SMHI

AlgAware

Oceanographic Unit
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Algal situation in
Marine Waters surrounding Sweden

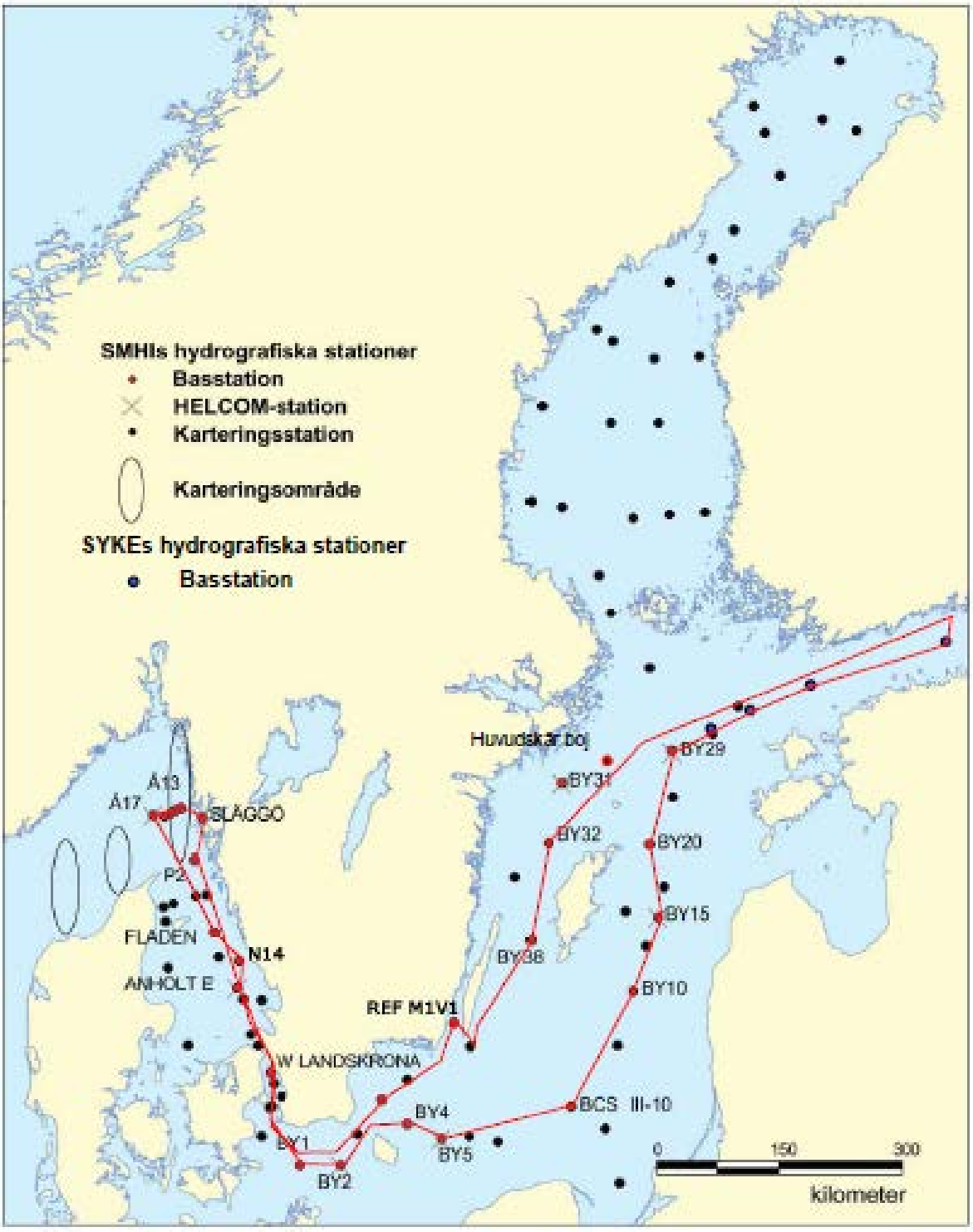

Fig. 1. Sampling stations 10-16 July 2017

Sammanfattning

I Skagerrak och Kattegatt återfanns kiselalgen *Proboscia alata* i höga koncentrationer vid alla provtagna stationer. Artdiversiteten vid samtliga stationer i Västerhavet var generellt sätt låg. Ett eller flera klorofyllmaxima hittades vid alla stationer och här fanns förutom höga tätheter av *P. alata* även mer eller mindre högre tätheter av olika arter av dinoflagellatsläktet *Ceratium*. Vid Å17, den yttersta stationen i Skagerrak, återfanns ett antal celler av en liten thekat dinoflagellat som troligtvis tillhör det giftiga släktet *Azadinium*.

Under expeditionen noterades endast några små tunna stråk av ytansamlingar av cyanobakterier söder om Ölands sydspets från relingen vid själva provtagningen. Från bryggan noterades ytansamlingar nordost om Gotland vid expeditionens början samt utefter östkusten av Öland på väg hem. Små riskornsstora aggregeringar av filamentösa cyanobakterier sågs i vattnet vid mynningen till Finska viken och en bit ner öster om Gotland samt i ett stort område från södra Öland upp till Norrköpingsdjupet. Vid samtliga stationer, förutom Väst om Landskrona, återfanns medelhöga till höga antal avde olika cyanobakterierna *Dolichospermum, Aphanizomenon flos-aquae* och *Nodularia spumigena** i olika kvoter. I Finska viken, öster om Gotland och de södra stationerna vid Bornholm återfanns mestadels *Dolichospermum och Aphanizomenon flos-aquae* . *Nodularia spumigena** förekom i högre tätheter i sydöstra Östersjön. I det västliga området mellan Öland och Gotland återfanns även *Nodularia spumigena** i högre tätheter men tillsammans med *Dolichospermum och Aphanizomenon flos-aquae*. Förutsättningarna för ytansamlingar var låga då vindstyrkan och vågorna blandade ner filamenten i vattenpelaren.

Mängden cyanobakterier i samtliga provar tagna under expeditionen indikerar att om vinden mojnar och solen kommer fram kan ytansamlingar snabbt byggas upp i hela egentliga Östersjön.

För att se satellittolkningar av ytansamlingar av cyanobakterier: http://www.smhi.se/vadret/hav-och-kust/algsituationen

