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Interactive comment on "Age structure, carbonate production and shell loss rate in an Early Miocene reef of the giant oyster *Crassostrea gryphoides*" *by* M. Harzhauser et al.

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This paper describes the Early Miocene giant oyster bed suggesting such the ecological aspects as age structure, carbonate production rate and taphonomic shell loss in the fossil reef of Crassostrea gryphoides. Their methods using digital laser scanning to measure the size, form and area of individuals and age structure are very interesting and challenging. The results seem to be important due to providing detailed quantitative data of the well-preserved shell bed. However, several aspects concerned with observations, methods and measurements are not well described in some places. For example, the detailed observation of the fossil bed and the treatment of the exposed

surface before scanning are not defined. The fossil bed surface is really flat, wavy or undulated? If undulated, how its dimension? The surface is naturally exposed, or was treated with water washing? Broken fragments are fully extracted? Only monospecific? If associated fauna is detectable, what composition? At least such the related information should be briefly described or refer to their previous papers, e.g. Harzhauser et al. (2015) etc. Taphonomical observations on the shell bed surface, vertical and oblique sections and their unified mode of occurrence by outcrop, photo and scanned image provide more detailed information: some dense and scattered mosaic, colony-like concentration, bouquet structure, 3D stacking pattern, etc. Such kinds of basic observations should be described if already done. Anyway, the taphonomic information included in the shell bed had better be used as much as possible. As paragraphs of text are generally long and not easy to be understood, some appropriate line feeds should be inserted following contexts.

As the purpose(s) of this paper is (are) not described in the last part of introduction, it had better add a few purposes suggesting the significance and importance of this paper. This will enhance the reliability of this work to readers. As individual species concerned are not well identified in taxonomic note, it had better use specific names clearly. Paragraphs in section "3.3 Length frequency data" seem to be ambiguous about the aim and not so well organized in context. At least it had better mention these data treatments and their significance clearly, referring to figures.

As English is moderately well organized, the manuscript will be acceptable after careful and moderate English corrections. Several detailed reviewer comments are indicated below. Authors should pay attention to them on some disunity and ambiguous sentences as well as several minor mistakes. Furthermore, the reference should been checked based on the standard of Biogeosciences again. I hope the authors' work goes well.

Page 2 7: sessile → basically/usually sessile As there are some secondary semi-infaunal bottom dwellers and the similar life style during the life span of the same ses-

sile species on muddy bottom according to Chinzei (1995; 2013), it had better mention the broader ecology. 11: The largest and fastest → insert line (better?) 27: with the onset of the Pliocene cooling → at/until ? (better?)

Page 3 5: a comparison with surveys for modern oyster reefs → awkward? "surveys for" is unnecessary? 5: Herein, we analyze → insert line (better?) 6: Crassostrea reef → Crassostrea shell bed (better? due to first appearance, not yet defined as a real biotic reef)

8: It had better discriminate oyster shell beds from biotic reefs. In case of events beds, original reef structures as not sedimentary but biogenic in situ shell accumulations were destroyed somewhat or not a little at least. After confirming the preservation of original reef structure, reefs are available to use. Anyway, I recommend to keep consistent and careful usage for fossil shell beds and reefs. 7: geotainment park → As this is not a familiar term, it had better add some additional explanation or reference. Different from geopark? 10: the patterns → What patterns? Awkward? 12: the population structure of an oyster reef → In this case "reef" is used appropriately. 12: Miocene Climatic Optimum → Whose definition? Refer to some related papar(s). 18: The status of the extant species → What status? Taxonomic? 22-23: certainly not conspecific with the European fossil species → Why? It had better add (a) brief reason(s). 23: "It" → What species? Ambiguous? 28-30: Why? awkward? 31: What are "the both groups"? What extant species? As mentioned with the fossil species in the previous sentence, confusing among groups and extant/fossil species?

Page 4 1-2: Ambiguous? What are "both groups"? What aspects of both groups are divergent? Are both groups are different from the Asian Pacific group? What is the Asian Pacific group? 3: this genetic evidence and biogeographic separation → difficult to catch the relation among both groups and the Asian Pacific group. 7-8: refer to a description of the type species → ambiguous? Though mentioned with no formal description in Salvi et al. (2014), how do you refer to "a description of the type species". 12: oyster reef → In this case, oyster shell bed is better, before describing the

taphonomical characters of the bed. 12: is excavated → was excavated? (better?) By whom? How? Already exposed? 13: part → a part 14: upper Burdigalian, Karpatian → upper Burdigalian and/to? Karpatian 15: Alpine-Carpathian thrust-belt (Fig. 2) → If possible, indicate the belt on Fig. 2 16: represents → is dominated by (better?) 16: quick → frequent? (better?) 16: which formed → was formed 19: fairly well understood → ambiguous? What mean? 20: The oyster reef → insert line 22: the section → What section? 24: was opposed by → Is this the common usage? 31: the Crassostrea shells → Crassostrea shells (better?) 32: the reef → Where? Indicate the detail of the locality.

