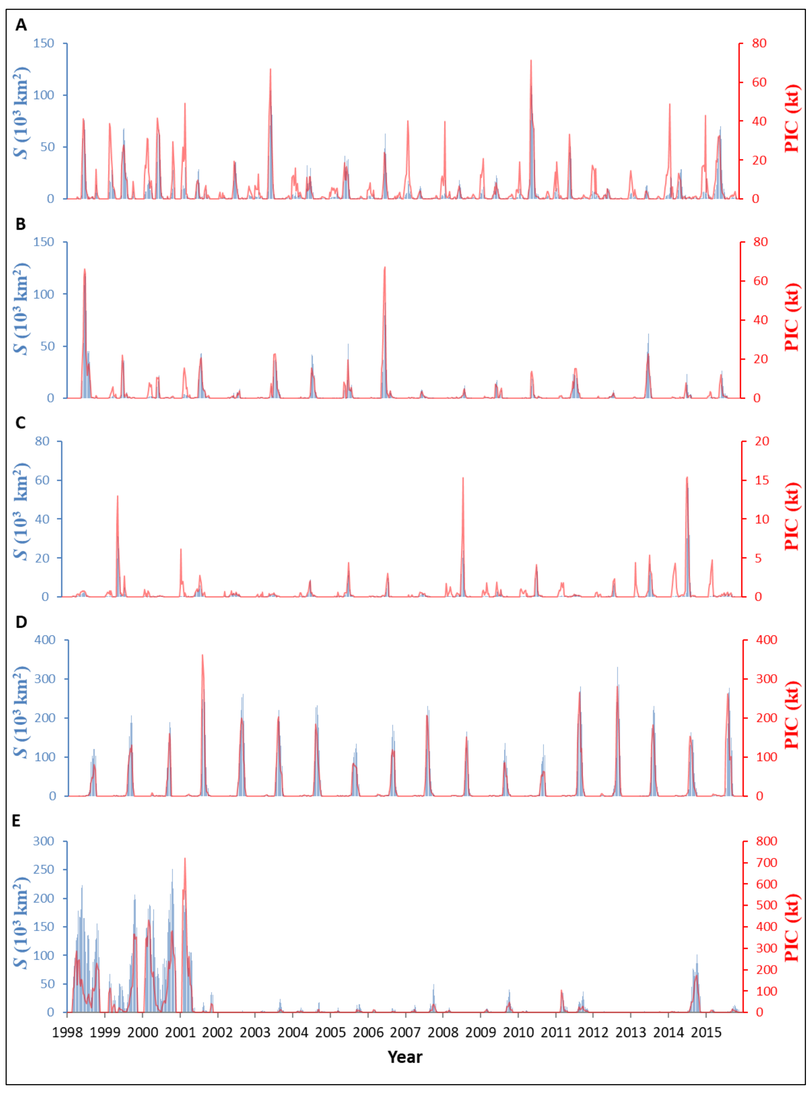
STATISTICAL ANALYSIS OF *E. huxleyi* BLOOM DYNAMICS DRIVEN BY ATMOSPHERIC AND OCEANIC FACTORS IN POLAR AND SUBPOLAR REGIONS

Dmitry Kondrik(1), Dmitry Pozdnyakov(1), Eduard Kazakov(1)
(1) Nansen International Environmental and Remote Sensing Center, Saint-Petersburg, Russia
E-mail: dmitry.kondrik@niersc.spb.ru