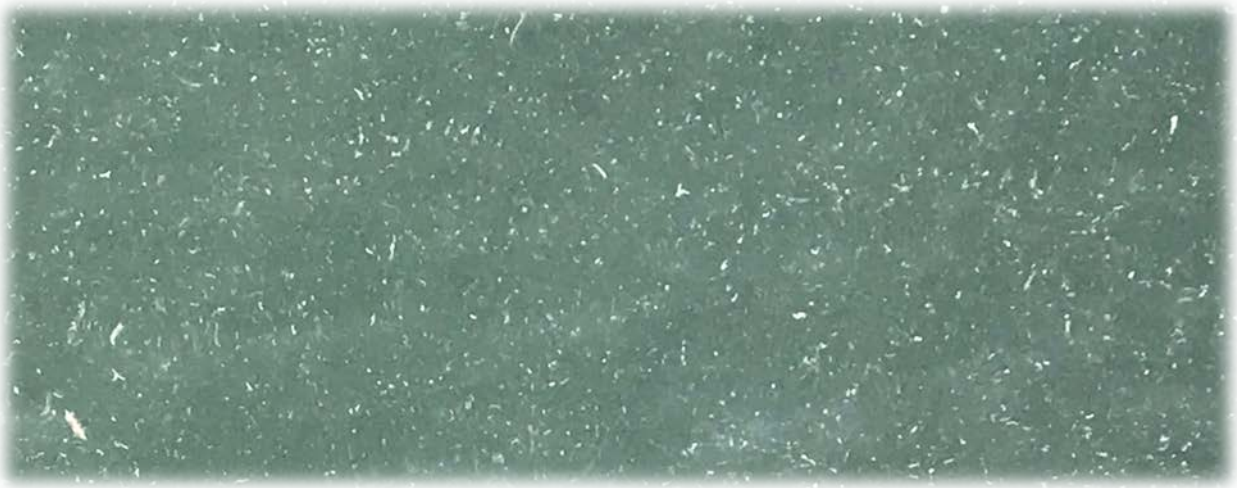

Fig.2. Grains of accumulated filamentous cyanobacteria were found in the outer part of the gulf of Finland and in the areas between Öland and Gotland. The wind stress mixed the filaments into the water column preventing surface accumulations to appear.

Abstract

The diatom *Proboscia alata* was found in high concentrations at all stations in the Skagerrak and in Kattegat. The species diversity was generally low at all west coast stations. One or two chlorophyll maxima were found at all stations, mainly caused by *P. alata* and also by different species belonging to the dinoflagellate genus *Ceratium.* A small thecate dinoflagellate most probably belonging to the toxin producing genus Azadinium was found in relatively high numbers at the outer most station in Skagerrak.

Surface aggregations could be seen from the bridge of the ship north east of Gotland and along the east coast of Öland. Small surface accumulations in forms of small streaks were also seen from sampling position close to south of Öland. Small grains of filamentous cyanobacteria were seen in the water at the entrance of Gulf of Finland, north east of Gotland and in a large area south of Öland up to Norrköping deep. Most samples collected contained moderate to high numbers of filament of the genus *Dolichospermum, Aphanizomenon flos-aquae* and *Nodularia spumigena** in different ratios. The absence of surface accumulations of these filaments were most probably due to wind stress that forced the filaments to be mixed down in the water column. The cyanobacterium *Aphanizomenon flos-aquae* and the genus *Dolichospermum* were found in highest concentrations in the eastern and southern parts. The only exception being the southeastern area where the toxic cyanobacterium *Nodularia spumigena** appeared in higher concentrations. The western part of the Baltic, between Öland and Gotland, contained all three different genera but *N. spumigena** was more abundant in this area.

The amount of cyanobacteria in the water column in most of the Baltic indicates that as soon as the wind stress goes down surface accumulations can start to appear quickly.

Please follow the link below to see interpretations of blooms from satellite images in the tic: http://www.smhi.se/vadret/hav-och-kust/algsituationen

The Skagerrak

Å17 14th of July

The integrated sample collected at Å17 was quite diverse but the total cell concentration was low. The phytoplankton community was dominated by the diatom *Proboscia alata*. Several species of the dinoflagellate genus *Ceratium* were also relatively common. A few small dinoflagellate cells looking like the toxin producing genus *Azadinium* was recorded. A fluorescence peak found at 30 meters mainly contained *P. alata* and different species of the genus *Ceratium.*

Å13, Å14, Å15 and Å16 14th of July

All stations had a small fluorescence peak at about 25-35 meters depth where the diatom *Proboscia alata* was found with the highest cell numbers. Different species of the dinoflagellate genus *Ceratium* was also more or less common at these fluorescence peaks.

