Growth of the common Cockle *Cerastoderma edule* : Validation of increment deposition periodicity by chemical marking

Bellamy, E. (1, 2, 3), Mahé K. (1), De Rafélis M. (3) & Lartaud F. (4)

(1) IFREMER, Laboratoire Ressources Halieutiques, Pôle National de Sclérochronologie, Boulogne sur Mer, France
(2) IFREMER, Laboratoire Environnement côtier & Ressources aquacoles, Boulogne sur Mer, France
(3) Laboratoire Biominéralisations et Environnements Sédimentaires, UMR ISTEP 7193, Université Pierre & Marie Curie, Paris VI, France
(4) Laboratoire d'écogéochimie des environnements benthiques (LECOB), CNRS FRE 3350, Observatoire océanologique de Banyuls, Université Pierre & Marie Curie, Paris VI, France

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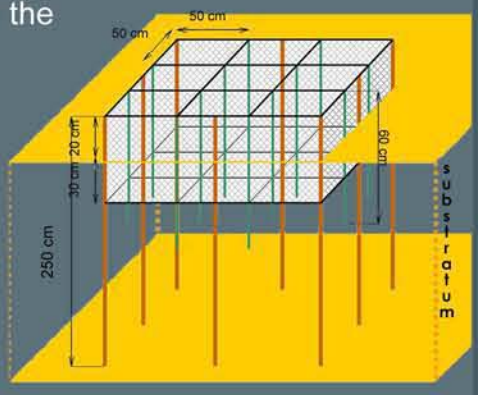
The bay of Somme is the first French field of cockles (*Cerastoderma edule*) with an annual production amounting to 3500 tons on average. In order to improve stock management, it is necessary to increase our knowledge of this species. Age is a key parameter to characterize a population and to study its dynamic through reproduction, recruitment... To estimate this parameter, the periodicity of calcified structure deposition in the shell is analysed using chemical marking. Firstly, this work aims at determining the optimal conditions for marking cockle shells using calcein ; secondly it focuses on growth striae to validate previous hypotheses on periodicity of increment deposition, based on the calcein marking.

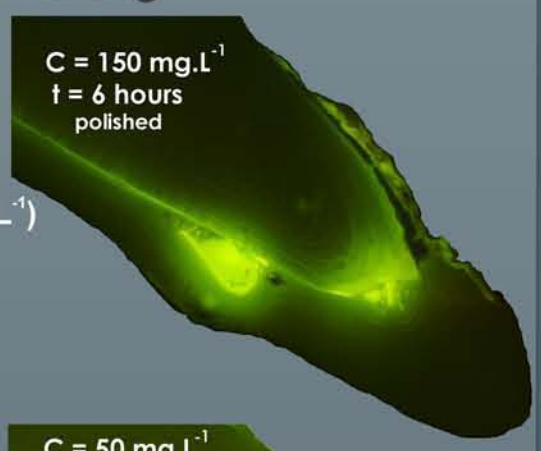
Materials and Methods

- An experimental structure comprising of different compartments, closed on the top, has been buried in the sediment to constrain cockles in defined areas.
- Cockles were collected around the structure and divided into groups of 100 animals (including 2 control groups) which size distribution spread over a large range.
- Identified groups were marked by immersion in a calcein solution (CAS 1461-15-0), using different concentrations and exposure times, then replaced *in situ* in the compartments of the structure.
- 12 days later, cockles were removed and sacrified. One valve of each shell[(1)] was embedded in epoxy resin, sectioned, polished and then observed under fluorescence microscopy.
- Growth increments were analysed using the TNPC software (Numerical Treatment of Calcified Pieces).

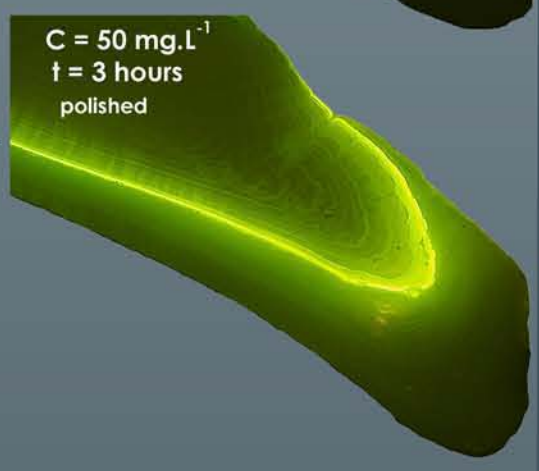


Calcein Marking

Individuals have been exposed to different concentrations (150, 50 mg.L^{-1}) and immersion times (6, 3 et 0,5 hours).

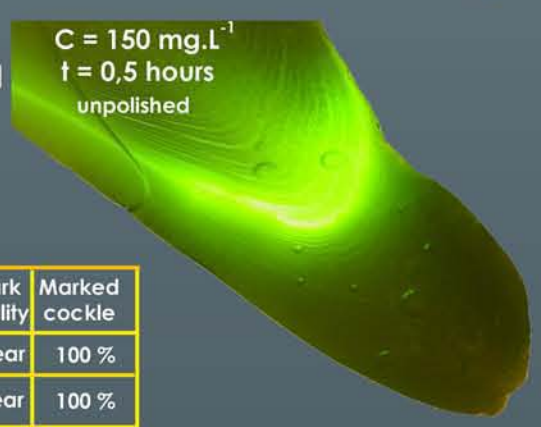


No mortality has occured during the experiment and all cockle shells exhibited **effective fluorescent marks**.



