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Biogeosciences Discussions
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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.

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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. David Goodwin for reviewing the manuscript and for his comments and suggestions.

Best regards, Joana Cardoso

Reviewer #2: This manuscript reports on age determination of the razor clam Ensis directus using periodic growth lines that were validated using oxygen isotope varia-

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tion. The study was carefully designed and the methods were appropriate. Both the results and their interpretation are reasonable. The authors draw several interesting conclusions regarding the timing of intra- and inter-annual growth that will of interest to a broad range of scientists. I recommend this manuscript be published pending minor revisions. Most of my comments below are minor and can easily be addressed.

4305-15: What is meant by "role"? Please clarify. Reply: we mean the importance of E. directus in the Dutch coastal ecosystem. We have re-written the sentence as “To evaluate the importance of E. directus in the Dutch coastal ecosystem, studying its population dynamics is essential.”

4307-23: This sounds like shell height to me. Reply: We called it shell length because it is the longest measure of the shell. To avoid confusion we specified that we define it as the distance from the dorsal to the ventral margin. In this way we don’t think there are misunderstandings.

4309-11: Is there any literature that discussed equilibrium in this taxon? If so, cite it here. Reply: we haven’t found any information on oxygen isotope equilibrium in the genus Ensis.

4310-4: "Nearby" is not specific enough. Please include a map showing the collection sites. Reply: We have changed the sentence to “Observed sea surface temperature and salinity were obtained via Waterbase (http://live.waterbase.nl/waterbase).” In the following sentences we say at which locations temperature and salinity were taken, giving the coordinates of each site. There is a map in the supplementary info showing the locations of the different sites, we have included a scale bar, to give an idea of the distance between these sites (Fig. S1_new).

Can the authors speculate on the degree that temperature and salinity vary over the distance between the three shell collecting localities? Reply: The area is a well-mixed zone with tidal currents up to 1.2 m/s. In terms of temperature, observations in 1 day in June 2011 have shown that there were no differences between locations over the entire

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water column. Nevertheless is it likely that the near coastal site has a bigger variability in salinity than the offshore locations because of freshwater influence. Observations on salinity taken in June, in a day with very calm weather conditions, suggest that salinity near the bottom is 2-2.5 permil higher (27.5-versus 30) at the stations furthest from the coast. However we do not have at the moment any long-term data on this. We have included a sentence regarding these aspects in the M&M section of the revised version of the manuscript.

4311-5: Why is the linear version used here while Dettman's alpha version is used earlier? It seems to me this explanation could be a bit clearer. Perhaps present it all at once. Reply: we have re-organised the paragraphs and put the section dealing with the temperature estimation following the section dealing with the comparison of measured and predicted isotope values. We changed the sentence to make clear that to reconstruct water temperatures we have solved equation [1] for temperature according to Dettman. We think that in this way it is clear that one eq. derives from the other and that the eq. for reconstructing temperatures used measured values of δ18O in the shell (relative to VPDB) and water (relative to VSMOW) in a simple and direct way.

I really liked the discussion of the timing of shell deposition with respect to reproduction. Similarly, the relationship of oxygen and carbon isotopes is certainly worth of additional study. Given that age can apparently be reliably determined from external growth lines, would it be possible to collect more specimens from the on-shore/off-shore transect and construct a larger number of growth curves? Having a larger data set would strengthen that argument regarding inter-annual growth rate differences perpendicular to shore. Reply: comparing growth rates along an inshore-offshore transect is for sure one of our future plans and an interesting thing to do. One of the co-authors (Rob Witbaard) has already started analysing shells from one of the locations but a lot still needs to be done as we have a huge collection of shells, as well as measurements on tissue growth and reproduction. We roughly know that more offshore stations have longer and older

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specimens suggesting that at least survival is better offshore. We will certainly continue analysing these shells to have an idea of differences in growth between locations but it is something that still requires a lot of work. In the present manuscript we focus on the validation of the growth lines and analysing differences in growth will be part of a future manuscript.

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

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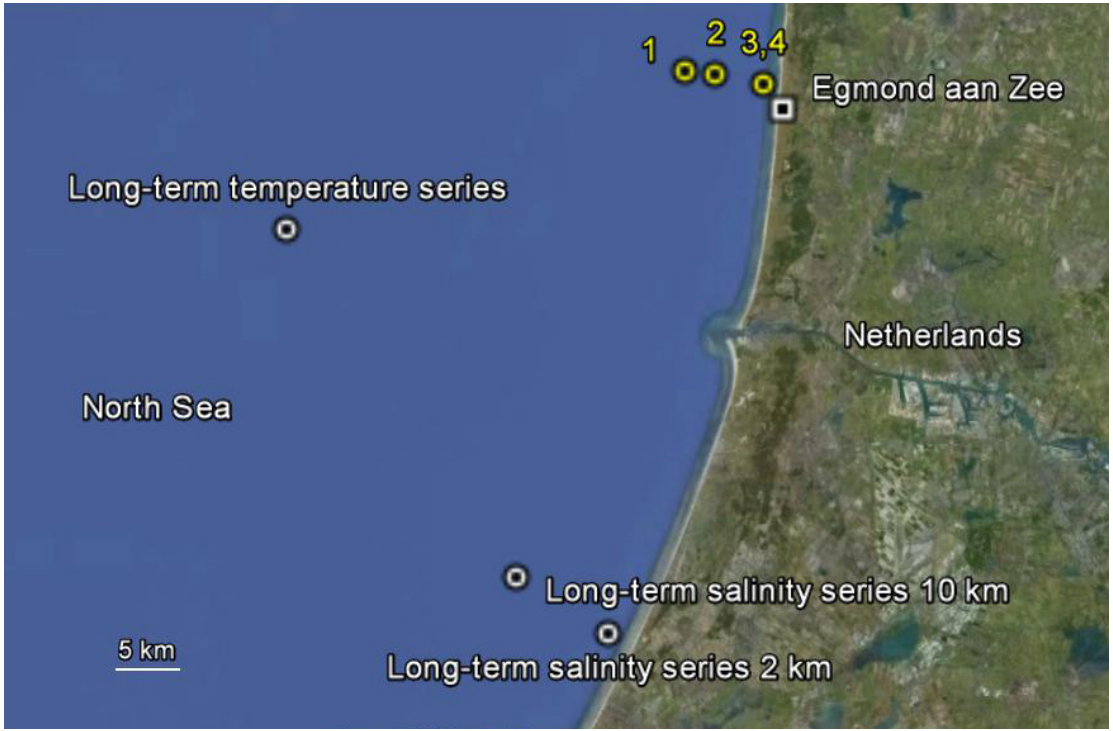

Fig. 1. FigS1_new

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