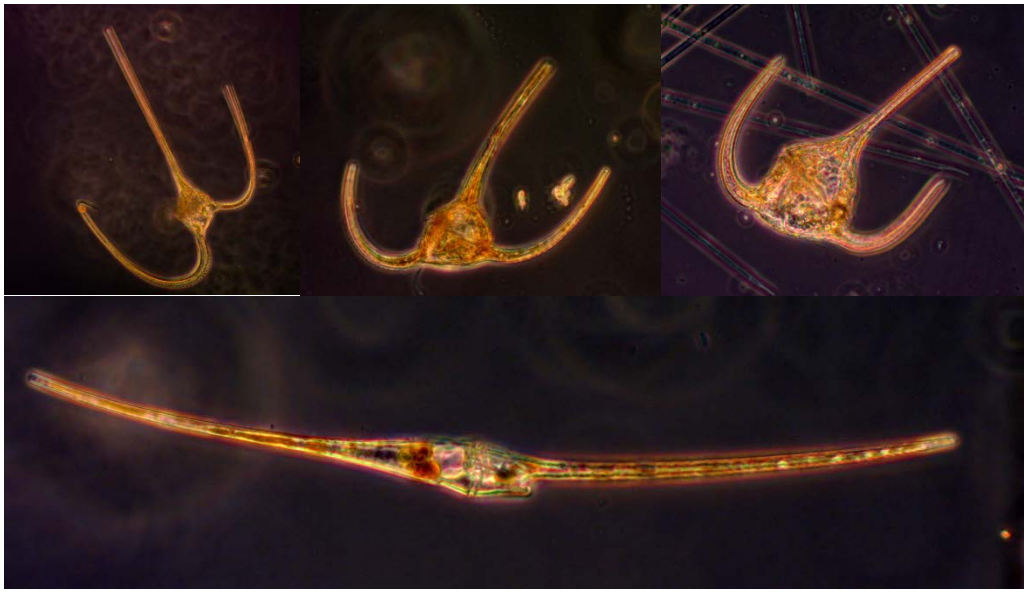

Fig.3 Different species of the dinoflagellate genus *Ceratium* were common in the fluorescence peaks in Skagerrak. Top row, from left to right, *Ceratium macroceros, Ceratium longipes* and *Ceratium tripos.* Below is *Ceratium fusus.*

Släggö (Skagerrak coast) 14th of July

The diatoms dominated the phytoplankton community in total cell numbers. The diatom *P. alata* was again most common but *Leptocylindrus danicus* and *Skeletonema marinoi* was also found in moderate numbers. The species diversity was slightly higher than at the other stations on the west coast. A small fluorescence maximum was found at 15 meters and consisted mainly of *P. alata* and different species of the genus *Ceratium.*

The Kattegat

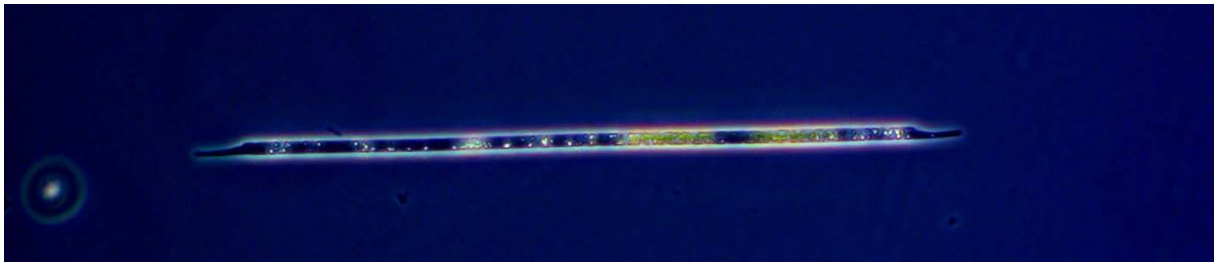

Fig.4. The diatom *Proboscia alata* was common at all stations on the Swedish west coast, constituting 60-90% of total cell numbers in the fluorescence peaks.

Fladen 13th of July and P2 14th of July

A deep fluorescence peak was found at both stations at around 25-35 meters. The peaks consisted of high cell numbers of *Proboscia alata* together with different *Ceratium* species.

