This is a good paper with many interesting observations. Though the text is fine, I would like to focus it more - like the title suggests - to salinity/N-fixer communities. The chapter on Nitrogen fixation rates (3.2.) does not represent typical situation due to the timing of the samplings. nitrogen fixation rates are generally low as the authors have also shown in the text. The chapter could be condensed, and I do not find novelty in the summarizing Table 1. However, the other parts of the article are fine. Introduction should tell us more about the UCYN-A organisms and their ecology as this is one of the major findings in the article.

Authors' response (AR): We are glad to read that reviewer 2 finds our study interesting, we are grateful for the time Dr Kuosa invested into improving our study, for the comments and suggestions. In the revised version, we aimed at setting a stronger focus on salinity/N-fixer communities. We further added a more detailed introduction to the ecology of UCYN-A to l. 68:

'Additionally, the small, unicellular cyanobacterial symbiont UCYN-A has been detected in the Baltic Sea (Bentzon-Tilia et al., 2015). This cosmopolitan diazotroph has previously been shown to be abundant throughout most marine systems (Zehr et al., 2016; Tang et al., 2019), and to substantially contribute to N2 fixation rates (Martinez-Perez et al., 2016; Mills et al., 2020).'

References:

Martínez-Pérez C, Mohr W, Löscher CR, Dekaezemacker J, Littmann S, Yilmaz P, Lehnen N, Fuchs BM, Lavik G, Schmitz RA, LaRoche J, Kuypers MM. The small unicellular diazotrophic symbiont, UCYN-A, is a key player in the marine nitrogen cycle. Nat Microbiol. 2016 Sep 12;1(11):16163. doi: 10.1038/nmicrobiol.2016.163.

Mills MM, Turk-Kubo KA, van Dijken GL, Henke BA, Harding K, Wilson ST, Arrigo KR, Zehr JP. Unusual marine cyanobacteria/haptophyte symbiosis relies on N2 fixation even in N-rich environments. ISME J. 2020 Oct;14(10):2395-2406. doi: 10.1038/s41396-020-0691-6. 2020

Tang, W., Wang, S., Fonseca-Batista, D. et al. Revisiting the distribution of oceanic N2 fixation and estimating diazotrophic contribution to marine production. Nat Commun 10, 831 (2019). https://doi.org/10.1038/s41467-019-08640-0

Zehr JP, Shilova IN, Farnelid HM, Muñoz-Marín MD, Turk-Kubo KA. Unusual marine unicellular symbiosis with the nitrogen-fixing cyanobacterium UCYN-A. Nat Microbiol. 2016

The table summarizing previous studies might not be novel, but we believe that it is helpful for seeing our data in context of other seasons and studies. We however, moved it to the supplementary material.

I have some detailed comments:

Line 30: The Baltic Sea covers an area of 415000 km2 with a permanent halocline preventing vertical mixing, oxygen (O2)-depleted waters in the deeper basins and coastal systems, accompanied with the occasional accumulation of hydrogen sulfide (H2S) and ammonium (NH4+) below the chemocline.

Northern deep basins (Åland Sea and Bothnian Sea) do not have a permanent halocline.

Phosphate accumulation should be mentioned.

AR: We clarified those points and included the phosphate accumulation; the text in l. 30 ff now reads:

'The Baltic Sea covers an area of 415000 km2 with a permanent halocline in the Baltic Sea proper, preventing vertical mixing, oxygen (O2)-depleted waters in the deeper basins and coastal systems, accompanied with the occasional accumulation of hydrogen sulfide (H2S) and ammonium (NH4+) below the chemocline (…). It is further challenged by a high land-derived influx of phosphorous leading to a substantial internal surface water and sedimentary phosphorous load (Gustafsson et al, 2017; Stigebrandt and Anderson, 2020).'

References:

Gustafsson, E., Savchuk, O.P., Gustafsson, B.G. et al. Key processes in the coupled carbon, nitrogen, and phosphorus cycling of the Baltic Sea. Biogeochemistry 134, 301–317 (2017). https://doi.org/10.1007/s10533-017-0361-6

Stigebrandt, A., Andersson, A., The Eutrophication of the Baltic Sea has been Boosted and Perpetuated by a Major Internal Phosphorus Source, Frontiers in Marine Science, vol. 7, 2020, p. 996 , https://www.frontiersin.org/article/10.3389/fmars.2020.572994

Line 44: Reference 'Capone, Douglas G; Carpenter, 1982;' is atypically written compared to others. Capone et al. 1982?

