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ChAOS: Pigments at the Arctic Seafloor with Changing Ice Cover

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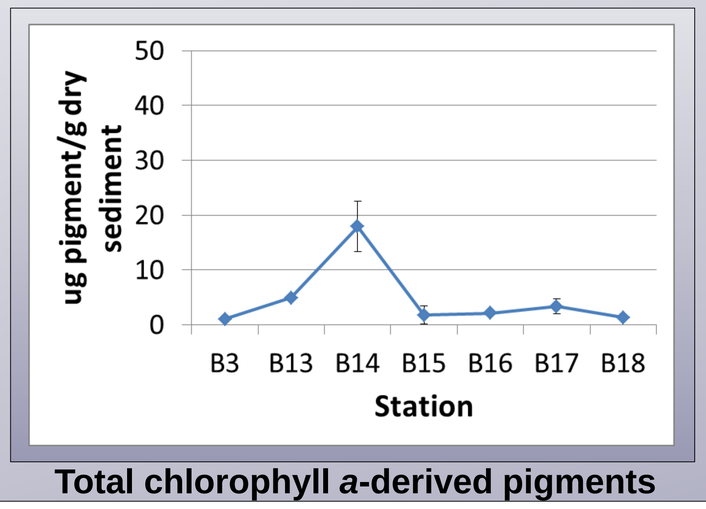
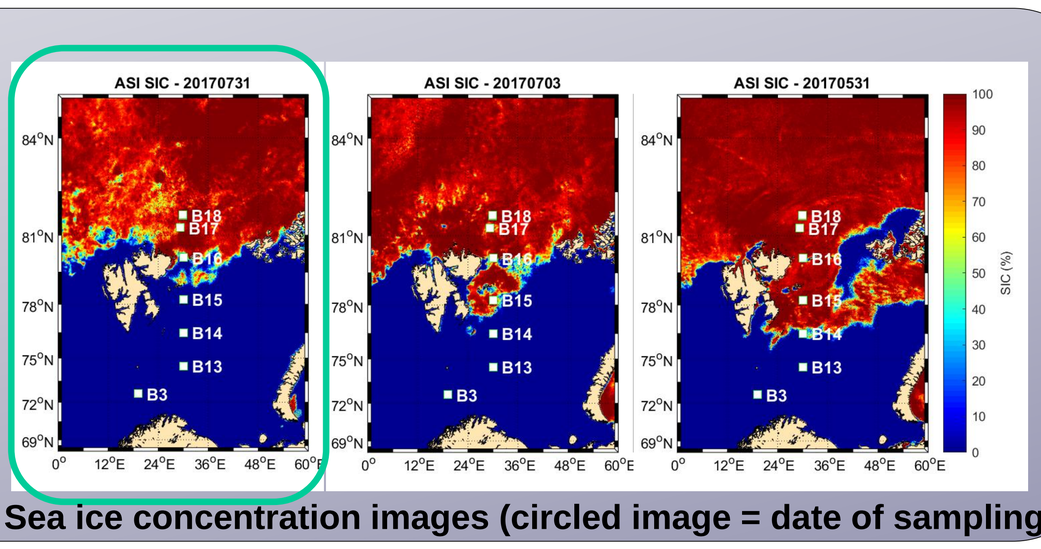
Introduction & Approach

Phytoplankton pigments at the seafloor provide a direct link to the water column primary producer community (Krajewska *et al*., 2017). Pigment degradation products also provide a record of the transformation processes that the autotrophic material has been exposed to (eg. grazing, oxidation; Tait *et a*l., 2015; Steele *et al*., 2018). Here, samples of surface sediment from Stations B3-B17 in the Barents Sea (Fig. 1) were sampled during three consecutive summers, and analysed using high performance liquid chromatography (Airs *et al*., 2001) to quantify pigments and their degradation products. The pigment data are considered together with sea ice cover from satellite images.