Anholt E 13th and Anholt E 15th of July

The phytoplankton community was similar on both visits. The diatoms dominated and far most abundant was *Proboscia alata*. Small diatoms belonging to the genus *Chaetoceros* was also found in moderate numbers on the first visit. Several species of the dinoflagellate genus *Ceratium* were recorded. A small fluorescence peak at around 18 meters was found on both occasions. *P. alata* was found in highest concentrations together with the dinoflagellate genus *Ceratium*. The dominance of *P. alata* in relation to the genus *Ceratium* seemed to have increased on the last sampling occasion.

N14 Falkenberg 13th of July

The species diversity was moderate. The diatom *Proboscia alata* dominated in the integrated hose sample together with moderate cell numbers of the diatom *Guinardia delicatula*. A small fluorescence peak was found at about 20 meters depth where P. *alata* and different species of the genus *Ceratium* dominated the community.

The Baltic Sea

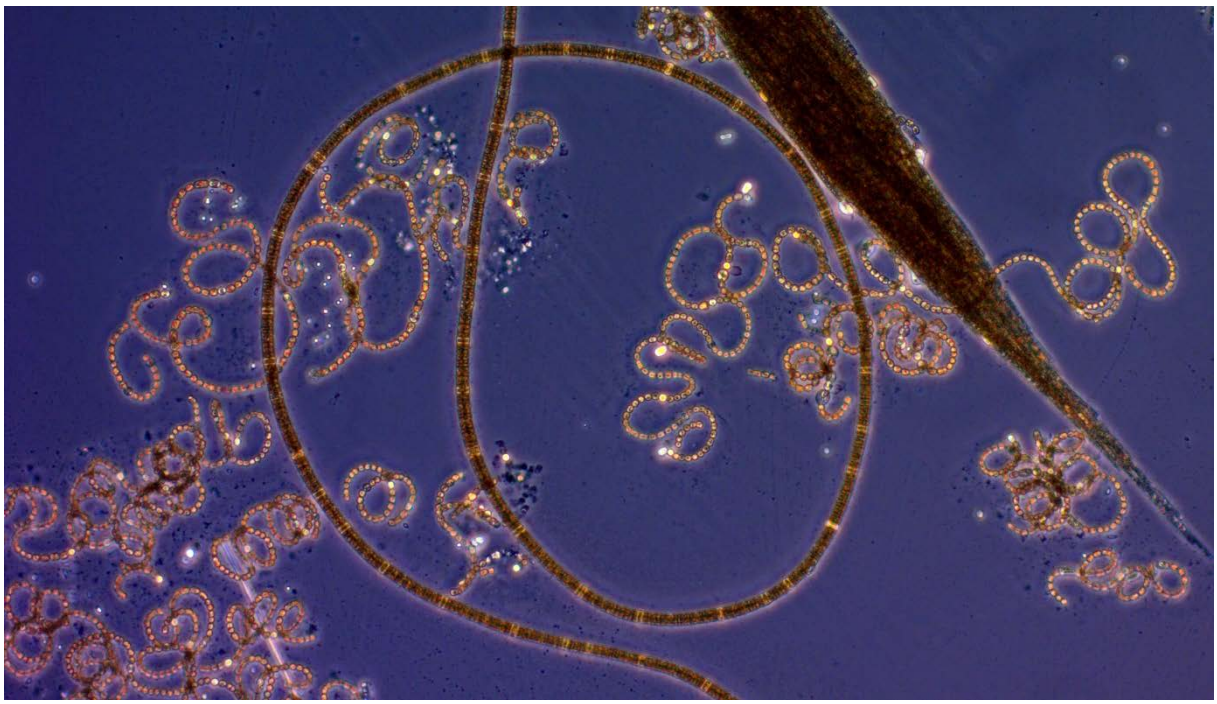

Fig.5 All three groups of filamentous cyanobacteria were found at all stations in the Baltic Sea but in different proportions. The small curly filaments belong to the genus *Dolichospermum.* The large curly filament with light streaks in the middle is the toxin producing *Nodularia spumigena**. The thick lump in the right hand corner is aggregates of many *Aphanizomenon flos-aquae filaments.*