AR: We formatted this reference.

Line 66: 'heterocytous' originating from a cell (cyte) is preferred instead of 'heterocystous' (cyst).

AR: Changed.

Line 66 and 70: '*Aphanizomen*' should be '*Aphanizomenon*'.

AR: Changed.

Line 73: ‘available for primary production’ = ‘available for other primary producers’?

AR: Changed.

Line 86: ‘(e.g. the Bothnian Sea) with a salinity of 0-2’ There may be an error here as the Bothnian Sea is closer to 5 in its salinity.

AR: Changed.

Line 87 onwards: see Laamanen, M. J., Forsstrom, L., & Sivonen, K. (2002). Diversity of *Aphanizomenon flos-aquae* (cyanobacterium) populations along a Baltic Sea salinity gradient. Applied and Environmental Microbiology, 68, 5296-5303. https://doi.org/10.1128/AEM.68.11.5296-5303.2002

AR: This is very helpful- it has been included throughout the manuscript.

Line 105: DIN analysis includes both ammonium and nitrate (+nitrite)?

AR: It only included nitrate and nitrite, we clarified this.

Line 164: ‘dried’ can mean many different methods with different end results. What is used here?

AR: We dried them at 65 degrees C overnight, this information has now been added.

Line 177: ‘basin’ with capital ‘b’.

AR: Changed.

Line 182: The results are given as NOx instead of DIN in the methods?

AR: This was also a comment from the other reviewer, it has been clarified what we mean (see above) and made consistent throughout the text.

Line 184: ‘The detected somewhat higher nutrient concentrations in the Bornholm and Eastern Gotland Basins could result from a decaying phytoplankton bloom, decreased microbial activity or increased eutrophication.’ This should lead to elevated ammonium concentrations.

AR: Correct, we unfortunately don’t have ammonia measurements, but we included a statement on this into the text:

‘The detected somewhat higher nutrient concentrations in the Bornholm and Eastern Gotland Basins could result from a decaying phytoplankton bloom releasing nutrients including ammonia, decreased microbial activity or increased eutrophication.’

Line 192: Only NOx is discussed. Did the samples have notable concentrations of ammonium?

AR: See above, we unfortunately do not have ammonia data from this cruise.

Line 303: ‘Moreover, a very recent study showed that ocean acidification has an impact on the diazotroph community composition and can decrease N2 fixation rates in the subtropical Atlantic Ocean (Singh et al., 2021).’ These N-fixers (*Trichodesmium*) are very different in their ecology. pH may have an effect on their growth, which is then reflected by their N-fixation capacity, not that pH directly affects N-fixation.

AR: Yes, this is a sensitive thought and difference, we clarified it in the text, which now reads ‘Moreover, a very recent study showed that ocean acidification has an impact on the diazotroph community composition and ecology and can decrease bulk N_2 fixation rates in the subtropical Atlantic Ocean (Singh et al., 2021).’

Line 313: ‘In case of a future freshening of the upper water column…’ This conclusion should be tied with basin-wide P-dynamics as it also affects the future of cyanobacterial blooms. I would propose using ‘potential’ in this paragraph.

AR: Good point, we changed this sentence to ‘In case of a potential future freshening of the upper water column (Liblik and Lips, 2019) in combination with increased PO_4^{3-} availability both through land-derived influx and through phosphorous mobilization via bottom-water anoxia (Ingall and Jahnke, 1997; Vahetra et al., 2007; Gustafsson et al, 2017; Stigebrandt and Anderson, 2020), …’.

Additional reference:

Vahtera, E., Conley, D. J., Gustafsson, B. G., Kuosa, H., Pitkänen, H., Savchuk, O. P., et al. (2007). Internal ecosystem feedbacks enhance nitrogen-fixing cyanobacteria blooms and complicate management in the Baltic Sea. *Ambio* 36, 186–194. doi: 10.1579/0044-7447(2007)36[186:IEFENC]2.0.CO;2

Additional changes: We added a personal acknowledgment to Dr Kuosa and an anonymous reviewer.