

Review manuscript bg-2020-494

*Reviews and syntheses: Trends in primary production in the Bay of Bengal – is it at a tipping point?*

by Carolin R. Löscher

The BoB has been hypothesized to be “at a tipping point” towards reaching severe anoxia in intermediate waters. Löscher provides an historical overview of primary productivity, nutrient limitation and phytoplankton community composition in the BoB. In the BoB, decreasing nutrient availability has caused a shift from large to small phytoplankton and a consequent decrease in primary productivity over the past two decades. Löscher challenges the view of the BoB as being about to become anoxic based on the apparent decrease in primary productivity, which would require less oxygen consumption in the water column.

The limited amount of in situ data available makes these interpretations considerably uncertain, but still of great use in providing a frame of discussion and inspiration for the upcoming activities of the IIOE-2.

Below I provide some minor comments and a few open questions to discuss with the author.

L29: Wouldn't stratification cause the opposite effect by impeding ventilation?

L49: Geological time scale is a bit vague; can you add the time span considered?

L50-51: empirical records?

L56: I would propose adding the time of year when the other rates were measured as a comparison to this indication of summer monsoon here.

L68 onwards: The role of mesoscale features is a bit downplayed, there have been a few publications on this for the BoB recently.

L88-89: better use “underrepresented”?

L107-108: Do you have a reference for this?

L112: Is it? do we have evidence that different community compositions of Synecho/Prochloro provide comparatively quantities of primary production?

L121-124: Organic matter availability would limit non-cyanobacterial diazotrophs, right? Unless you're considering a mixotrophic potential of the cyanobacterial ones (which I buy!).

L135 onwards: what is the cause of this tremendous decrease in nutrients?

L145: Can you elaborate, maybe earlier in the text when the different Prochloros are introduced, on their potential different contribution to primary production? Are some more productive than others? Or is their level of productivity spatiotemporally controlled by the availability/dynamics of the resources that are specifically limiting for each clade?

L149-150: The concept of the tipping point and the discussion around oxygen in the BoB needs a bit more detailed introduction for the non-familiarized reader.

L157 onwards: Probably all these factors co-occur and interact.

L168: Remove “could”?

L169: But point out the seasonal bias in measurements available so far.

L170: But there would probably be a sort of successional equilibrium where nutrient limitation would decrease primary production creating a niche for  $N_2$  fixation, followed by DIN availability stemming from diazotrophs reviving non-diazotroph primary producers back. I guess the key question here is P availability.

L175: frustules?

L179-183: I agree that limited primary production due to stratification would lead to decreased export and less oxygen consumption in intermediate layers, but wouldn't it also impede ventilation?

L201: I would maybe refer to sub/mesoscale features in general, as features other than eddies (e.g. driven by wind) can drive localized vertical mixing.