Murmansk Marine Biological Institute KSC RAS

Phytoplankton studies in the ice edge zone of the Barents Sea in the spring of 2016

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INTRODUCTION

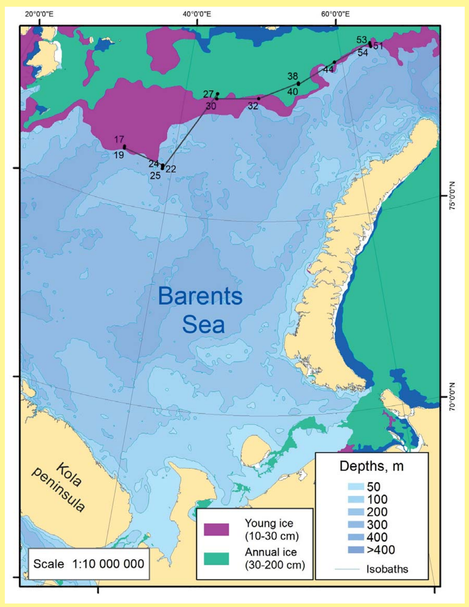
The study of the spring development of microphytoplankton and its pigment composition provides an opportunity to obtain the complete picture of seasonal succession and the production potential of the Barents Sea since most of the annual biomass of Arctic phytoplankton is produced during the spring succession cycle. The high productivity of the Arctic water masses is to a certain extent due to the presence of "bloom near ice edge" where the main organic matter is produced during the vegetative season.

In April-May 2016, the composition of phytoplankton and the spatial dynamics of chlorophyll a concentration in the ice edge zone of the Barents Sea were studied. New data are presented on the concentration of chlorophyll a, the temperature, and the salinity of the water masses.

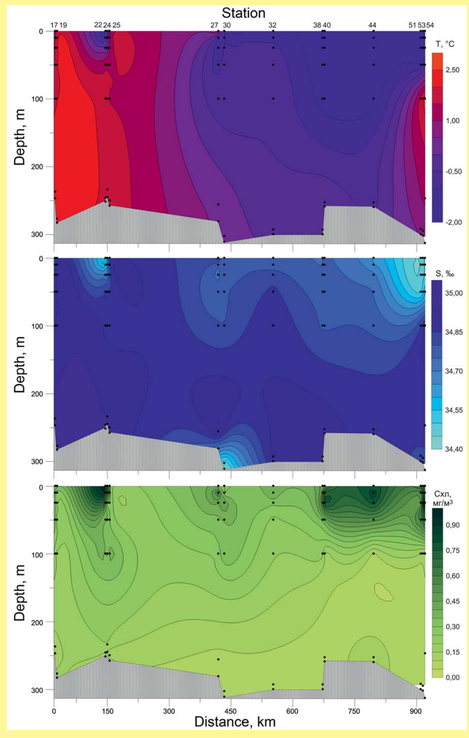
MATERIALS AND METHODS

The samples were taken in the north-east of the Barents Sea shelf in spring 2016 from the board of research vessel "Dalnie Zelentsy". Seawater samples were taken at 14 stations of arbitrary latitudinal cut (south of the Franz Josef Land archipelago) in the fields of young and annual ice. Samples of seawater with a volume of 2 to 3 liters were taken by Multi Water Sampler Hydrobios MWS 12. Samples were taken at standard hydrological horizons (0, 10, 25, 50, 100 m, and bottom). Water was filtered by a vacuum pump (produced by GAST). The Vladipor MFAS-OC-4 membranes, with 0.6 μm pore size were used. The concentration of chlorophyll a was measured by spectrophotometry. UV-Visible spectrophotometer Nicolett Evolution 500 (produced by Spectronic Unicam) were used. The temperature and salinity were measured by SEACAT SBE 19 plus.

The samples were fixed by formalin. The phytoplankton composition was determined in Najott's chamber at × 100-400. Satellites data on the chlorophyll concentration also were used.



Location of sampling stations



Vertical profiles of chlorophyll *a*, S, T distribution. Arbitrary cut. April 2016

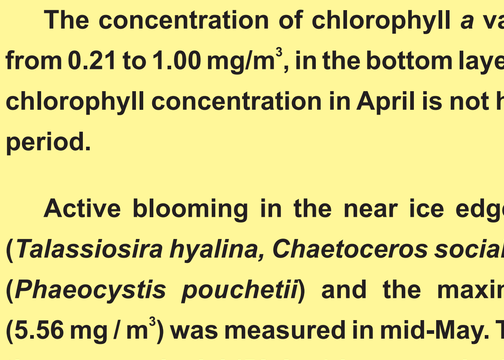
RESULTS

CTD data showed that research was carried out in the Atlantic and Arctic waters. According to the ice situation data and our observations, the ice condition was presented by studge ice, young and annual ice.

