

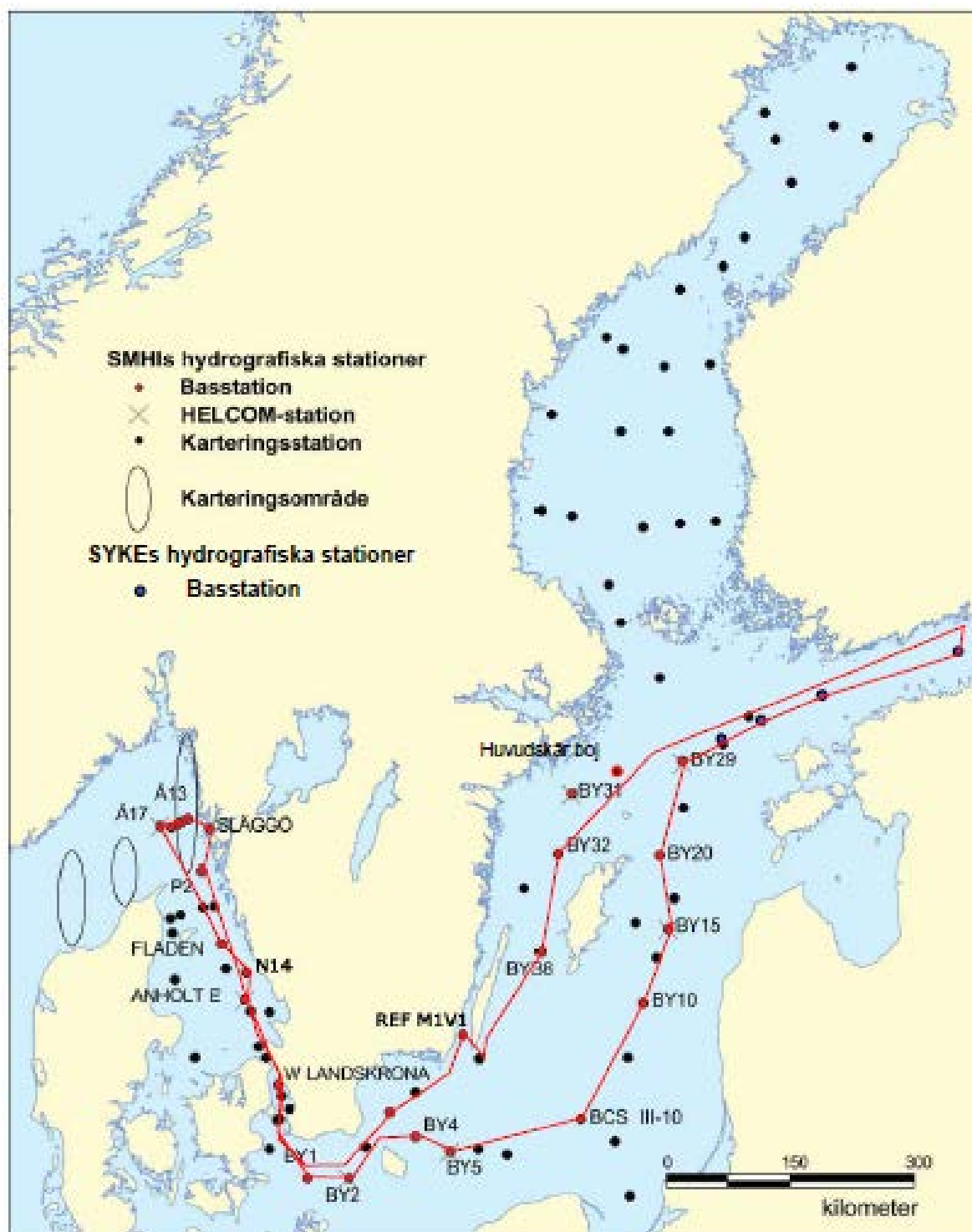


Fig. 1. Sampling stations July 2016

Sammanfattning

I Skagerrak återfanns kiselalgen *Proboscia alata* i relativt höga koncentrationer vid samtliga stationer. Ett eller flera klorofyllmaxima observerades vid alla stationer och här fanns höga tätheter av olika arter av dinoflagellatsläktet *Ceratium* och vissa fall stora mängder av den potentiellt fiskdödande dinoflagellaten *Karenia mikimotoi**.

