# *Interactive comment on* "Holistic monitoring of increased pollutant loading and its impact on the environmental condition of a coastal lagoon with *Ammonia* as a proxy for impact on biodiversity" *by* Areen Sen and Punyasloke Bhadury

**Anonymous Referee #2**

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In recent years, a number of publications have come up on the ecology and hydrobiology of Chilika lagoon, Asia's largest brackish water system, which is also a Ramsar convention site. The present study attempts to showcase the eutrophic nature of the lagoon including threats due to heavy metal pollution. The authors' layout to demonstrate their view point on pollution effects on the foraminifers is worthy and efforts well taken. Despite it made an interesting reading, the study suffers from various shortcomings without any conclusive cause/effect output. The following comments should help the authors how their study has not reached the specified goals.

Heavy metal pollution in Chilika Lagoon doesn't appear to be intense (no major industries / point sources cited by the authors) nor there is any abnormal level of metallic ions. This aspect appears out of context considering the main objective of this study is to investigate the effects of nutrient loading on the sedimentary organic carbon vis-á-vis the foraminiferal Ammonia sp. distribution and abundance.

The investigation was held for a year at monthly intervals at six selected stations representing organically rich areas and those unaffected by human inhabitation being away. In the process, it is not however clear why the northern part of the lagoon (where many rivers open, Fig.1; line 38; lines 549-551) was not considered by the authors; one or two locations there would have been meaningful.

Measurement of environmental variables was done professionally using appropriate methodologies sans PTE samples, collected from surface only, while they were intended to study effects on sedimentary fauna! This is stringently not in agreement. Despite the shallow nature of the lagoon, considerable differences could occur between the pore water chemistry (as shown with nutrients) and surface/bottom water and therefore the efficacy of PTE data while dealing with infauna is unconvinced.

Descriptions of seasonal variations of environmental variables though thorough could not be used to relate seasonality of Ammonia sp. I am not sure even the authors are clear on this. In such a case why elaborate descriptions on how each of these (nutrient) variables changed with season? This component could be shortened.

Looking at the nutrient features, it is not clear entirely whether Chilika Lagoon is highly eutrophic. The low N: Si ratio found during the study (and therefore abundance of diatoms instead of cyanobacteria; vide Srichandran et al., 2015 cited by the authors) is suggestive of near healthy conditions in the lagoon contrary to what the authors report. It is a bit confusing therefore. No cyanobacterial blooms and only bacillariophyceans in moderate proportions, is a good sign!

What Is the role of seagrasses, if any, in the lagoon? Are there seagrass beds at the

selected sites? Discrepancies are noticed with respect to the distribution of TOC. The highest values at st.C5 as reported by the authors do not conform to river inputs since there are no rivers shown close to the location (see Fig.1).

Coming to the biological aspects, it is not clear why only the top 2 cm of sediment were considered for extracting the fauna; this could be one of the reasons for the overall paucity of Ammonia numerically at the selected sites. Genus Ammonia is known to inhabit organically rich sediments globally often with mono specific dominance overwhelming all other meiobenthos. The present findings (paucity of fauna) are contrary to this, not fully explained by the authors. Whether the organic rich sediments are potentially liable to dissolve calcareous tests, should not be forgotten.

Based on Bray-Curtis similarity, the samples could be divided into 6 clusters, which however showed no specific spatial and/or seasonal variability except that some had only dead shells while others a mixture of live/dead shells in varying proportions. Characterization of either area(s) or season could not be demonstrated therefore. This could be because of lack of adequate number of replicates for a given location/region. It is however interesting the correlation between surface (not pore water) NO3 and sediment TOC was significant. In ecological parlance, correlation coefficients R2 $\geq$0.5 (P $\leq$0.05) are usually the confident levels of acceptance of any existing relationship between the biota and environmental factors.

The ms needs to be checked for typos, grammatical corrections and phrasing. At one place (line 126), it is written 'subtropical'. Chilika lagoon is situated on the Indian seacoast well within 23.50 N latitude.

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