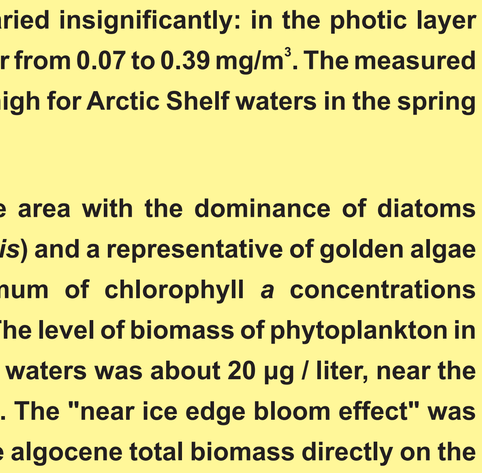
In the structure of the algocenosis, the dominant was the species of early spring phases of the succession cycle. The main dominant taxa were - diatom algae. At the species level, among the dominants were - *Chaetoceros socialis, Fragilariopsis oceanica, Talassiosira hyaline, Talassiosira gravida/antarctica*. The quantity of microalgae in the upper pelagic (0-50 m) varied in the range of 10^3-10^5 cells/liter, the total biomass ~ 100-102 μg/liter.

The concentration of chlorophyll *a* varied insignificantly: in the photic layer from 0.21 to 1.00 mg/m^3, in the bottom layer from 0.07 to 0.39 mg/m^3. The measured chlorophyll concentration in April is not high for Arctic Shelf waters in the spring period.

Active blooming in the near ice edge area with the dominance of diatoms (*Talassiosira hyalina, Chaetoceros socialis*) and a representative of golden algae (*Phaeocystis pouchetii*) and the maximum of chlorophyll *a* concentrations (5.56 mg / m^3) was measured in mid-May. The level of biomass of phytoplankton in the upper pelagial (50-0 m) in researched waters was about 20 μg / liter, near the ice edge - about 180 μg / liter (maximum). The "near ice edge bloom effect" was expressed in the form of increasing of the algocene total biomass directly on the ice edge and at the distance of 1-2.5 nautical miles. At a distance of 5.5 miles from the ice edge, "near ice edge bloom effect" was absent. The concentration of chlorophyll is also decreased with distance from the ice edge. Comparison of field data (chlorophyll) with remote sensing revealed lower values in sub-satellite measurements.

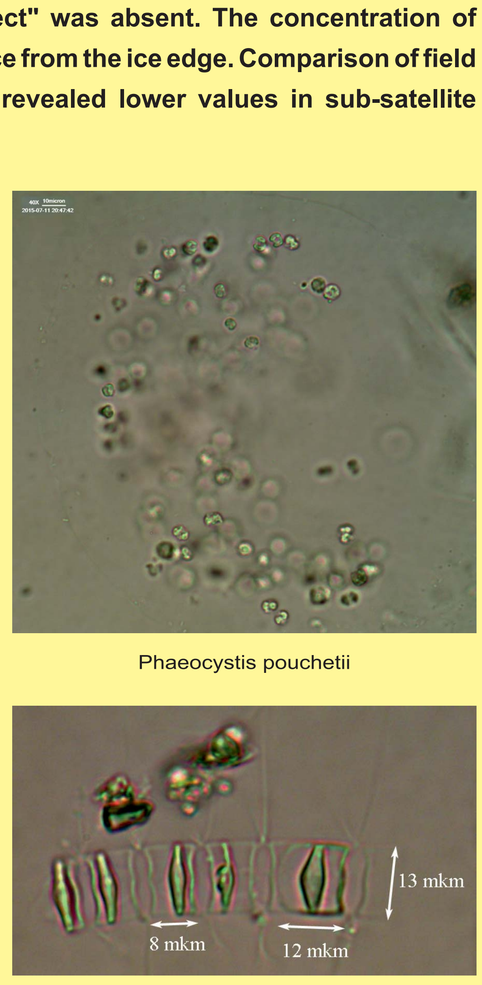


Thalassiosira gravida antarctica



Phaeocystis pouchetii

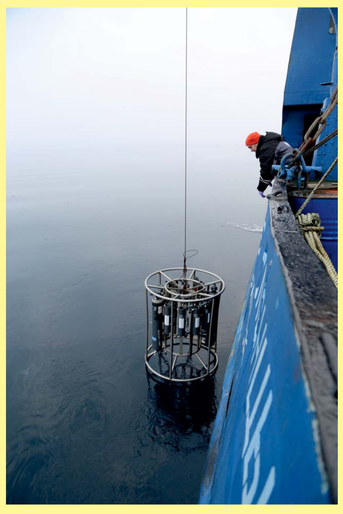
Fragilariopsis oceanica



Chaetoceros socialis

Research vessel " Dalnie Zelentsy"

Field work



Water sampling.
Multi Water Sampler Hydrobios MWS 12

Vessel in the ice conditions

Pancake ice

Filtration unit on the board of the vessel

Chlorophyll concentration determination in situ

CONCLUSIONS

Thus, the composition of phytoplankton, its biomass and low chlorophyll content (≤1 mg/m^3) in April shows the absence of active microphytoplankton vegetation. Intensive blooming in the near ice edge area (concentration of chlorophyll 5.56 mg/m^3), which were mainly presented by diatoms and golden algae *P. pouchetii* was revealed in May.

The "near ice edge bloom effect" reflects the decrease of chlorophyll concentrations and algocoenosis total biomass which are decreasing with the distance from the ice edge.

The results of research can be applied for possible changes analysis in the structural and functional organization of Arctic algal communities under changing climate and increased Atlantic influence and increased insolation.

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