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Interactive comment on "The distinct roles of two intertidal foraminiferal species in phytodetrital carbon and nitrogen fluxes – results from laboratory feeding experiments" *by* Julia Wukovits et al.

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R2: I felt that the rationale to translate these experiments to field based interpretations were rather limited – I suggest the authors strengthen this aspect of the manuscript, making it clear what the findings mean in terms of field-context by reference to a wider literature. If this is not possible, then the translation of these results from laboratory to field studies should be treated with greater caution e.g. tone-down statements such as on line 311.

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JW: The following section was added to the manuscript:

Line 315-324: “Our phytodetritus uptake estimates propose, that the foraminiferal biomass consists of $\sim$ 6 – 8% diatom-derived pC /TOC, with the major amount contained within A. tepida (compare Table 3). An in-situ feeding experiment with deep-sea foraminifera resulted in values of $\sim$ 1 – 12% pC/TOC (Nomaki et al., 2005b). Similar in-situ incubations in the core of the oxygen minimum zone of the Arabian Sea report $\sim$ 15% pC/TOC in epifaunal and shallow infaunal foraminiferal carbon uptake (Enge et al., 2014). In-situ incubations offer results closest to the natural responses of organisms in their natural habitat and enable precise estimates of foraminiferal nutrient fluxes. Although, specific microhabitat conditions can have a strong influence on organismic behaviour. The artificial conditions in laboratory experiments also have an influence on physiological analysis, therefore the obtained results should be treated with caution. However, our estimates lie in the same order of magnitude as the above mentioned in-situ studies and offer a basis for estimations on foraminiferal carbon and nitrogen fluxes.”

R2: Sections of the manuscript, such as 3.3 are very interesting but take a very linear approach – again, cross-reference to any extended literature might strengthen these arguments.

JW: We hope, that the additional paragraph provided in 3.4 works against the section‘s former linearity:

Line 323-333: "Kleptoplasty is a wide spread phenomenon in foraminifera, specifically in species inhabiting dysoxic sediments, where kleptoplasts could promote survival in anoxic pore waters (Bernhard et al., 1999). They might be involved in biochemical pathways within the foraminiferal cytoplasm, e.g. the transport of inorganic carbon and nitrogen (LeKieffre et al., 2018). Further, transmission electron microscopic investigations on H. germanica report a very limited abundance of food vesicles (Goldstein et al., 2018). Kleptoplast-bearing species might occupy a distinct niche concerning their

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energetic demands. Additionally, they might play a not yet discovered importance in the fluxes of inorganic or dissolved carbon and nitrogen compounds. However, secondary producers with high uptake rates and a quick response to particulate OM sources like A. tepida play a strong role in the biogeochemical carbon and nitrogen recycling.

R2: The discussion leaves the reader with a sense of some "loose ends“, so again – perhaps some editing of the discussion to focus on a stronger connection between experiments and field would be helpful. Try to avoid, as in the conclusion (section 5) open-ended discussion where the role for bacteria, for example are never quite tied-down.

JW: Several new sections were added in the discussion (see answers to R1). Further, Line 301-308 were removed in the revised manuscript. We hope this improves the discussion.

R2: Please ensure that you include a proper and complete review of the recent literature (e.g. Jauffrais et al. 2016) on kleptoplasty – you can largely include this in the introduction/state-of-the-art; why not take the opportunity to highlight that "uptake“ remains a critical feeding strategy and despite these exciting new developments, the focus of your manuscript illustrates the critical role of benthic Foraminiferal feeding as a key component in the benthic biogeochemical cycle of the intertidal environment – can you say this?

JW: The following section was added to the introduction:

Line 60-78: "A major, important difference between the two species subject to this study is the fact, that H. germanica hosts functional plastids derived from ingested microalgae (Jauffrais et al., 2016; Lopez, 1979), a phenomenon known as kleptoplasty, which was first described for a sacoglossan opisthobranch (Trench, 1969). It was shown, that diatom-derived chloroplasts in the cytoplasm of H. germanica retain their function (as photosynthetically active kleptoplasts) for up to two weeks (Jauffrais et al., 2016). Further, there is recent proof that H. germanica takes up inorganic carbon

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and nitrogen sources (HCO3 and NH4+) from the surrounding seawater, most likely to generate metabolites in autotrophic-heterotrophic interactions with its kleptoplasts (LeKieffre et al., 2018). Consequently, the mixotrophic lifestyle of H. germanica might lead to a lower demand of carbon and nitrogen sources and thus to a lower ingestion of various particulate OM sources as food sources. In contrary, food-derived chloroplasts in A. tepida lose their photosynthetic activity after a maximum of 24 hours (Jauffrais et al., 2016)."