Page 5 1: range of 9.8°C → 9.8-??°C 7: below fair weather base → Why below fair weather base? 8: the original distribution patterns → Of what? 12: site → What site? 28: the digital surface model → Refer to some paper concerned with this model. 30: were identified → How? 31: 1121 are complete shells → How identified? How complete?

Page 6 2-3: the main cause for fragmentation seems to be predatory and hydrodynamic breakage → Why concluded? Predatory and hydrodynamic breakage looks different on the fracture property? How about artificial excavating works during making flat bedding surface? 6: morphologies → In this case, shell outline? 10: imaginary → estimated? 11-12: shell margins, which comprise about 1000 points on average → ambiguous? What kind of points? 12: outline point number → number of outline points ? 16-19: awkward? What the boundary? Why the edges are the ... transform? What is this tree? 20: What is the difference between shell length (line 7) and centre line length? 20: rounded to the nearest mm → ambiguous? 23: raw data and log-10 → raw and log-10 (better?) 23: Area data → How do you get the areal data? What does "area" mean? 26: ambiguous? 26: manual outlines → What mean?

Page 7 5: cohorts → At the first appearance place of this term, it had better make a brief definition of the term or refer to some paper concerning the term at the same meaning. In taxonomy, cohort means an informal taxonomic category between class and order.

7: communities → Due to an inappropriate usage of this specific term in ecology, other term should be used. 8-11: Whose works? Refer to the concerning paper. 12: were subjected to → awkward? 26: increments are formed annually → What does "increments" mean in this case? Usually following diurnal, daily, spring-neap, seasonal and annual cycles, a few kinds of increments as shell materials are formed periodically. 26-28: ambiguous? What does "perpendicular convex ridges and concave furrows" mean? I had better use morphological terms commonly used in conchology or some descriptive papers concerned with ostreid shell morphology. Otherwise refer Fig. 3, showing the detailed morphological features of ligament areas 29: convex tops → What mean?

Page 8 4: a second one → the second one 4: from a slightly younger site → from a slightly younger horizon (?) Another different site? 6: as base → as a base (better?) 7: biostrome → In different text pages, reef, biostrome and shell bed are separately used for the same bed. Consistent usage is desirable. 10-11: late Langhian → upper Langhian 14-15: rate constant → What kind of rate constant?

Page 9 1: Image analysis → The image analysis (better?) 5-7: Using 1.2 g cm-3 for the chalky layer and 2.2 g cm-3 for the 5 foliate layer as rough estimates result in a mean density of 1.84 g cm-3 and 1.81 g cm-3 for the right and left valves, respectively.→ Using 1.2 and 2.2 g cm-3 for the chalky layer g cm-3 for the and foliate layers as rough estimates, mean density results in of 1.84 g cm-3 and 1.81 g cm-3 for the right and left valves, respectively. 8-9: the entire data set → What mean? 20: In a first step; in a second step → In the first step; in the second step 22-23: the geometric transformation is determined, which puts → awkward? Page 10 3: the protected site → ambiguous? Necessary for brief explanation. 9: Lopez → Lopes ? 19: size-frequency cohorts → What mean? "cohorts" should not be used in this case? "cohort" is a biogenic group of individuals. In this case you only detected some groups on the coordinate statistically. 19-20: awkward? 20-22: What is a subject in this sentence? "Applying the von Bertalanffy equation to the length data" ? Is this suitable as a subject in the

context? 27: we assume that at least two natural cohorts may be amalgamated in this group. → Why? What reason? 28: pattern → What pattern?

Page 11 1: The data show that old and large shells are rare. → Repetition of line 26 on page 10? 6: is → may result from (better? for example) 18: points to fragmentation → Why selected among three (fragmentation, abration and bioerosion)? 18: key factor → a key factor (for what?) 19: this process → What does this mean? 21: fully degraded within one or two decades → What is the evidence? 22: the taphonomically active zone → What mean? Not described in text well. 22-24: Logically not easy to understand. 26-27: the values for chalky layers → What values? Volume %? Areal %? 27-28: The amount of chalky layers → What amount?

Page 12 19: as secondary soft-bottom dweller → as a secondary soft-bottom dweller (better?) 21-22: 100 specimens per m2 → 100 individuals per m2 (better?) 24-25: with the oyster reef → within the oyster reef (better?)

Page 13 9-10: reflect the combined effect of mortality, respectively the 9 declining life expectancy with age, and the shell loss by biotic and physical factors. → ambiguous; "respectively" usage awkward? reflect the combined effect of 1) mortality, respectively 2) the 9 declining life expectancy with age, and 3) the shell loss by biotic and physical factors. ? reflect 1) the combined effect of mortality, respectively 2) the 9 declining life expectancy with age, and 3) the shell loss by biotic and physical factors. ? 13: Shell half-lives→ Half-lives of Crassostrea gryphoides (better?) 13: two decades the seemingly rigid → two decades. The seemingly (/apparently) rigid (better?) 17: performance → rate? (better?) 25: form → preserve (better?) Reef structures were once formed but not well preserved in general?

Please also note the supplement to this comment:
http://www.biogeosciences-discuss.net/12/C6346/2015/bgd-12-C6346-2015-supplement.pdf