Object of the study

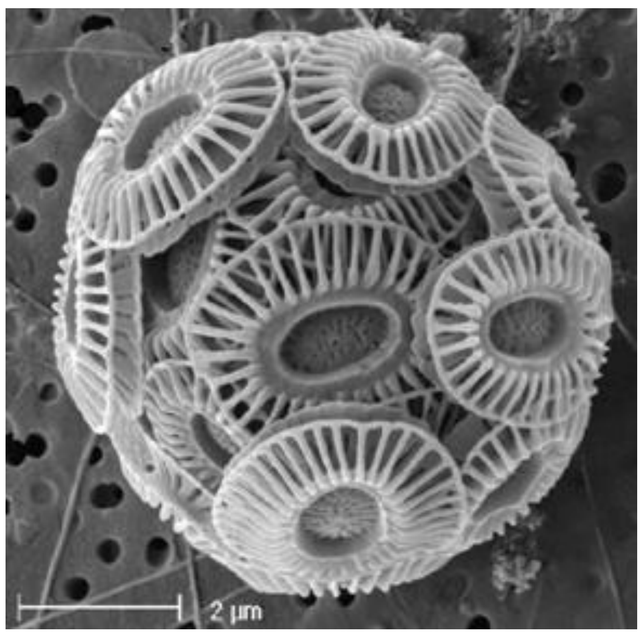


Figure 1. E.huxleyi cell

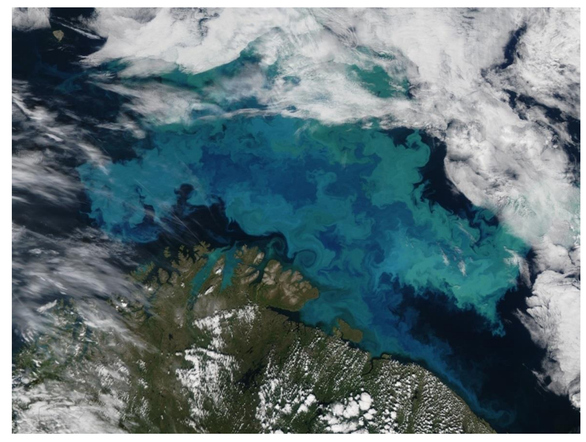


Figure 2. MODIS Aqua image of *E. huxleyi* bloom (14 Aug 2011) in the Barents Sea from NASA website

Figure 3. *E. huxleyi* bloom area dynamics and total PIC content for studied seas:

