Potential use of *Paracentrotus lividus* as bioindicator for recent trace element pollution monitoring

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Introduction

Some previously poorly studied trace elements can now be considered as chemical pollutants further to the recent modification of their production and industrial uses. Appropriate bioindicators, such as the purple sea urchin *Paracentrotus lividus* (fig. 1), are useful tools to detect early trace metal pollutions of the marine coastal environment. In this work, we investigate the potential use of *P. lividus* as bioindicator for recent trace element pollution monitoring.

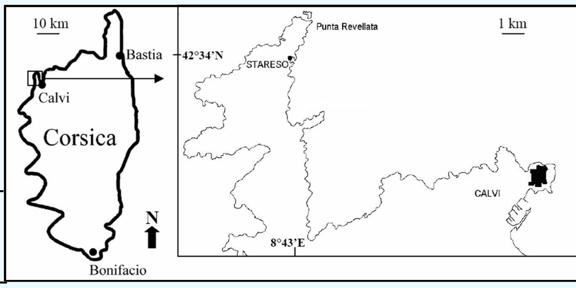
Figure 1. *Paracentrotus lividus* (1).

Material and methods

Adult sea urchins were collected in March 2007 in STARESO (Corse, France), a reference site for Mediterranean coastal pollution monitoring (fig. 2). Gonads and the digestive wall were isolated from frozen (n=20) or alive (n=6) sea urchins, lyophilised and digested. Classic trace metal (Fe, Cd, Cr, Pb, Zn and Cu) and newly studied trace element (Al, V, Mn, Co, Ni, Se, Mo and Ag) contents were measured by ICP-MS (ELAN DRC II model).

Concentration data were compared as followed:

- females vs males;
- frozen vs alive sea urchins;
- gonads vs digestive wall.



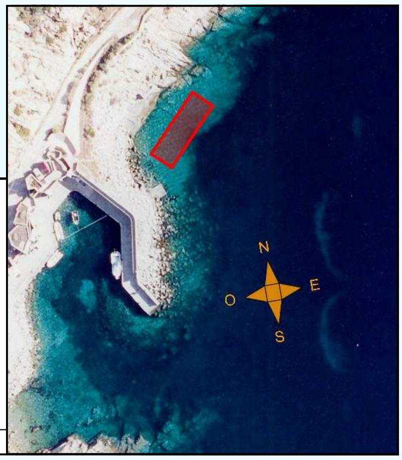


Figure 2. Map of Corsica, with a zoom in Calvi area (2), and sampling site location outside of Stareso harbour (red rectangle).

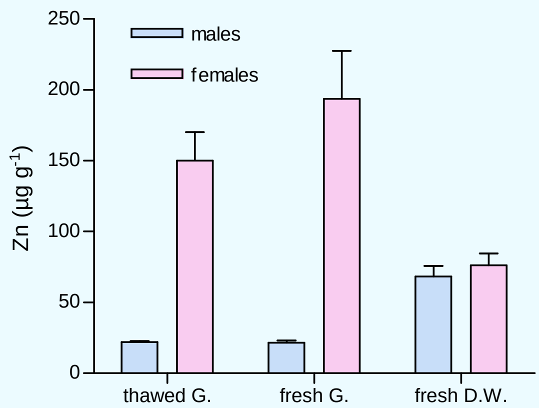


Figure 3. Zn concentrations (µg g^{-1} of dry weight) in gonads (G.) and in the digestive wall (D.W.) of fresh and/or thawed female and male sea urchins.

Results and discussion

1. Investigated elements are all measurable in sea urchin gonads and digestive wall (e.g. table 1). These data can be considered as reference values for subsequent comparisons with polluted sites.

2. Females vs males. Gametogenesis requires large amounts of Zn (3). This demand is less for spermatogenesis than for oogenesis (fig. 3). All other elements show similar concentrations in female and male soft organs.

3. Frozen vs alive sea urchins. Once thawed, sea urchins showed a liquefaction of most of their digestive organs. Sea urchins must then be dissected alive to sample these internal organs. Neither gonad recovery nor their trace element contents were influenced by freezing.

4. Gonads vs digestive wall. Studied elements show higher concentrations in the digestive wall than in gonads, except for female Zn contents (table 1 and fig. 3).

Trace element	Al 27	V 51	Cr 52	Fe 54	Mn 55	Co 59	Ni 60	Cu 63	Zn 64	Se 78	Mo 98	Ag 107	Cd 111	Pb 208
G. average	27.15	0.61	0.17	33.20	1.45	0.12	1.99	3.19	193.67	1.97	0.21	0.08	0.13	0.10
SD	18.85	0.30	0.06	11.52	0.31	0.02	0.64	0.36	58.76	0.43	0.10	0.01	0.10	0.03
D.W. average	276.67	2.95	0.54	172.67	4.66	0.36	7.78	16.10	76.10	2.79	4.43	0.98	3.64	0.88
SD	146.03	0.76	0.12	65.74	1.19	0.10	4.27	4.91	14.90	0.73	0.68	0.46	1.07	0.21
max. / min.	10.19	4.87	3.20	5.20	3.22	3.04	3.90	5.04	2.54	1.41	21.38	12.46	27.36	9.09

Table 1. Trace element concentrations (µg g^{-1} of dry weight) in gonads (G.) and in the digestive wall (D.W.) of fresh female sea urchins. Red averages are significantly different (p<0.5).

Conclusion

P. lividus is an interesting candidate to monitor recent trace element pollution of the coastal ecosystem. Investigated elements are all measurable in its soft tissues. Moreover, nor sex (except for Zn) or reproductive performances, nor adult size influence the measured trace element contents.

Bibliography

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