R2: Personally, I think you could develop the illustrations/figures – these can be helpful to the readership and I would be tempted to add more, including a location map and some supplementary SEM images of the species – as noted above the genus Ammonia is particularly problematic and displays cryptic diversity, does it not?

JW: A location map was added. A supplementary table containing SEM pictures of the species was added.

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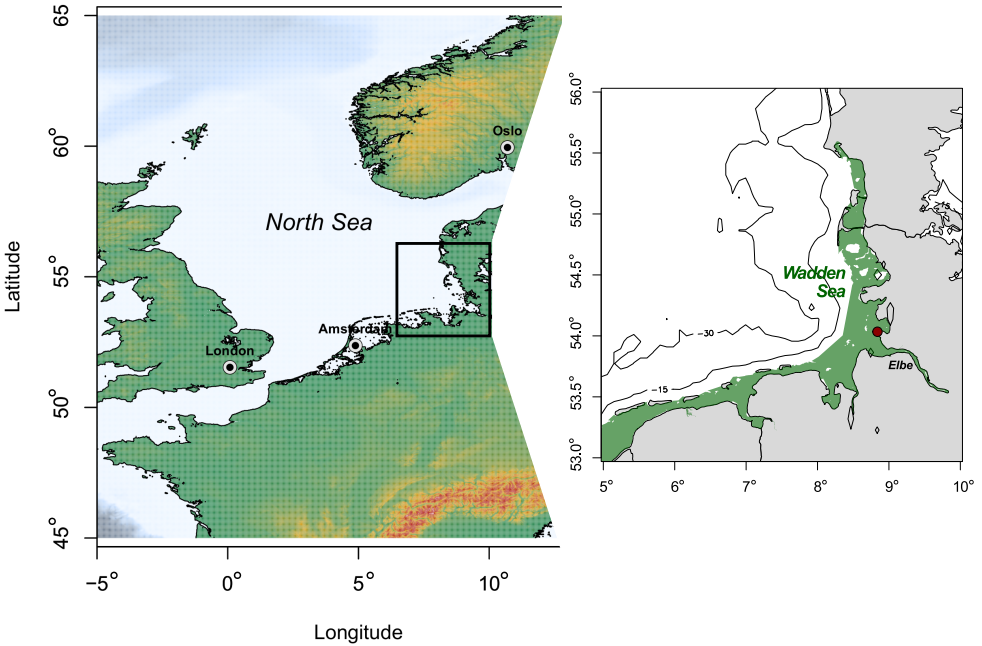

Fig. 1. Sampling Area

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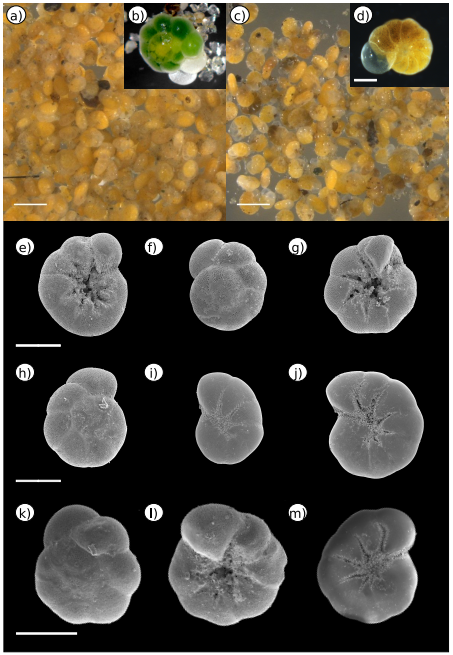

Supplementary Figure 1. a) Light microscope image of fresh picked *A. tepida* specimens (scale bar = 500 µm). b) *A. tepida* after feeding on fresh microalgae. c) Fresh picked *H. germanica* specimens (scale bar = 500 µm). d) *H. germanica* individual (scale bar = 200 µm). e)-h) SEM images of *A. tepida* collected in 2014 at the sampling location of this study (scale bar = 200 µm). i)-j) *H. germanica* collected in 2014 at the sampling location of this study (scale bar = 200 µm). k)-l) *A. tepida* collected in 2016 at the sampling location of this study (scale bar = 200 µm). m) *H. germanica* collected in 2016 at the sampling location of this study (scale bar = 200 µm).

Fig. 2. Supplementary Figure

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