A. North
B. Norwegian
C. Greenland
D. Barents
E. Bering

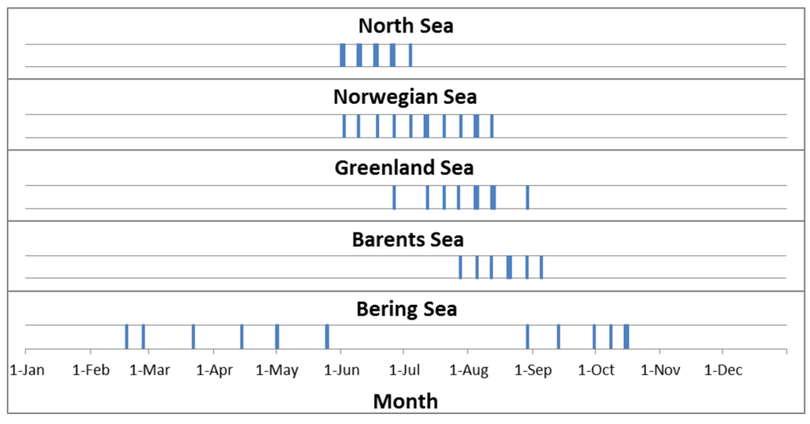


Figure 4. Largest bloom extension occurrences for all years

Results

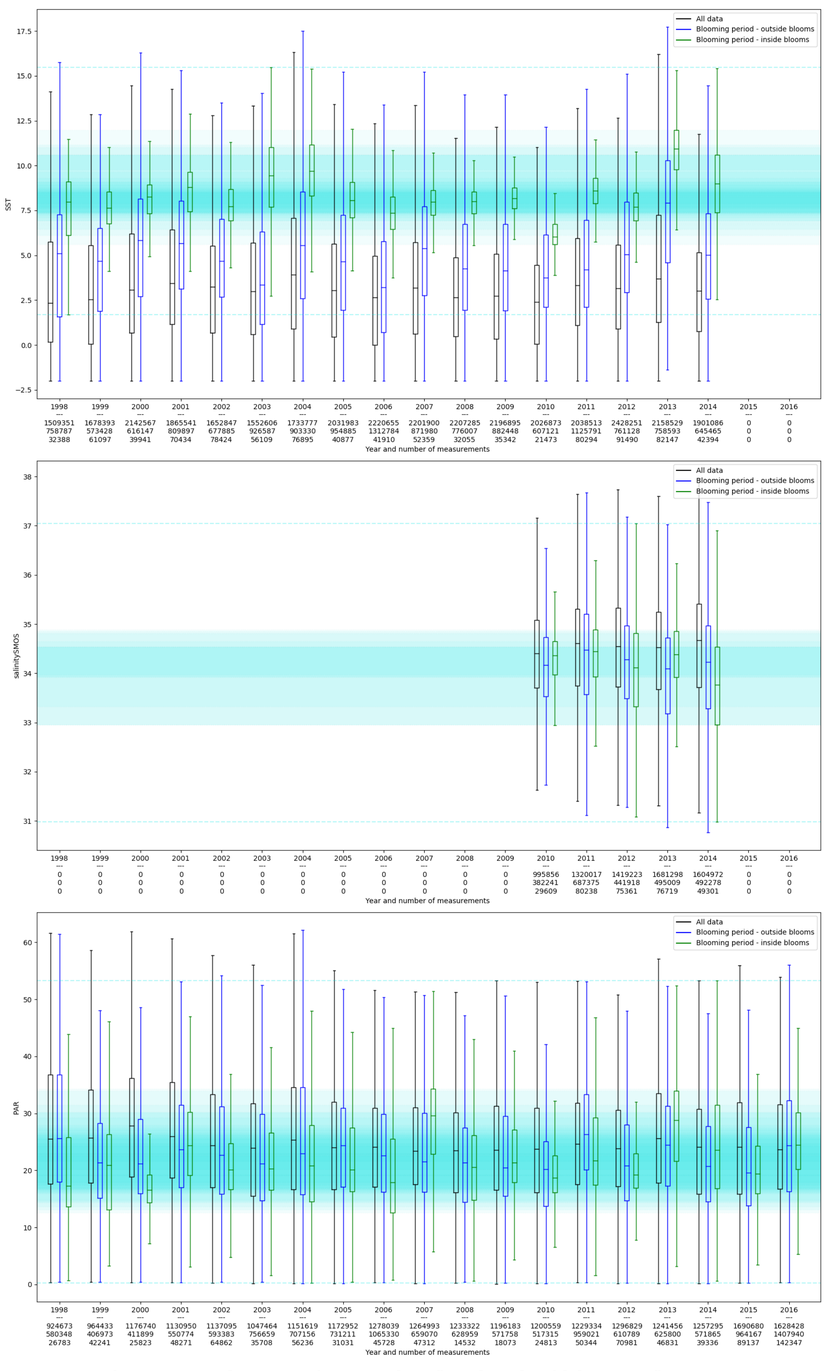


Figure 5. Tolerance intervals of *E. huxleyi* blooms for Sea Surface Temperature (°C, Pathfinder v5.3 data), Sea Surface Salinity (‰, SMOS data), and Photosynthetically available Radiation (Ein/m²/day, GlobColour data) – Barents Sea as an example

