

The role of macro-algae and near-shore mixing on productivity of the fjord

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Description

Greenland is characterized by a vast and heterogeneous coastline. A lot of the marine research as yet has been focused on the central regions of the fjord while processes along a cross-section of the fjord remain largely unstudied. These shallower regions are however often characterized by extensive macro-algae beds or intense mixing and are important breeding and feeding places for fish. In this proposal we aimed to study the importance of these near-shore areas and specifically quantify the role of macro-algae beds and tidal mixing in shallow areas.

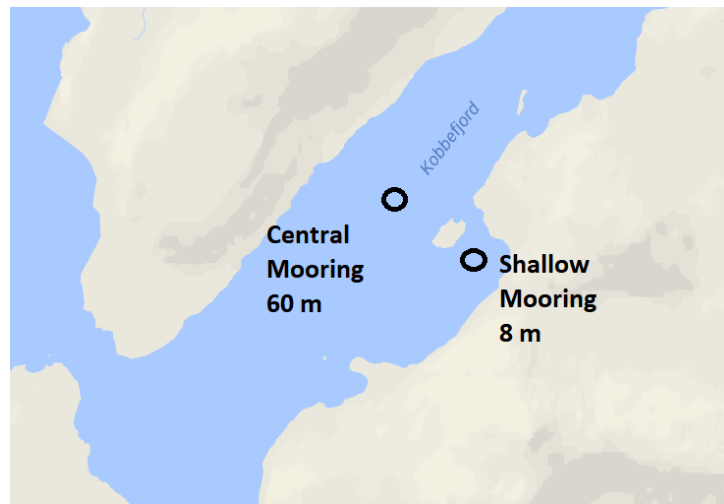


Figure 1: Map of Kobbefjord with indication of location of mooring system (yellow symbols) and sampling transects stations.

From June 2016 to October 2016, moorings were deployed in Kobbefjord at two different locations (Figure 1). One system was deployed in the central part of the fjord (Central mooring, total depth 60 m). One system was deployed in the subtidal zone in between the macro-algae patches (Shallow mooring, total depth 8 m). The instruments (at 5 meter depth) continuously monitored temperature, salinity and oxygen. Along the mooring primary production is measured by ^{14}C incubations using photosynthesis-irradiance (PI) curves.

Figure 2 shows the measure temperature and salinity from June 2016 to January 2017 by the instruments in the fjord. Both instruments show a similar pattern however temperature at the shallow site is higher compared to central part. The maximum temperature in the shallow region is 10 °C while in the central part it is only 7.1 °C. This difference is also reflected in the mean temperature which is 3.66 °C in the shallow area versus 3.14 °C in the deeper area. Similarly to the temperature, salinity is also more extreme in the shallow area which can be linked with the more direct input of freshwater. In the central area, this freshwater is largely mixed already explaining why the spikes in salinity are not as pronounced.