2017



Total chlorophyll *a*-derived pigments



Sea ice concentration images (circled image = date of sampling)

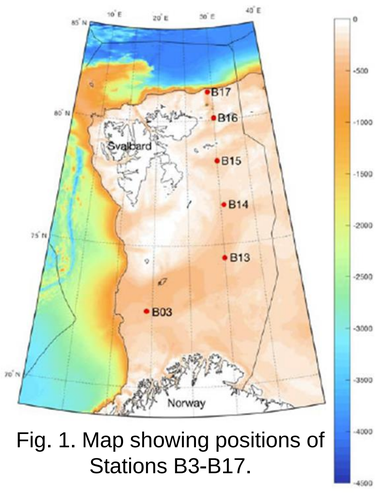
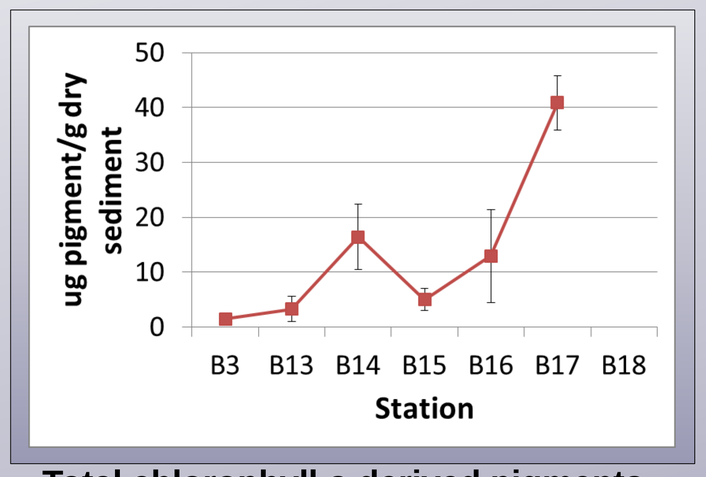
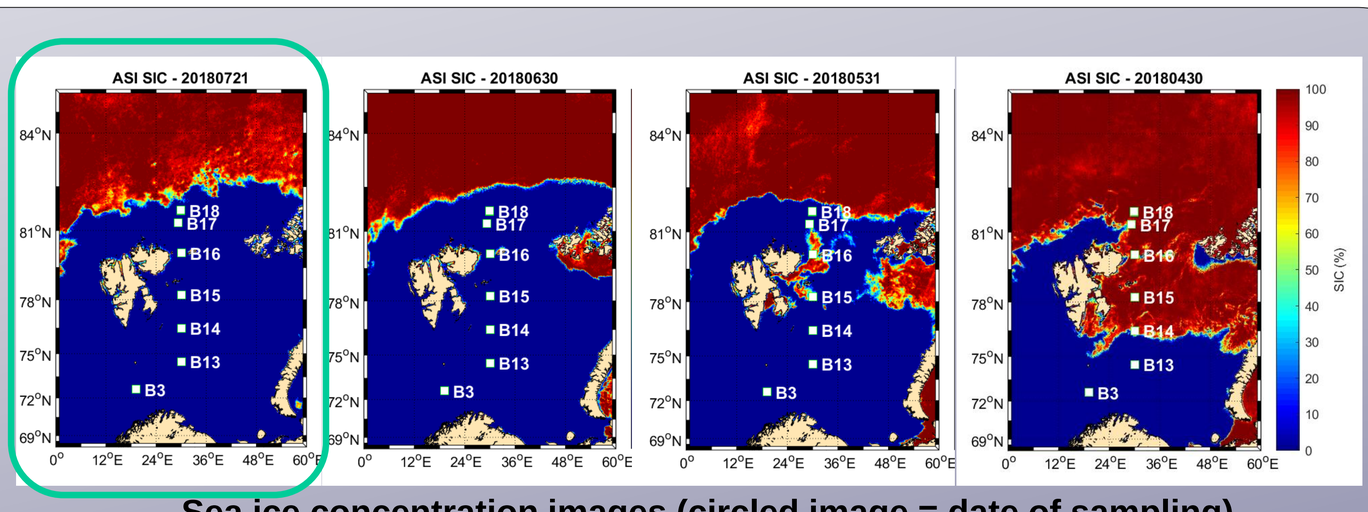


Fig. 1. Map showing positions of Stations B3-B17.