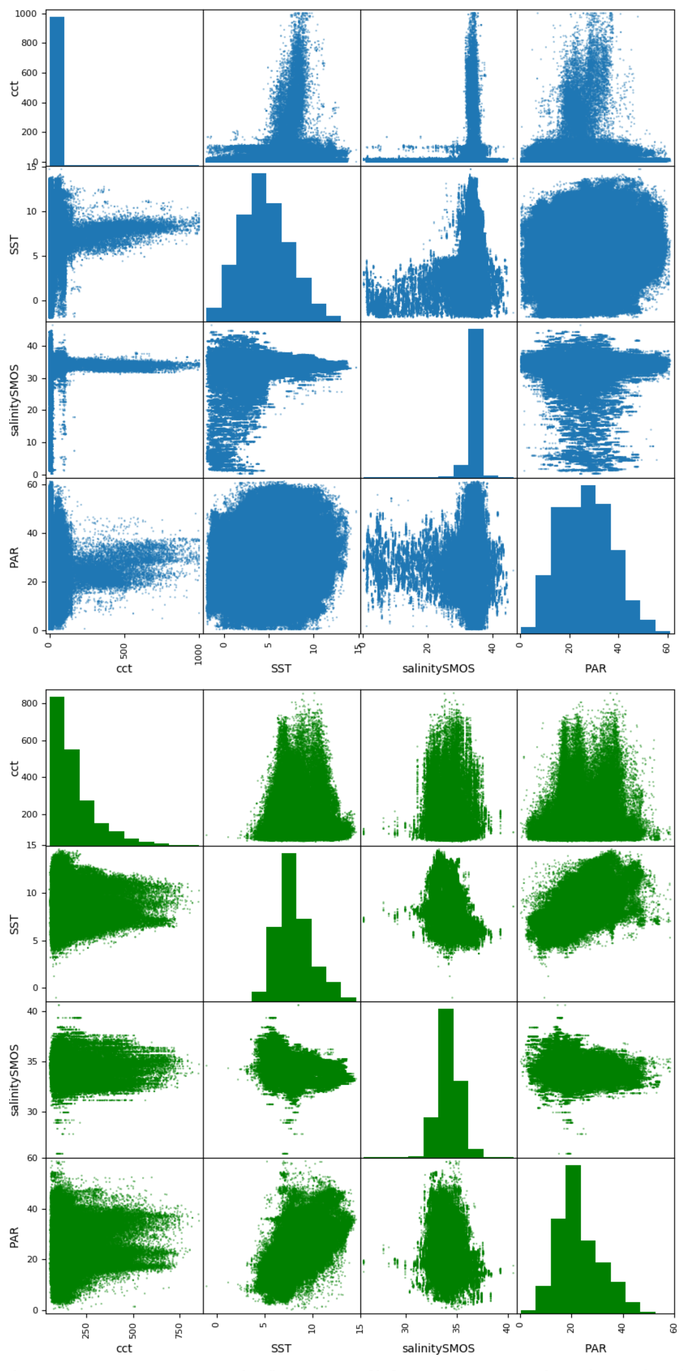


Figure 6. Scatter matrix for coccoliths concentration (cct, *10^9 units/m³), Sea Surface Temperature (°C), Sea Surface Salinity (‰), and Photosynthetically available Radiation PAR (Ein/m²/day) – Barents Sea as an example (Blue – all data, Green – Blooms only)

Table 1. Approximate ranges of parameters registered in blooms

Parameter/Sea	North	Norwegian	Greenland	Barents	Bering	Labrador
SST (°C)	10-15	5-12	7-12	4-14	2-15	0-20
Salinity (‰)	28-40	32-37	27-37	31-38	28-33	28-35
PAR (Ein/m²/day)	20-60	10-50	35-50	10-50	5-40	15-60

Table 2. Results of Random Forest Classifier implementation

Sea	Observed True	Observed False		Accuracy	Precision	Recall	Importance Rates (SST, Salinity, PAR)
	Predicted True	Predicted False	Predicted True	Predicted False			
North	4167	405	2819	1753	0.647	0.911	0.596	0.394, 0.219, 0.387
Norwegian	10653	2165	8163	4656	0.597	0.831	0.566	0.329, 0.326, 0.345
Greenland	4292	188	1821	2660	0.776	0.958	0.702	0.605, 0.159, 0.236
Barents	68065	11502	35996	43571	0.701	0.855	0.654	0.578, 0.230, 0.192
Bering	22975	2412	16327	9061	0.631	0.905	0.585	0.276, 0.564, 0.160
Labrador	49190	3490	23632	29049	0.743	0.934	0.675	0.347, 0.305, 0.347

Summary

The first results of statistical analysis show that *E. huxleyi* species require specific environmental conditions to form the vast bloom areas (which can reach up to several hundreds of thousands km²). Moreover, the ranges and importance of each parameter are appeared to be sea-specific (see Tables 1 and 2).

The Random Forest Classifier trained and implemented in the course of this study showed that only by using sea surface temperature, salinity and photosynthetically available radiation values the blooms occurrence can be predicted with accuracy, precision, and recall up to 78%, 96%, 70%, respectively (for detailed information see Table 2).

This work will be continued further by including additional parameters, such as nutrient concentrations (nitrates, phosphates and silicates).

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