LL7, LL12 10th of July and LL15, LL19/BY29 11th of July, the Gulf of Finland

Small grains of cyanobacteria could be seen in the water at LL7 and LL12. The grains consisted mainly of the cyanobacteria *Aphanizomenon flos-aquae*. Quite a few filaments of the genus *Dolichospermum* was also noted at all stations. Single filaments of the toxin producing cyanobacterium *Nodularia spumigena** was found in low numbers of filaments at all stations. Samples were taken at small fluorescence peaks at

10 meters at both LL7 and LL 12 and it contained, besides the cyanobacteria, both dinoflagellates and diatoms. The toxin producing dinoflagellate *Dinophysis acuminata** was most common of the dinoflagellates and the species *Chaetoceros wighamii* and *C. subtile* most common among the diatoms.

BY20 Fårö Deep 11th of July

Small grains of filamentous cyanobakteria could be seen in the water column from the boat. No surface accumulations were visible due to the wind stress and waves. Almost equal amounts of *Aphanizomenon flos-aquae*, *Nodularia spumigena** and the genus *Dolichospermum* were present in the sample from the surface. Some cells of the toxic genus *Dinopysis** were also found in the surface sample. No fluorescence peak was observed.

BY15 Gotlands Deep 11th of July

No surface accumulations were visible from the boat but small grains were visible. Both *Nodularia spumigena**, the genus *Dolichospermum* and *Aphanizomenon flos-aquae* were found in moderate concentrations in the sample taken at the surface. The cell concentrations and species diversity were quite low in the integrated sample (0-10m). The dinoflagellates *Dinophysis norvegica**and different pico cyanobacteria colonies were most common.

BY10 11th of July

The cell concentrations were low. Moderate amounts of filaments of *Nodularia spumigena* and *Dolichospermum* sp. were found, whereas only a few, mostly single filaments of *A. flos-aquae* were present. Various diatoms were observed, for example *Chaetoceros impressus* and *C. danicus*, in moderate concentrations.

4-CTRY-BP replacing BCS-III South East of Gotland 12th of July

This station was sampled during night so it was not possible to see if any surface accumulations existed. Both the hose sample and the net sample contained lot of phytoplankton cells. The toxin producing *Nodularia spumigena** was most abundant among the filamentous cyanobacteria. Several filaments of *Dolichospermum* sp. and *A. flos-aquae* were also found.

BY5 Bornholms Deep 12th of July

No surface accumulations could be seen from the boat. The absence of accumulations might be due to some wind and waves. Only small amounts of the toxic cyanobakteria *Nodularia spumigena** was found in the surface sample. The genus *Dolichospermum* was most common of the filamentous cyanobakteria at this station. The integrated sample (0-10 m) contained both diatoms such as *Chaetoceros impressus* and *C. danicus* and different colony forming pico cyanobacteria.