Kiselalger var mycket vanliga i Kattegatt och även här var *Proboscia alata* den art som återfanns i höga koncentrationer vid samtliga stationer. *Skeletonema marinoi* och små arter av släktet *Chaetoceros* var vanliga vid N14 Falkenberg. Dinoflagellater återfanns i låga antal, förutom *Prorocentrum micans* och *Ceratium fusus* som var relativt vanliga.

De första synliga ytansamlingarna av cyanobakterier återfanns i de södra delarna av Östersjön från Bornholmsbassängen och västerut till Öresund. I Finska viken, samt i den nordöstra delen av Östersjön var det relativt höga vågor och vattnet var mer eller mindre omblandat ner till 10-15 meter. Filamentösa cyanobakterier var dock synliga i vattnet som små korn vid Finska vikens mynning, i starten av expeditionen, och i lite mindre mängder öster om Gotland. Vid BY5, i södra delen, började ytansamlingar uppträda i vattnet i form av större korn och strimmor. Analys av ytprover och integrerade prover (0-10m) visade att det främst var *Aphanizomenon flos-aquae* som dominerade bland de filamentösa cyanobakterierna i Finska viken, medan *Nodularia spumigena** ökade söderut. På återresan hade ansamlingarna i de södra delarna ökat markant och stora områden var täckta med ytansamlingar (se fig. 2). Norr om Hanöbukten återfanns mindre mängder, mest i form av korn, förutom mellan Öland och Gotland, söder om BY32, där lite större ytor med ytansamlingar noterades sporadiskt som ljusare partier i vattnet. Även utanför inloppet till Finska viken sågs större ytansamlingar i form av ljusare partier eller orange strimmor i vattnet.

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

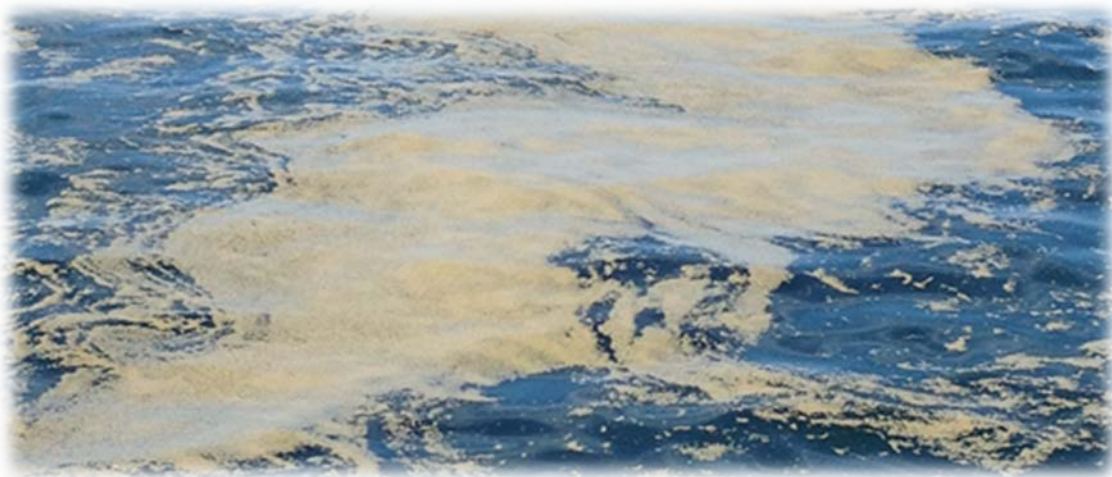


Fig. 2. Large surface accumulations were found in the southern part of the Baltic Sea on the way back to Finland.

