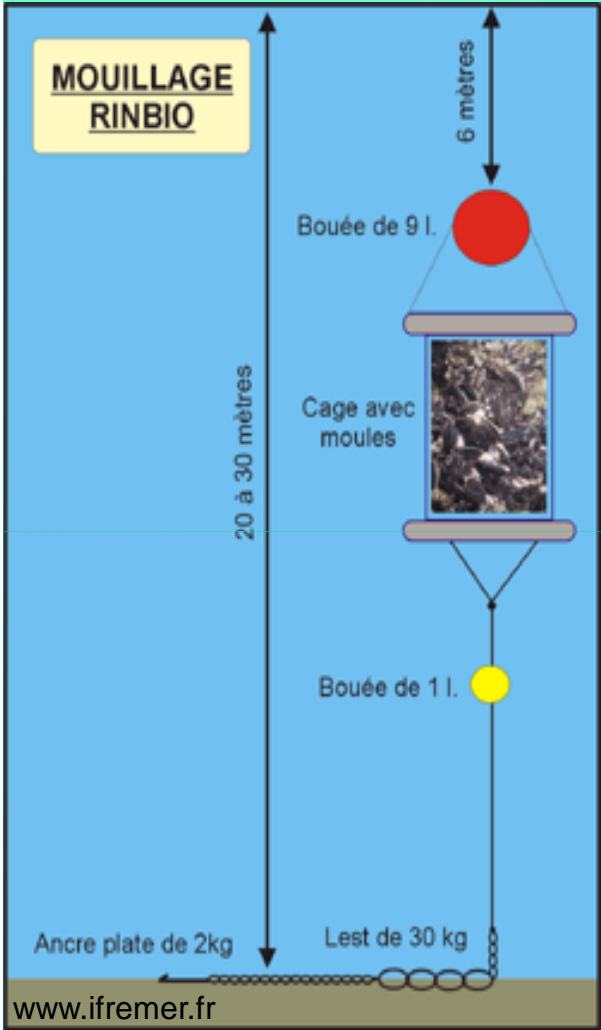
Mussel caging

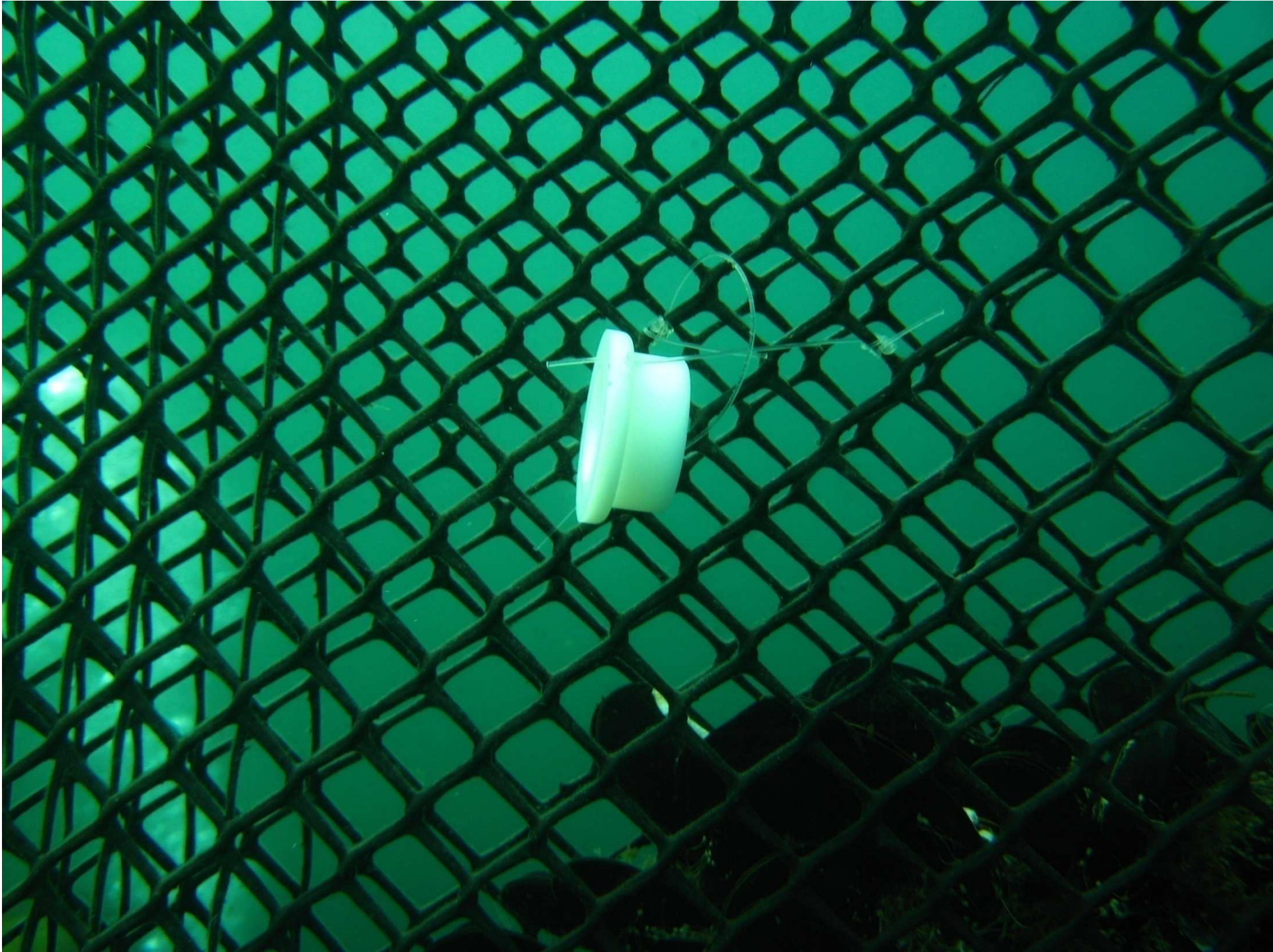


A
P
P
L
I
C
A
T
I
O
N
S

3









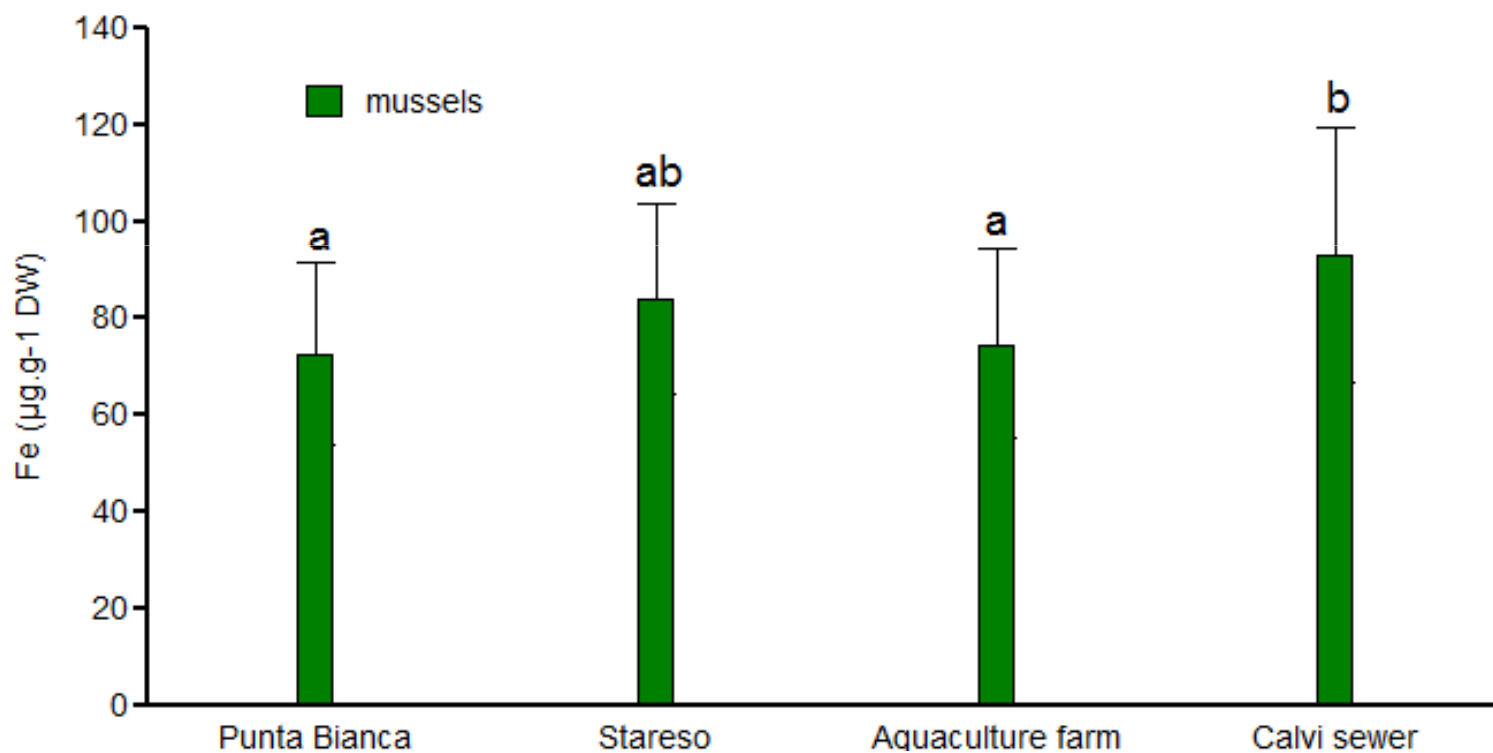
Mussel caging



A
P
P
L
I
C
A
T
I
O
N
S

3

Calvi sewer / Punta Bianca = 1.28

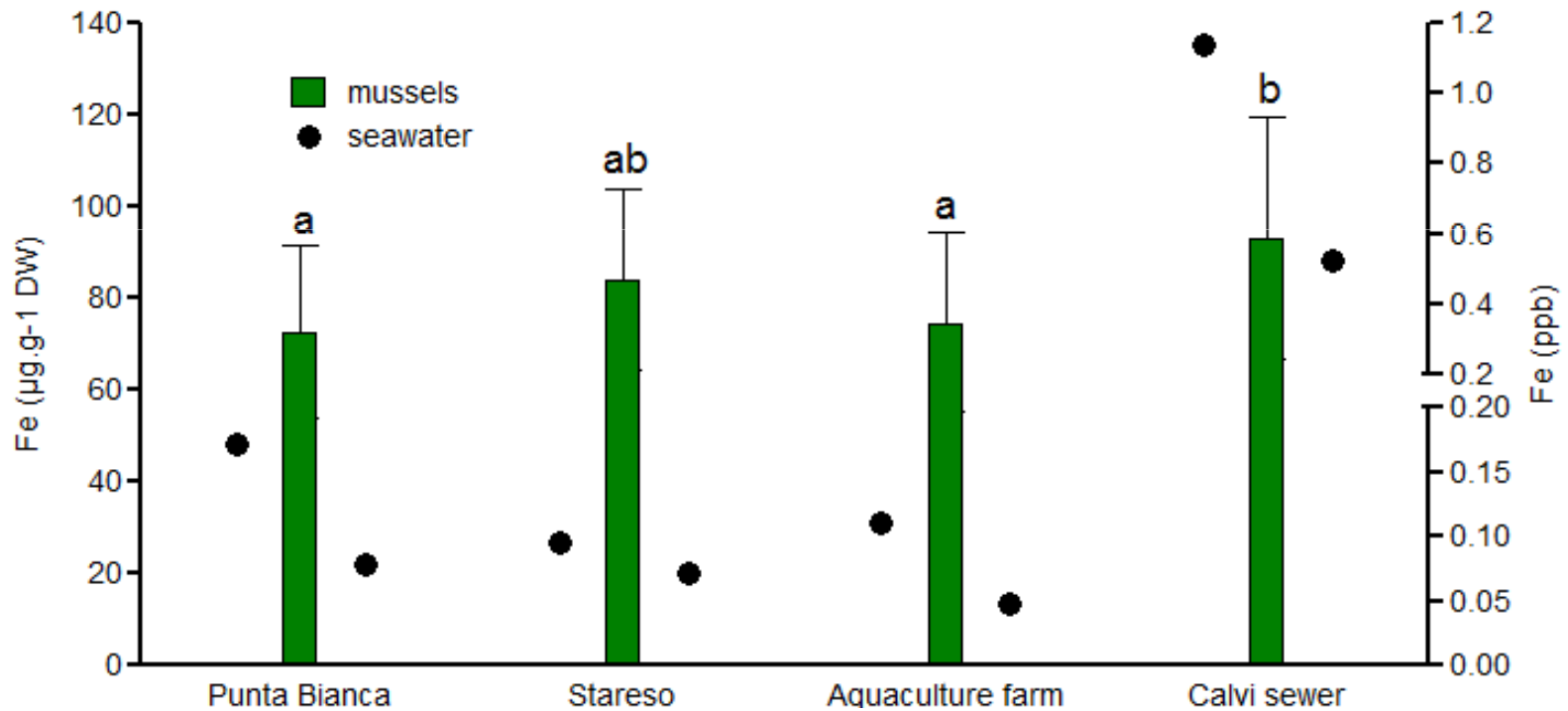