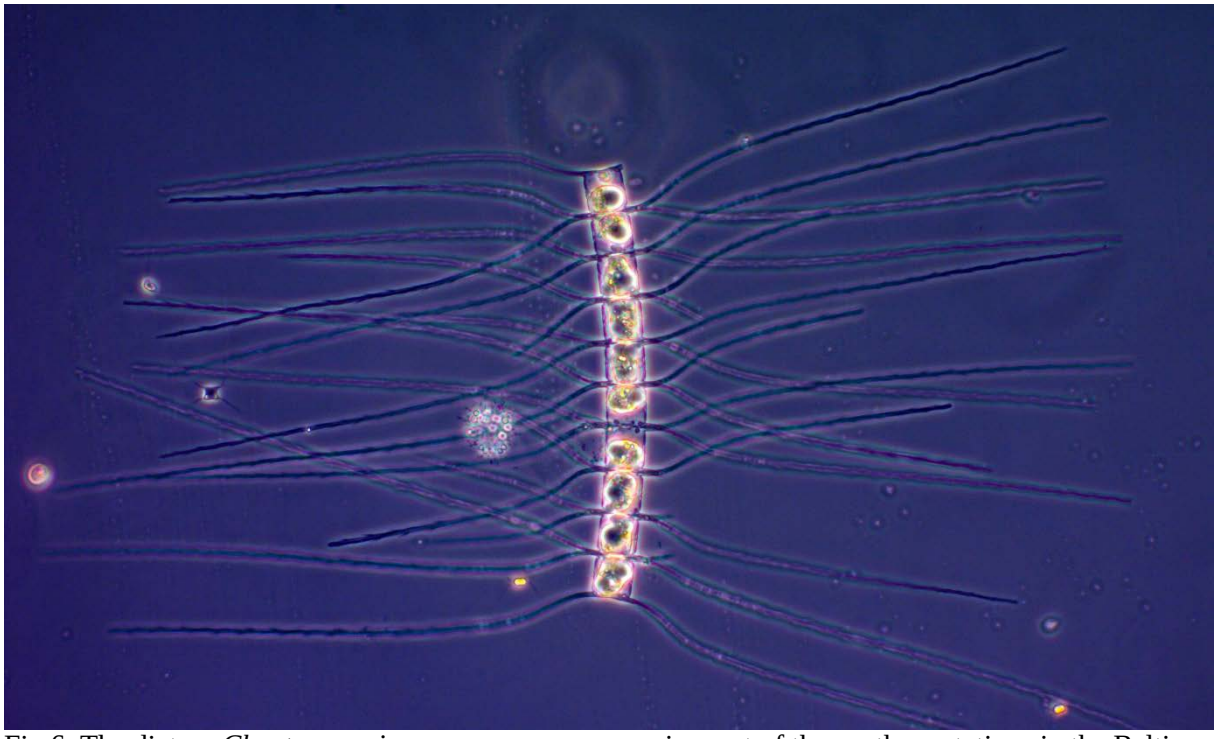
Fig.6. The diatom *Chaetoceros impressus* was common in most of the southern stations in the Baltic proper.

BY4 Christiansö 12th of July

No surface accumulations were visible from the boat. Only low numbers of filaments were found in the sample collected at the surface. The net sample and the integrated sample (0-10 m) contained higher numbers of filaments indicated that all three different cyanobacteria existed in moderate numbers of filament all over the sampled water column.

BY2 Arkona 13rd of July

No surface accumulations or grains of filamentous cyanobacteria could be seen. Quite low numbers of filaments of all three different groups of filamentous cyanobacteria was present in the integrated hose sample. The overall species diversity was quite low.

W Landskrona 13th of July

No surface accumulations were noted. No cyanobacteria filaments were found in any samples. The community consisted mostly of diatoms such *as P. alata, Thalassionema nitzschioides* and some *Guinardia delicatula*. Different species of the dinoflagellate genus *Ceratium* were also found. The most prominent was *C. fusus* and *C. longipes*. A small fluorescence maximum was found at 10-15 meters and contained almost exclusively the large diatom *Proboscia alata* (fig. 4).

Hanöbukten 15th of July

The surface sample contained many filaments of cyanobacteria. The toxic *Nodularia spumigena** was most numerous but both the genus *Dolichospermum* and *Aphanizomenon flos-aquae* was also found in high numbers. No cyanobacteria aggregations could be seen from the boat probably due to that sampling was done in the dusk. A small fluorescence peak was observed at 15 meters and the diatom *Chaetoceros impressus* dominated here.

REF M1V1 and 4.5 NE Ölands Södra 16th of July

The surface sample at Ref M1V1 contained mostly filaments of the genus *Dolichospermum* and *Aphanizomenon flos-aquae* only a few filaments of *Nodularia spumigena* * were found. The integrated hose sample contained moderate species diversity. Both *Chaetoceros danicus* and *C. impressus* were found in relative high concentrations. The first streaks of cyanobakteria accumulations were noted in the water at NE Ölands Södra. The surface sample collected at this station contained mostly *N. spumigena** but also *A. flos-aquae* and the genus *Dolichospermum* was found in relatively high concentrations.