2018

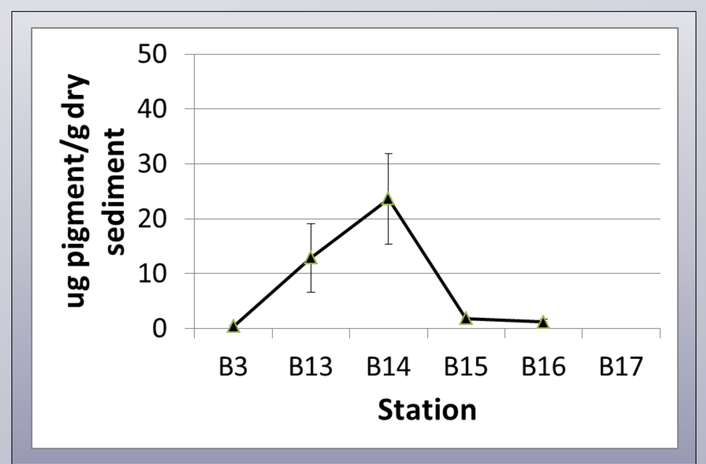


Total chlorophyll *a*-derived pigments

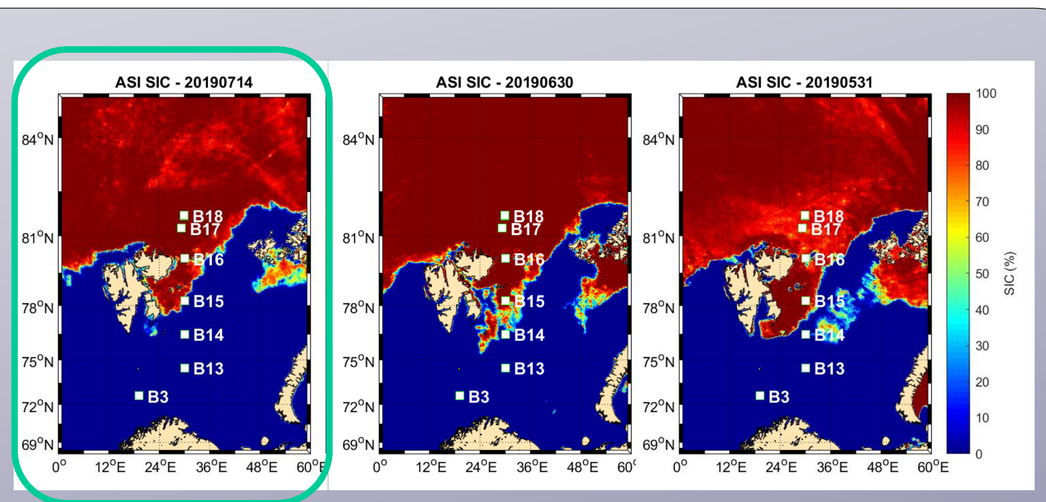


Sea ice concentration images (circled image = date of sampling)

2019



Total chlorophyll *a*-derived pigments



Sea ice concentration images (circled image = date of sampling)

Results & Conclusions

In 2017 and 2019, the edge of the sea ice at the end of June was between stations B14 and B15 (main panel), and the maximum concentration of chlorophyll-derived pigments was observed at Station B14, near the Arctic Front. In 2018 however, all stations were ice-free by the end of June (and most were also ice free at the end of May; main panel). In this case, the highest pigment concentration at the seafloor was observed at Station B17, the station sampled that was closest to the ice edge. The chlorophyll-derived pigment concentration observed on the seafloor at B17 in 2018 was more than twice that observed at B14 in any year sampled. Further, the material on the seafloor at B17 in 2018 had a fresh signature, with 60% of chlorins comprising unaltered chlorophyll *a.* In contrast, the average proportion of unaltered chlorophyll *a* at the seafloor at B14 over the three years was 40%. Together, these data show that early ice melt at Northern latitudes in the Barents Sea triggers autotrophic production that reaches the seafloor in a relatively unaltered state. This provides an additional or earlier food source to the benthos, which may alter the timing or feeding strategies of benthic consumers, and/or provide an additional carbon source for sequestration.

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References

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Tait *et al*., 2015. *Prog. Oceanogr*. 137: 546-558.

Acknowledgements

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