Abstract

The diatom *Proboscia alata* was found in relatively high concentrations at all stations in the Skagerrak. One or two chlorophyll maxima were found at all stations, mainly caused by the dinoflagellate genus *Ceratium*. At a couple of stations quite high densities of the fish killing species *Karenia mikimotoi* were found.

Diatoms were very common in the Kattegat area, and *Proboscia alata* was abundant at all stations. The diatoms *Skeletonema marinoi* and small *Chaetoceros* species were common at N14 Falkenberg. The dinoflagellates *Prorocentrum micans* and *Ceratium fusus* were rather common.

There were visible surface accumulations of filamentous cyanobacteria in the southern parts of the Baltic Sea between Bornholm and Öresund. Filamentous cyanobacteria were present as small grains in the water at the first sampling points in the outer parts of the Finnish Bay and in small amounts east of Gotland. At BY5, the Bornholm Basin, surface accumulations with streaks of different sizes started to appear and continued to appear until Öresund. *Aphanizomenon flos-aqua* was the most abundant of the filamentous cyanobacteria in the Finnish Bay, but *Nodularia spumigena** increased in concentrations going south. The surface accumulations had grown to larger areas in the southern parts of the Baltic when going back (fig. 2). Irregular areas of surface accumulations in the shape of lighter green to more intense orange coloured patches or streaks could also be seen between Öland and Gotland and, as approaching the entrance of the Finnish Bay.

Please follow the link below to see interpretations of blooms from satellite images in the tic: <http://www.smhi.se/en/weather/sweden-weather/1.11631>

The Skagerrak

Å17 24th of July

The integrated sample collected at Å17 contained quite low cell concentrations. The phytoplankton community was dominated by the diatom *Proboscía alata*. Several species of the dinoflagellate genus *Ceratium* were also relatively common.

Å13, Å14, Å15 and Å16 24th of July

All stations had a quite distinct chlorophyll fluorescence peak, in fact two peaks were found at Å15. At Å16 there was a peak at 18 meters mainly caused by the diatom *P. alata*. Some dinoflagellates were numerous, such as different species of the genus *Ceratium* as well as *Karenia mikimotoi**. At Å15 two chlorophyll fluorescence maxima were found. At 10 meters there was a mixture of *Proboscía alata* and different *Ceratium* species, such as *C. lineatum*. At 46 meters another maximum was found and it consisted almost exclusively of the dinoflagellate *Karenia mikimotoi**. At Å14 and Å13, the maxima were found at 10 m, both mainly caused by *Karenia mikimotoi** (fig. 3).

