

Dear Antonino Briguglio,

Thank you very much for useful suggestions for improvements to our work.

Please see our point-by-point answer to all your comments below.

Kind regards

Authors

#### Answers to general comments

1. Whilst most of the discussion is deeply speculative, the evidence the authors provide does not leave much room for other explanations than kleptoplastidy, at least during limited time frames of the foraminifer cell's life.

Re: We agree that we do not have direct pieces of evidence for the presented theory but in Paleontology, especially in the case of such old fossils as we studied, indirect pieces of evidence are common methods applied and are usually the only data available for inferring. We are planning to try to do biomarkers in the future however we are afraid that there could be insufficient amount of organic matter within the foraminiferal tests for analysis. What is more, because of the common migration of hydrocarbons in the rock environment there is no evidence that organic matter found inside the fossils is linked to those fossils.

2. I feel the authors should go a bit deeper into the life strategy of this taxon as it was indeed restricted to the photic zone but perhaps could have been mixotrophic most of the times and just sporadically host single chloroplasts after digestion of their prey, keeping them alive for as much as they could. After all, we are just at the beginning of photosymbiotic strategies for foraminifera and things could have been much more unstable as we can observe them today.

Re: We agree, in fact it is our basic hypothesis that *Semitextularia* were mixotrophic foraminifera. We also agree as this very early photosymbiotic strategy, might have been rather unstable. However, we doubt that the forams both hosted algal symbionts and harvested chloroplasts, as we are not aware of that strategy in any protists or invertebrates. The mixotrophic strategy is, of course supported by our isotopic data, specifically different isotopic contrast between foraminiferal test and bulk rock samples, which seems to be related to the paleodepth/illumination intensity.

We have supplemented the revised version of the manuscript (discussion), hopefully clarifying an apparent misunderstanding by the reviewer of what constitutes a mixotrophic strategy. A mixotroph is any organism or holobiont that has the capability of both feeding and photosynthesizing. The mode of mixotrophy, whether kleptoplasty, or facultative or obligate symbiosis between a host and photosynthesizing symbiont, is the question that we cannot resolve in fossil specimens..

3. Literature they refer to, is not the most recent one.

Re: We have added generally up to three references (e.g., early, update, and recent/review), noting by "e.g." that there are often many more possible. We would be very grateful for additional suggestions of missing papers.

#### Answers to comments directly introduced into the manuscript

Line 45 (Introduction) . Reviewer: "such morphological similarities should be addressed with more details. whereas I can easily recognize the similarity between peneroplids and *Semitetularia*, It is more difficult the comparison with calcarinids."

Re: We provided a morphological comparison of *Semitextularia* and peneroplids in more detail in the Discussion chapter.

Line 113. Reviewer: “the authors need to be more specific with the meaning of area (which is quite clear for me) and height (which can be tricky). ideally a shape independent parameter can be the cubic root of the product of the three dimensions (L x I x S). here I think that height is already in the area so it does not consider the thickness and it shall be included, I think”

Re: The test area was measured specifically on the flat side of the test using the software Digimizer. In terms of height and width measurements, they were conducted under SEM. The “height of the test” should be understood as the greatest distance between the proloculus and the last chamber measured on the flat side of the test. However, the “width of the test” means the greatest distance between the edges of the flat side of the test - the measurement was most often done nearly perpendicularly to the height measurement. Unfortunately, we could not proceed with the thickness measurements so they are not included in our analysis at all. Please see rearranged Fig. 1c.

Line 166. Reviewer: “red algae in the devonian have never been reported, but in one study only where the remains were dated to the ordovician. classically red algae start from the jurassic, so they have to be removed. could be dinos or green algae”

Re: This is a misunderstanding, interestingly by both reviewers. Yes, coralline/ calcareous red alga are only well known from the Jurassic, with possible Paleozoic reports. But we are not referring to calcareous red algae, but rather to unicellular red algae that have been recognized from the Proterozoic, at least since Butterfield et al. (1990), with recent articles noting that red-algal-derived plastids gave rise to dinoflagellates, diatoms, and coccolithophorids. For example:

Jürgen F. H. Strassert, Iker Irisarri, Tom A. Williams & Fabien Burki. 2021. A molecular timescale for eukaryote evolution with implications for the origin of red algal-derived plastids. in Nature Communications [from the abstract: "This period in the Meso- and Neoproterozoic Eras set the stage for the later expansion to dominance of red algal-derived primary production in the contemporary oceans,"]

Dear Marcelle Boudagher-Fadel,  
We appreciate all your comments on our manuscript.  
Please find below our answer to all of them.  
Kind regards  
Authors

This paper is an interesting, well-written contribution to the study of the Photosynthetically-active foraminifera. The conclusion and discussion are speculative. The mode of life concentrate mainly on morphological and habitat comparison with the recent photosymbiont-bearing *Peneroplis* and the conclusion of *Semitextularia* being kleptoplastic is based on the the  $\delta^{13}\text{C}$  enrichment in relation to rock matrix samples.

Re: Please see our answer above (Reviewer 1 RE: no. 1).

Endosymbiosis however is a more complex co-evolutionary process and should be discussed involving also different factors such as the temperature during the Devonian;

Re: We are not able to accurately estimate the temperature during sedimentation of Skały and Miłoszów strata. It was a tropical shelf of the Laurussia paleocontinent but we do not have more precise information about the temperature of the Devonian sea in the area of the Holy Cross Mountains. The eventual influence of temperature on C isotope fractionation is too small for observed test-bulk rock contrast.

the composition and wall structure of *Semitextularia* (a thin section of a specimen is important to illustrate in this article);

Re: The pictures of thin sections of *Semitextularia* tests have been added to figure 1 which shows that the testwall and test as a whole are transparent.

the presence of any remains of plastids

Re: We have not found any remains of plastids within foraminiferal tests, nor is such preservation likely in fossil shells.

It is also important to discuss the different life strategy adopted by *Semitextularia*. In this article it is confirmed that they were living in the photic zone and are mixotrophs. Could they have used, however, different sources of energy and carbon, instead of having a single trophic mode.

Re: Based on our data we can say that *Semitextularia* stayed photosynthetically active (possibly not continuously being rather mixotrophic). We would like to avoid more speculative interpretations about different sources of energy as we do not have methods to check and prove it. See also comment: Rev 1 No. 2

What is also missing in the manuscript the listing of the foraminiferal assemblages co-existing with *Semitextularia*. In order to study accurately the mode of life and plaeoenvironment of this taxon you have to take into account the whole foraminiferal and floral assemblages in the studied thin section/rock sample. For instance, what other foraminifera are also found? Would the shape of their tests implies that they are also kleptoplastic; were fragments of algae found in the rocks? etc..

Re: *Semitextularia* was the only plurilocular foraminifera in the Skały and Miłoszów assemblages. *Semitextularia* is the oldest and pioneering multichamber form. Apart from *Semitextularia*, there are also some bilocular and tubular forms from Moravaminidae family and many different microproblematica which ecology are unknown. We have supplemented the ms with this informations.

Some recent literature are not referred to.

Re: We have added generally up to three references, noting by “e.g.” that there are often many more possible. We would be very grateful for additional suggestions of missing papers.

Answers to comments directly introduced into the manuscript

Line 114.  $\sqrt{\text{area}/\text{height}}$ - Do you mean thickness?

See explanation above

Line 150. You need a thin section too

Re: The thin section pictures have been added to Figure 1

Line 166 Reviewer: “Red algae have been reported from the Devonian but not confirmed. Have you found any? Could be green algae?”

This is a misunderstanding, interestingly by both reviewers. Yes, coralline/ calcareous red alga are only well known from the Jurassic, with possible Paleozoic reports. But we are not referring to calcareous red algae, but rather to unicellular red algae that have been recognized from the Proterozoic, at least since Butterfield et al. (1990), with recent articles noting that red-algal-derived plastids gave rise to dinoflagellates, diatoms, and coccolithophorids. For example:

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Line 189 Reviewer: “In my opinion, the only megalospheric specimen is Fig. 1a. The sizes of the tests are similar except for 1a. some of them like 1e the first chamber is broken.”

Re: A comparison of the size range of early chambers has been added, with comparison with known gamonts, agamonts and schizonts of an extant species.