

## ***Interactive comment on “Growth increment periodicity in the shell of the razor clam *Ensis directus* using stable isotopes as a method to validate age” by J. F. M. F. Cardoso et al.***

**J. F. M. F. Cardoso et al.**

joanafcardoso@portugalmail.com

Received and published: 10 May 2013

Reply to reviewer Ms. Ref. No.: bg-2013-88 Title: Growth increment periodicity in the shell of the razor clam *Ensis directus* using stable isotopes as a method to validate age

The authors thank Dr. Paul Butler for taking time to review the manuscript and for his helpful suggestions.

Best regards, Joana Cardoso

Reviewer #1: Overall comments This is a very nice study of growth increment formation in *Ensis directus* and the use of the stable oxygen isotope response to seawater tem-

C1766

peratures to validate annual periodicity. The research is described very clearly in the text, with appropriate, uncluttered and informative Figures. I would recommend very few changes or additions as far as the substantive science is concerned (and these are all minor suggestions). Most of the points I make below relate to typographical errors or attempt to improve some phraseology.

P 4305 L 26: . . . may cause errors in age determination to be made on the basis of . . . Reply: corrected.

P4306 L 5 ‘extend’ rather than ‘extent’ Reply: corrected.

P4307 L 17 ‘Building’ rather than ‘Buiding’ Reply: corrected.

L 20 It would also be interesting to know the depth at which the bivalve were collected. Reply: depth data were included in the revised version of the manuscript.

P4309 I think it would help the reader to have a picture showing the transects used to mill the samples. Reply: we have included a picture (please see attached) showing the drilled transects in the supplementary information of the revised version of the manuscript (new Figure S2).

P4310 L 4 ‘near’ rather than ‘nearby’ Reply: corrected

P4311 L 10 . . . four lines were considered to be annual by analysis . . . Reply: corrected

L 12 ‘shell 6’. There is no shell 6 Reply: it refers to shell 2 and not 6. This section was deleted as it appears later on, in section 3.3.

P4312 L 10-12 I suggest rephrasing this as follows: ‘By matching measured and predicted values, all the 18OS samples were assigned to the months April to October, with most samples being assigned to June to September’ Reply: changed

L 23 ‘The age . . . ’ rather than ‘Age . . . ’ Reply: corrected

C1767

L 25 'Age estimation took account of the fact that all shells . . .' Reply: corrected

P4313 L 3 '. . .to be . . .' rather than '. . .as being . . .' Reply: corrected

L 6 Since the 'last period of growth' might be interpreted as the period since the last increment, I suggest rephrasing this in terms of increments, eg '. . . the last complete increment was considered to have occurred in 2009 . . .' Reply: corrected

LL 3 – 7 On a more general point, when I've just had my fourth birthday I call myself 'four years old', even though I'm in my fifth year. So I think your shells should be described as one year younger than you say. Reply: ageing was done in relation to the year they were born (similar to what is done in humans). The shells were collected in April 2010, at this time they have just entered (or were about to enter) their next year of growth (spawning occurs around April/May; Cardoso et al. 2007). That is why we considered that their age was the year of collection minus the year of birth (for shells 1 and 3: 2010-2005 = 5 yr old (entering the 6th year of growth); shell 4: 2010-2008 = 2 yr old (3rd year of growth); and for shell 2: 2010-2004 = 6 yr old (7th year of growth)).

L 17 I suggest 'was' rather than 'could be' Reply: corrected

P4314 L 13 '. . . and that the growth stop occurs . . .' Reply: corrected

L 16 As this is the first time have referred to *A. islandica*, you need to use its full designation. Reply: corrected

P4315 LL 11 – 19 Do you detect any extra increments or disturbance lines associated with this event ? Reply: No, we saw no disturbance on the shells during this period. This information was added to the text.

P4316 LL 10 – 12  $\delta^{13}\text{C}$  is markedly lower at the growth line – it is usually the lowest value each year. This would tend to support the idea that more metabolic carbon is used at this time (since metabolic carbon is very depleted in  $\delta^{13}\text{C}$ ) Reply: this information was added to the text

C1768

LL 18 – 20 Although you say here that growth resumes around April -and the 180 measurements support that interpretation, I did notice that in Figure S3 there seems to be no growth until July. Is that just a lack of resolution in the field measurements (unfortunately I can't access Witbaard et al 2012) ? Reply: this difference has to do with the fact that data from Figure S3 are a mean of many shells with large individual variation in growth. Some large shells already showed clear growth early in the year but in small shells this was almost not noticeable or they hadn't grown at all. So the mean was close to zero in spring and mean growth was only visible in the summer. The report by Witbaard et al. 2012 is indeed not available yet on the NIOZ website. We'll try to make it available as soon as possible.

P4317 LL 1 - 2 same point about the ages as P 4313 above. Reply: please see reply to the above point.

LL 18 – 20 I suggest rephrasing as follows: "In contrast, shell growth in the present study was in general higher than that observed off the English east coast (Palmer, 2004). The mean annual temperature pattern in the Dutch Wadden Sea and off the Dutch North Sea coast is similar . . .' Reply: corrected

P4318 L 3 'reflection' rather than 'reflexion' Reply: done

References Can you check the cross references – I noticed that Keith et al, Khim et al and Krantz et al 1987 are in the reference list but do not appear in the paper (and I only checked the Ks!) Reply: references were checked and corrected

Figures Fig 3 – The axes are not labelled. Also, I suggest you take out the first (leftmost) date on the x-axis. That's because all the other dates come just before a growth line, and it's a bit misleading to have a date there which isn't followed by a vertical line. Reply: axes were labelled. The leftmost date was deleted (also in Fig. S3(old figure S2))

Supplementary material Fig S2 – In the top plot, 'Shell'is missing the final 'l' Reply:

C1769

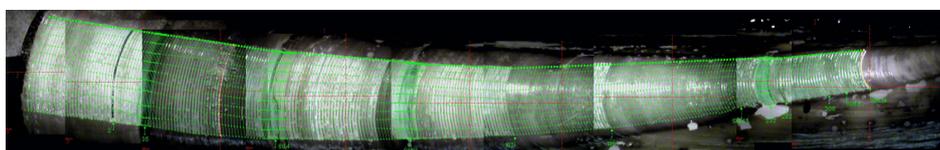
corrected. This Figure is now Fig. S3.

Fig S3 –As the text refers to months (eg 'July and August' on P4313 L 22), could you also use months (as words) in the caption? Reply: done

---

Interactive comment on Biogeosciences Discuss., 10, 4303, 2013.

C1770



**Fig. 1.** Figure S2\_new

C1771