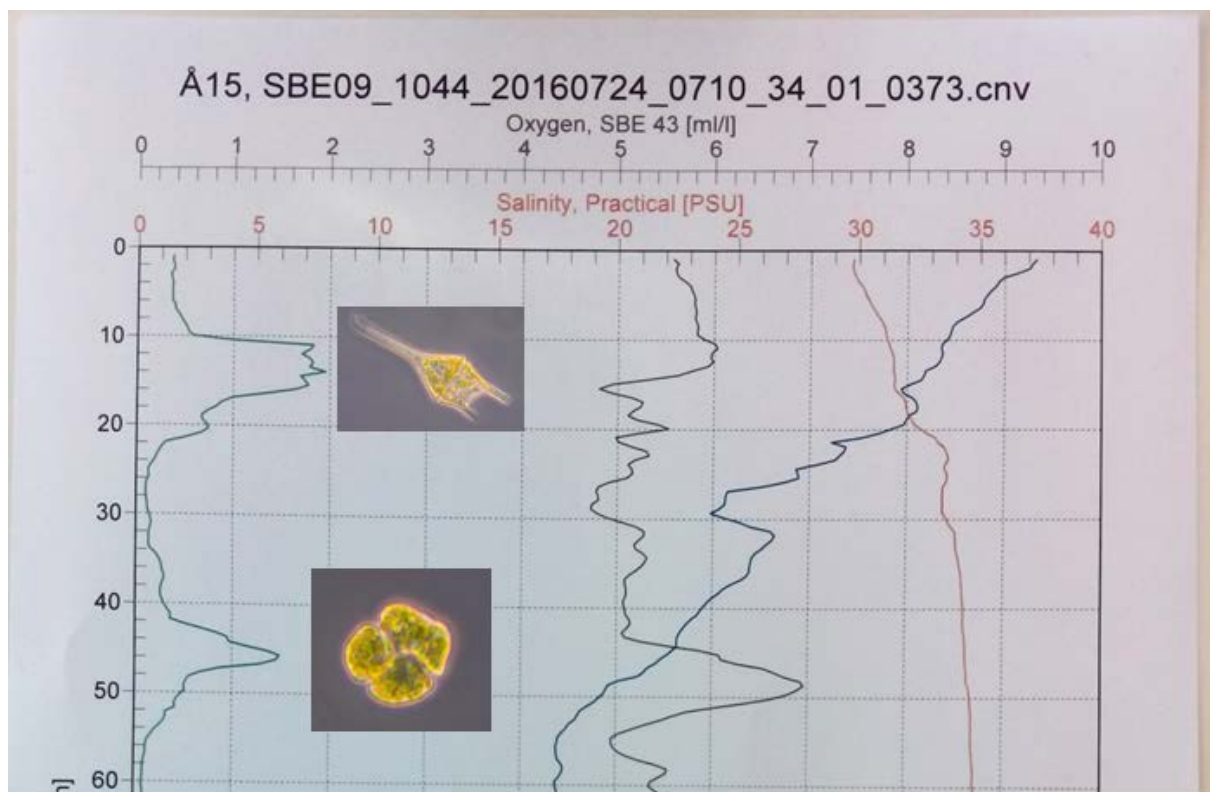


Fig.3 The dinoflagellate *Ceratium lineatum* was common along with other species from this genus at the first chlorophyll a maximum found at Å15. The second chlorophyll maximum mainly contained the fish killing species *Karenia mikimotoi**.

Släggö (Skagerrak coast) 24th of July

The diatom *Cerataulina pelagica* dominated the phytoplankton community, and the species diversity among the diatoms was higher compared to the sample from Å17. The dinoflagellates had high species diversity and *Prorocentrum micans* was dominating this group. There were several potentially toxic species present; *Pseudo-nitzschia* spp.^{*}, *Karenia mikimotoi*^{*}, *Dinophysis acuminata*^{*}, and *Dinophysis norvegica*^{*}. A distinct and thin chlorophyll fluorescence maximum was found at 10 meters and the upper edge of the maximum was sampled and analysed. The dinoflagellate *K. mikimotoi*^{*} was still dominating at this depth (fig 3).

The Kattegat

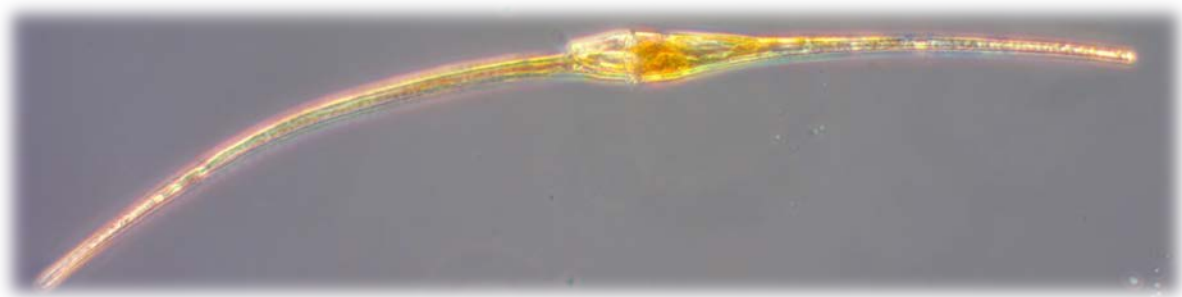


Fig.4. The dinoflagellate *Ceratium fusus* was quite common at Anholt E on the first visit and at the chlorophyll a maximum at Fladen.

