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Dear Perran Cook,

thank you for your positive comments to our last submitted manuscript. Now we have included the technical corrections (please see next page) and submitted the manuscript once more.
We hope, that we have corrected all typos to your satisfaction.

Yours Sincerely,
The authors

Corrections of the manuscript:

Perran Cook:
Pg2 Line 10 This sentence is unclear. …are motivated by concerns about low-oxygen condition….
The authors*: We rephrased the first sentence, which were unclear. Page 2, line 10f now reads:*
Some of the reviewed studies on cyanobacteria assume that global warming will exacerbate the existing oxygen deficiency in the Baltic Sea. Warming decreases the solubility of oxygen in seawater which leads to lower oxygen concentrations. Further, warming conditions may favour cyanobacteria because they are better adapted to oligotrophy and they benefit from the increased light levels that come along with increased stratification in response to increased air-sea heat fluxes (Carey et al., 2012; Paerl and Huisman, 2009; Andersson et al., 2015b). Increased nitrogen fixation helps to overcome oligotrophy and increases primary production and subsequent export of organic matter to depth.

Perran Cook:
Pg 18 line 14 reword to 'there is little evidence'
The authors*: We replaced the wording: 'there are only few evidences' in 'there is little evidence. Page 18, line 14f now reads:*
The importance of viruses in controlling cyanobacteria abundances is, however, still poorly understood. There is little evidence for the impact of viruses on cyanobacteria.

Perran Cook:
3.3.1 salinity constraints
The authors*: We deleted the duplicate paragraph on Dolichospermum sp. Page 23, line 28ff and an unnecessary sentence about Nodularia sp. on Page 23, line 20f. The paragraph now reads:*

Salinity constrains
The Baltic Sea features a wide range of salinities, ranging from 15-25 PSU in the north western part of the Baltic to 2-3 PSU in the Bothnian Bay. The Baltic Proper, situated in the centre, is characterised by intermediate values around 6-8 PSU. The large spatial variance in salinity can induce large local salinity variations over time when ocean currents mix water masses from different origins. This can decrease the local growth- and photosynthesis rates of algae and cyanobacteria, once specific salinity thresholds are over- or undercut and physiological stress sets in. By this means-salinity has the potential to control the occurrence of cyanobacteria species. Salinity thresholds are set in SCOBI and ECOSMO where growth is not permitted above 10 and 11.5 PSU, respectively. The other models do not include salinity constrains on simulated cyanobacteria.

Field observations show that in most parts of the Baltic Sea large cyanobacteria blooms occur during summer, except in the relatively saline waters in the Kattegat and the Belt Sea. Thus, e.g., Rakko and Seppäälä (2014) conclude, in line with the SCOBI and ECOSMO models, that high salinities seem to restrict the growth of Baltic Sea cyanobacteria and estimate a threshold around 10 PSU. Low salinities, in contrast, do not seem to restrict the growth of cyanobacteria in the Baltic Sea in general and several studies report blooms at very low values: Wasmund (1997) relates Baltic Sea blooms to salinities between 3.8-11.5 PSU and Kononen et al. (1996) report no significant correlation of bloom-forming cyanobacteria in the Gulf of Finland with salinity (i.e., salinities between 3-6 PSU).

The differences between species are substantial. Brutemark et al. (2015) even state, that salinity might be one of the main factors that explains the distribution of species in the Baltic Sea. These statements are supported by laboratory experiments which we list in the following for the most relevant species.

– *Aphanizomenon flos-aquae* is known as a freshwater species (Laamanen et al., 2002). Accordingly, Rakko and Seppäälä (2014) and Laamanen et al. (2002) measured rather low salinities of 0-5 PSU for optimal growth. Rakko and Seppäälä (2014) describe this species as rather coastal, preferring less saline conditions. In line, Lehtimäki et al. (1997) state that *Aphanizomenon flos-aquae* is not able to tolerate salinities higher than 10 PSU. Consistently, its abundance decreases from the northern to the southern part of the Baltic proper.

– The taxa Dolichospermum originate from freshwater, with some strains adapted to brackish water (Brutemark et al., 2015). In agreement, in the Baltic Sea the specie Dolichospermum flos-aquae shows similar growth rates between 0-10 PSU and a strong decrease in growth rates at higher salinities (Moisander et al., 2002).

– For different strains of *Nodularia spumigena* a wide range of tolerable salinities were reported: 0-20 PSU (Moisander et al., 2002; Lehtimäki et al., 1997), while Rakko and Seppäälä (2014) and Nordin et al. (1980) narrow the optimal salinity range down to 5-10 PSU.

To sum up, in most areas of the Baltic Sea, salinity is no restriction for growth of cyanobacteria (an exception are the Danish Straits). Interestingly, however, salinities apparently affect the toxicity of cyanobacteria blooms: Mazur-Marzec et al. (2005) report an increase of Nodularin production for *Nodularia spumigena* with increasing salinity concentrations. In line, Brutemark et al. (2015) found the highest intracellular toxin concentration at the highest tested salinity concentrations (6 PSU) for *Dolichospermum spp.*.