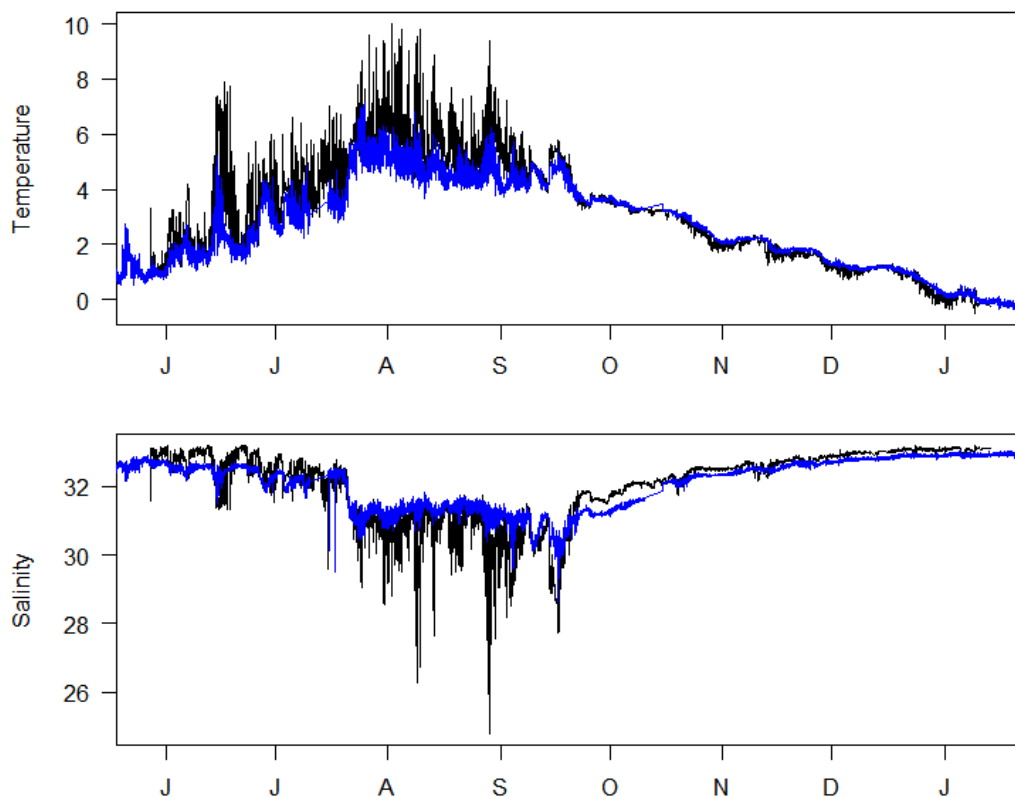


Figure 2: Observed temperature and salinity in Kobbefjord from June 2016 to January 2017. The black line shows the data from the shallow mooring, the blue line the central mooring.

Similar to the physical conditions, we also observed differences in biogeochemistry specifically the oxygen concentration and primary production. Based on discrete primary production measurements with ^{14}C and using the oxygen data from the loggers (Cox et al., 2015), the daily primary production was measured in the two locations (Fig. 3). In the

period from June to January, the primary production in the shallow region was two times higher compared to productivity measurements in the central part (at 5 m depth).

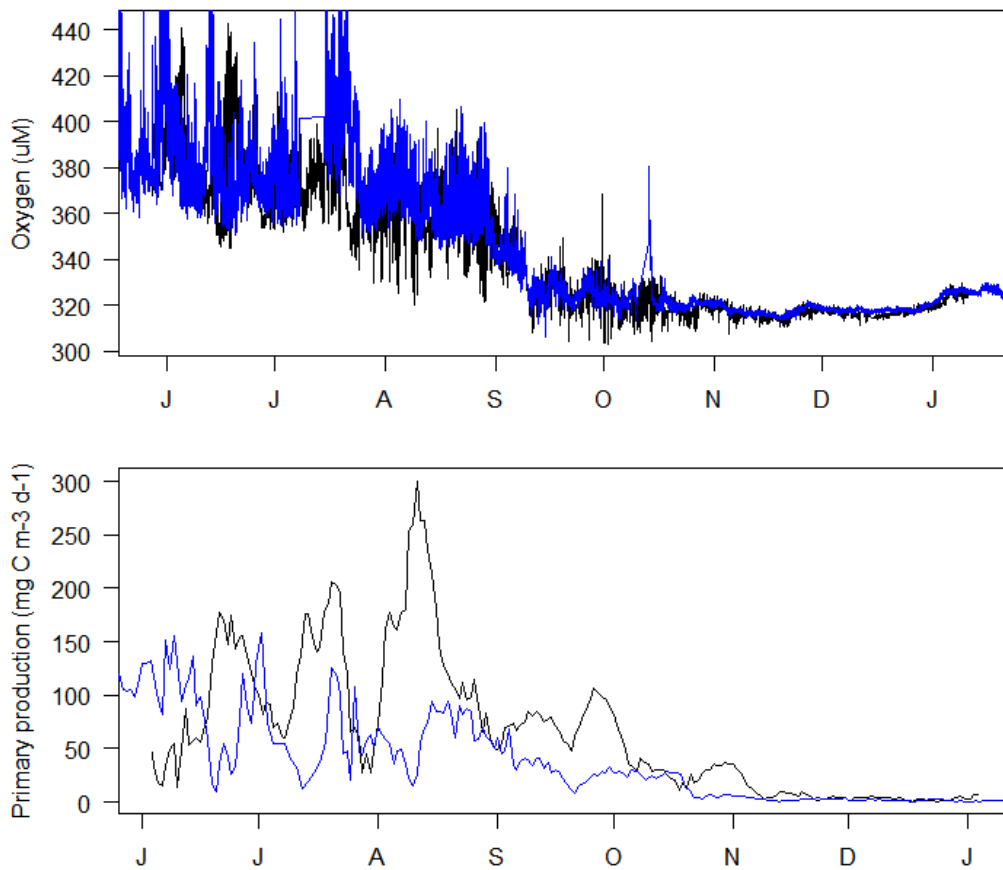


Figure 3: Observed oxygen concentration ($\mu\text{mol L}^{-1}$) and primary production ($\text{mg C m}^{-3} \text{d}^{-1}$) from June 2016 to January 2017. The black line shows the data from the shallow mooring, the blue line the central mooring.

This results indicate that shallow areas are more productive than the central part which likely can be associated with macro-algae. Combined with a warmer temperature, this results in more favorable feeding areas for higher trophic levels (e.g. fish larvae). We aim to further investigate the full seasonal difference between the shallow and central part of the fjord resulting in a publication comparing these sites.

Budget

The money granted for the project was used for following cost:

Table 1: Budget for the proposed project

Budget		Price	Quantity	Amount
Transportation	Deploy moorings and water sampling using Avataq (GINR)	6000	5	30000
Lab consumables	Radioactive 14C (primary production)			15000
Lab consumables	Filters, vials, scintillation liquid			5000
Total				50000