Fladen 23rd of July

Low cell concentrations and low species diversity were found. The diatom *Proboscia alata* was found in relatively high concentrations along with *Rhizosolenia hebetata*, that was less numerous. A small chlorophyll maximum was found at 20 meters and here dinoflagellates like *Ceratium fusus* (fig. 4) were the most common.

Anholt E 23rd and Anholt E 25th of July

The phytoplankton community was quite low in cell numbers on both visits. The diatom *Proboscia alata* dominated in the samples on both sampling occasions. There was a small chlorophyll fluorescence peak on the first visit at 20 meters, mainly consisting of different dinoflagellate species of the genus *Ceratium*, among which *C. fusus* (fig. 4) was the most abundant. Some filaments of cyanobacteria were present on both occasions.

N14 Falkenberg 25th of July

The species diversity was relatively high. The phytoplankton community was dominated by diatoms, where especially *Skeletonema costatum*, *Proboscia alata* and small *Chaetoceros* species were the most common. A small fluorescence peak was found at 15 meters and it mainly consisted of different species from the dinoflagellate genus *Ceratium*.

The Baltic Sea



Fig.5. At the outer part of the Finnish Bay, and east and west of Gotland, small grains of cyanobacteria filaments could be seen close to the surface.

LL7 20th of July, LL12 and LL15 21st of July

The stations are situated at the mouth of, and southwest of the Finnish Bay and are part of the Finnish monitoring programme.

Small grains of cyanobacteria could be seen in the water at LL7. The other two stations were sampled during night with no possibility to see the grains. The grains consisted mainly of *Aphanizomenon flos-aquae*. Quite a few filaments of the genus *Dolichospermum* was also noted at all stations. The toxin producing cyanobacterium *Nodularia spumigena** was found in moderate numbers at LL15 but only in low numbers at the other two stations. Besides the cyanobacteria, dinoflagellates dominated, both the toxin producing *Dinophysis acuminata** and *Heterocapsa triquetra* were common at all three stations.

BY20 Fårö Deep 21st of July

No surface accumulations of filamentous cyanobacteria were seen, most probably due to wind and waves. Moderate concentrations of *A. flos-aqua* were found in the surface sample collected with a bucket. *N. spumigena** and the genus *Dolichospermum* were also found but in low concentrations. The ciliate *Helicostomella subulata* were found in relatively high concentrations. The diatom *Chaetoceros wighamii* was found in low concentrations. The secchi depth was around 5 meters and if the weather will be favourable it will result in surface accumulation in this area.

BY15 Gotlands Deep and BY20 Fårö Deep 21st of July

No surface accumulations were visible. The cell concentrations were quite low and no single species dominated. Both *Nodularia spumigena**, the genus *Dolichospermum* and *Aphanizomenon flos-aquae* were found in moderate concentrations. Some of the filaments of *N. spumigena** seemed to have started degrading and were quite colourless. The species diversity was relatively low in the integrated samples (0-10m) at both stations. The dinoflagellates *Dinophysis acuminata** and *Phalacroma rotundatum** were

common at BY15. At BY20, diatoms such as *Chaetoceros wighamii* were found in moderate concentrations.

BY10 22nd 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 found, for example *Chaetoceros impressus* and *C. danicus*, in moderate concentrations.

BCS-III South East of Gotland 22nd of July

A few grains of cyanobacteria could be noted at the surface. *Nodularia spumigena** was more abundant at this station than in the northern part of the Baltic Sea. Some aggregated filaments of *Dolichospermum* sp. and *A. flos-aquae* were found. Species from the colony forming cyanobacteria genera *Snowella* and *Aphanothece* were abundant. The integrated sample (0-10 m) consisted of a quite diverse community with diatoms, dinoflagellates and other flagellates present.