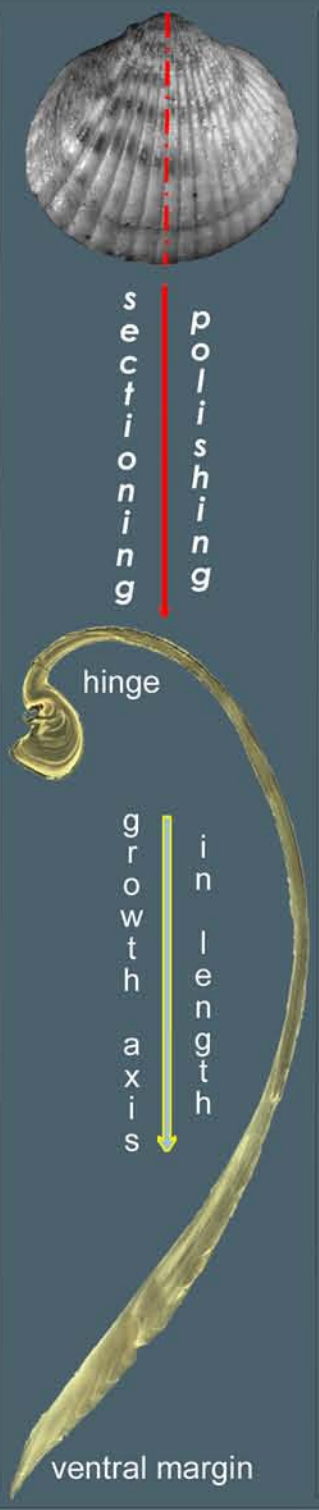
The fluorescent marks displayed **no variation of intensity** for the 3 marking treatments.

Furthermore, **no diffusion phenomenon** was observed inside the shell whatever the marking conditions.



Calcein concentration	Immersion time	Mortality	Mark quality	Marked cockle
150 mg.L^{-1}	6 hours	0 %	clear	100 %
50 mg.L^{-1}	3 hours	0 %	clear	100 %
150 mg.L^{-1}	0,5 hours	0 %	clear	100 %

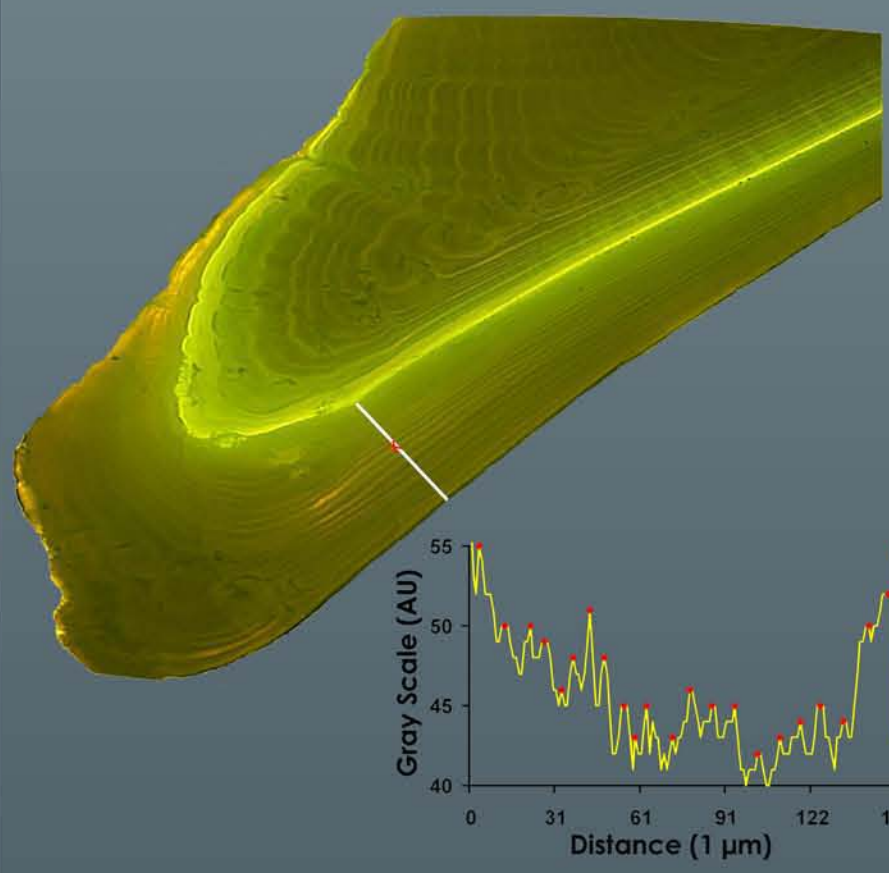
15 µm



Deposition Frequency

In order to determine the number of growth increment mineralized during the 12 days of experiment, we extracted gray levels along a radial axis parallel to the growth axis in thickness, thanks to **image processing methods**.

Following simultaneously the gray scale curve and its location along its radial axis, **gray peaks can be validated as growth increments** (red spots).



Repeating this process several times on each valve of each cockles, **23 growth increments** have been identified within the 12 day period during which 23 tides occured.

Conclusion

+ First chemical marking experiment on *Cerastoderma edule*
+ Efficiency of the *in situ* experimental structure
+ Effectiveness of calcein marking from 30 minutes exposure time at C = 150 mg.L^{-1}
+ Validation of a tidal periodicity of increment formation

Perspectives

+ to develop a growth model considering inter-season and inter-site variations
+ to analyse the infuence of environmental parameters on cockle growth
+ to elaborate an age estimation model from morphometric parameters[(1)]

Aknowldgement : GEMEL Picardie, CRPMEM from Boulogne sur Mer

(1) : Bellamy, E., Mahé, K. & Lefebvre, A., 2008. Morphometry and growth of a bivalve : the common cockle *Cerastoderma edule* in the bay of Somme. *Physiomar 08, 1-4 September 2008, Brest, France*, poster.