BY38 Karlsö Deep and BY32 Norrköping 16th of July

High concentrations of grains were present in the water column at both BY38 and BY32. The wind mixed the filaments into the water column and prevented the filaments to aggregate at the surface. The surface sample contained almost equal amounts of all three groups of filamentous cyanobacterium. The integrated samples (0-10m) contained low species diversity mainly single cells were found of any species. Different pico cyanobakteria colonies were found in moderate numbers.

Surface samples, bucket	**The following filamentous cyanobacteria were observed:**		
Station:	***Aphanizomenon flos-aquae***	***Nodularia spumigena*** *	***Dolichospermum spp.***
LL7 10/7	common	present	common
LL12 10/7	common	present	common
LL15 11/7	common	present	common
LL19 / BY29 11/7	common	present	common
BY20 11/7	common	common	common
BY15 11/7	common	present	present
BY10 11/7	common	common	common
4 CTRY-BP 12/7	common	very common	common
BY5 12/7	present	present	common
BY4 12/7	present	present	present
West Hammer Odde 12/7	present	present	present
BY2 12/7	present	present	present
W Landskrona 13/7	not found	not found	not found
Hanöbukten 15/7	common	very common	common
REF M1V1 16/7	common	present	common
Ölands södra udde 16/7	present	common	present
BY38 16/7	common	common	common
BY32 16/7	common	common	common

Selection of observed species	BY2	BY5	Ref M1V1	BY15	4 CTRY-BP	BY38
Red=potentially toxic species	12/7	12/7	16/7	11/7	12/7	16/7
Hose 0-10 m	presence	presence	presence	presence	presence	presence
Chaetoceros danicus		present	present	present	present	
Chaetoceros impressus	present	present	present		present	
Cyclotella choctawhatcheana	present					
Nitzschia longissima						present
Dinophysis acuminata			present	present		present
Dinophysis norvegica		present		present	present	present
Diplopsalis CPX				present		
Gymnodiniales						present
Prorocentrum minimum				present		
Oocystis sp.				present		
Planctonema lauterbornii	present	present		present		
Ebria tripartita		present	present		present	
pico cyanobacteria colonies	common	common	present	common	common	common
Dolichospermum spp.	present	common	common	present	common	common
Aphanizomenon flos-aquae	present	common	common	common	common	common
Nodularia spumigena	present	present	present	present	very common	common

Selection of observed species	Anholt E	Anholt E	N14 Falkenberg	Släggö	Å17
Red=potentially toxic species	13/7	15/7	13/7	14/7	14/7
Hose 0-10 m	presence	presence	presence	presence	presence
Cerataulina pelagica					present
Chaetoceros affinis				present	
Chaetoceros throndsenii	present				
Chaetoceros subtilis	present				
Chaetoceros spp		present	present	present	present
Cylindrotheca closterium	present				
Guinardia delicatula			present		
Leptocylindrus danicus				common	present
Nitzschia longissima	present	present	present	present	
Proboscia alata	very common	very common	very common	very common	very common
Pseudo-nitzschia spp					present
Skeletonema marinoi		present		present	
Thalassionema nitzschioides	present	present			
Azadinium spp					present
Ceratium furca				present	present
Ceratium fusus	present	present	present	present	common
Ceratium longipes	present	present	present	present	present
Ceratium macroceros			present	present	present
Ceratium tripos	common	present	present	present	
Dinophysis acuminata				present	
Diplopsalis CPX	present		present		
Prorocentrum micans		present		present	
Protoceratium reticulatum					present
Protoperidinium crassipes					present
Protoperidinium steinii			present		
Protoperidinium spp				present	
Oocystis spp	present				
Prymnesiales	present				