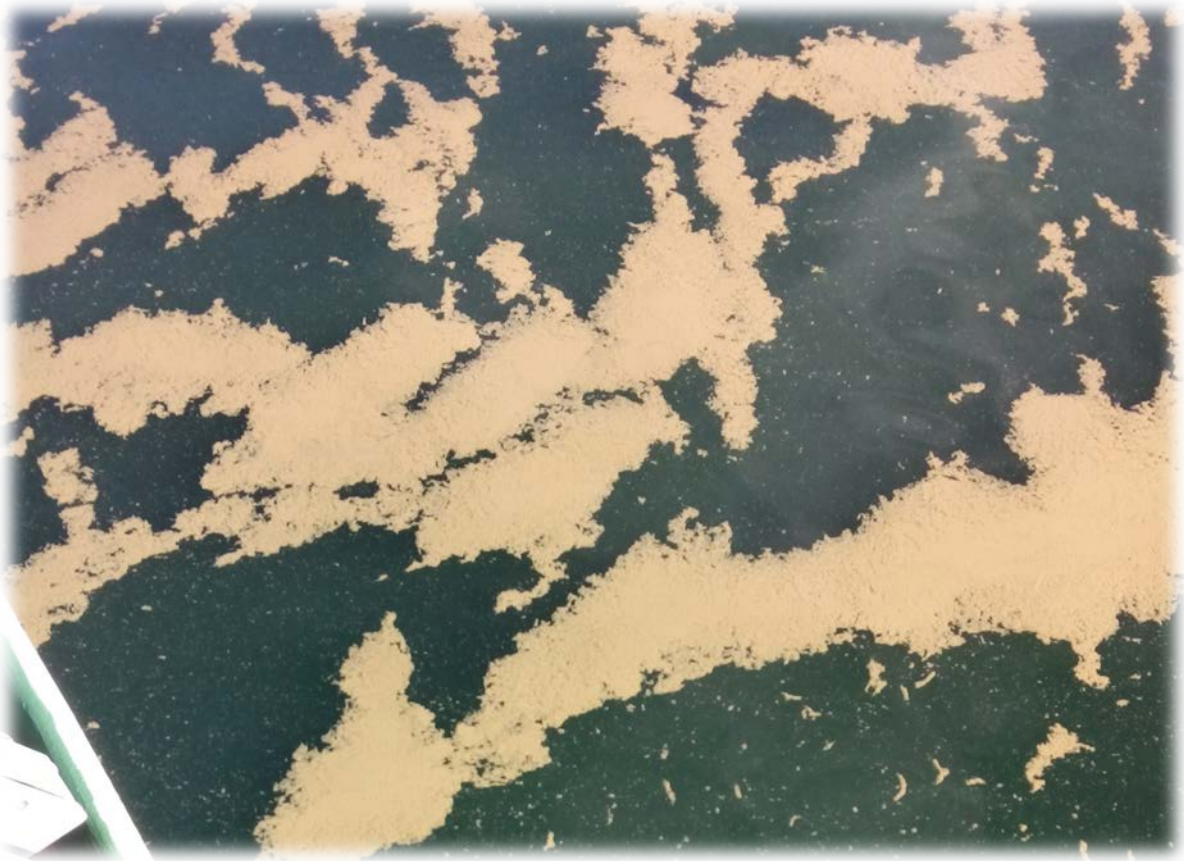


Fig.6. Large surface accumulations of filamentous cyanobacteria were visible from BY5 Bornholm Basin and almost to W Landskrona, both ways during the cruise. The toxin producing cyanobacterium Nodularia spumigena dominated at the surface in the samples analysed.*

BY5 Bornholms Deep 22nd of July

Surface accumulations of filamentous cyanobacteria were clearly seen (fig. 6). The cell density was higher in this part of the Baltic Sea and the integrated sample (0-10 m) at BY5 consisted of a quite diverse plankton community compared to the eastern part of the Baltic Sea. The diatoms were mainly represented by *Chaetoceros danicus* that dominated, but there were also high concentrations of *Chaetoceros impressus* and *Cylindrotheca closterium*. Among the dinoflagellates, *Prorocentrum minimum* and *Heterocapsa triquetra* were the most abundant. A minor fluorescence maximum was found at 10 meters and it consisted mainly of the diatom *C. impressus* (fig 7.), and *C. danicus* was found in relatively high concentrations.