Mussel caging



Calvi sewer / Punta Bianca : mussels = 1.28
water ~ 10



A
P
P
L
I
C
A
T
I
O
N
S

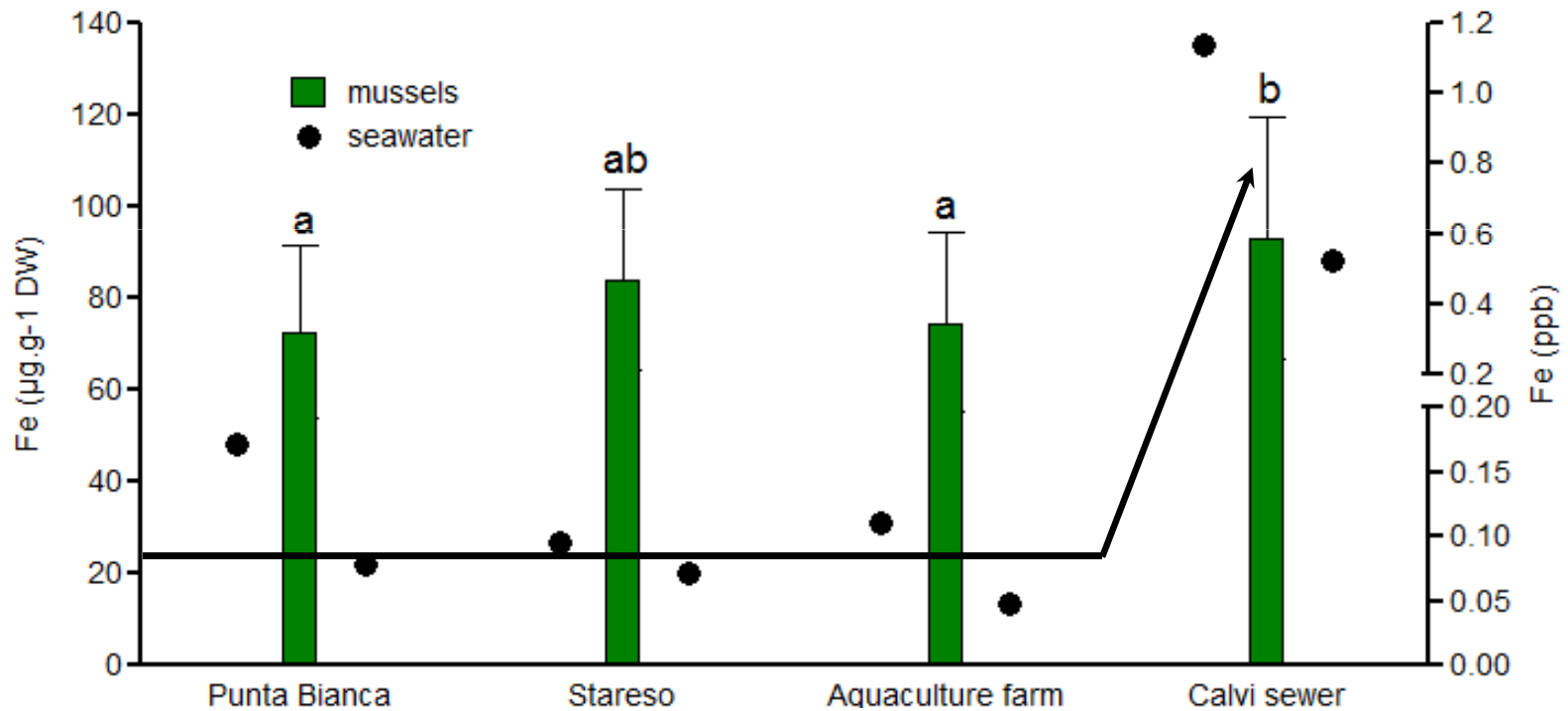
3



Mussel caging



Calvi sewer / Punta Bianca : mussels = 1.28
water ~ 10



A
P
P
L
I
C
A
T
I
O
N
S

3



DGTs vs bioindicators



**C
O
N
C
L
U
S
I
O
N
S**



DGTs vs bioindicators



C
O
N
C
L
U
S
I
O
N
S

- Different and complementary informations;
- Organisms ecology in their chemical environment;
- Average TE concentrations over deployment time;
- Schedule monitoring campaigns.



DGTs vs bioindicators



C
O
N
C
L
U
S
I
O
N
S

- Different and complementary informations;
- Organisms ecology in their chemical environment;
- Average TE concentrations over deployment time;
- Schedule monitoring campaigns.



Combined use in ecological, ecotoxicological and ecosystemic approaches of marine coastal environment functioning.



Q
U
E
S
T
I
O
N
S

Thank you for
your attention