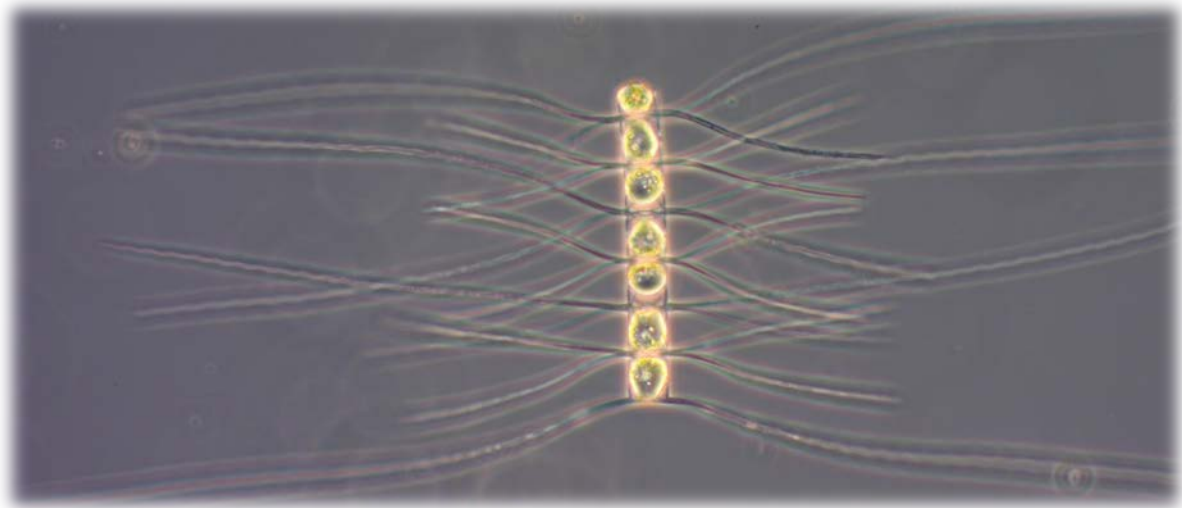


Fig. 7. The diatom *Chaetoceros impressus* was common in the chlorophyll fluorescence maximum found at 10 meters at BY5 Bornholm Basin and at many other stations in the Baltic Sea.

BY4 Christiansö 22nd of July

This station was sampled late in the evening making it difficult to see aggregations of cyanobacteria in the water. The surface sample revealed that filamentous cyanobacteria and especially *Nodularia spumigena** were quite common.

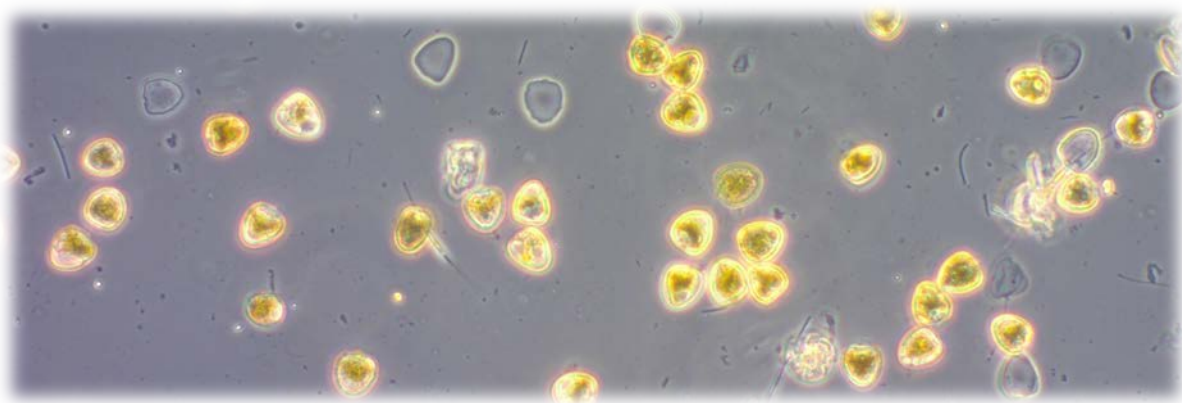


Fig. 8. High concentrations of the dinoflagellate *Prorocentrum minimum* were recorded in the net sample taken at BY2 Arkona Basin.

BY2 Arkona 23rd of July

Large surface accumulations of filamentous cyanobacteria could clearly be seen even though it was dusk and the sunset was ongoing. *Nodularia spumigena** was dominating the surface sample. Both *A. flos-aquae* and *Dolichospermum* sp. were present in substantial amounts. Significant concentrations of the dinoflagellate *Prorocentrum minimum* were recorded in the net sample from 20-0 meters (fig 8). *C. impressus* was the most common among the diatoms.

BY1 23rd of July

Surface accumulations were still pronounced and *N. spumigena** was the most common followed by *A. flos-aquae* and some filaments of *Dolichospermum* sp.

W Landskrona 23rd of July

No surface accumulations were noted. Only a few filaments of *N. spumigena**, *A. flos-aqua* and *Dolichospermum* sp. were found in the surface sample. The dinoflagellate *P. minimum*, also found at BY1, was present in quite high concentrations. A fluorescence maximum was found at 19 meters and contained almost exclusively the large diatom *Guinardia flaccida* (fig. 9).

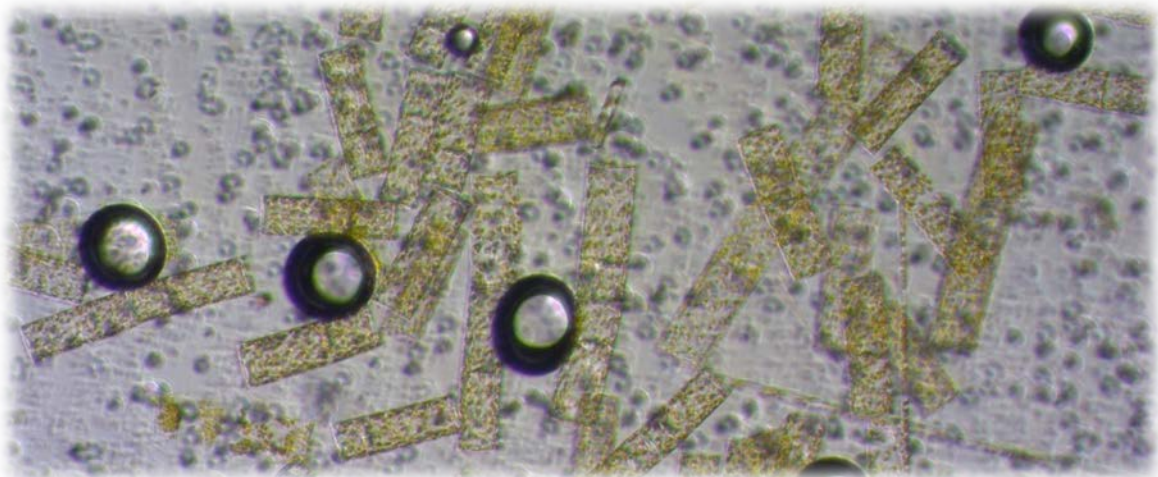


Fig. 9. High concentrations of the diatom *Guinardia flaccida* was found at 19 meters depth at W Landskrona.

Hanöbukten 25th of July

Cyanobacteria aggregations in the shape of small grains were clearly seen in the water. The grains consisted of the filamentous cyanobacteria *A. flos-aquae* and *N. spumigena**. The diatom *Chaetoceros impressus* was common. A small chlorophyll fluorescence peak was observed at 10 meters at which *C. impressus* dominated.

REF M1V1 and 4.5 NE Ölands Södra 26th of July

Dolichospermum sp. was the most common among the filamentous cyanobacteria in the surface at both stations. *N. spumigena** and *A. flos-aquae* were also quite common. The integrated sample (0-10 m) taken at REF M1V1 contained a community of low biodiversity. *C. impressus* was the most common among the diatoms.

BY38 Karlsö Deep and BY32 Norrköping 26th of July

These two stations were dominated by the filamentous cyanobacterium *N. spumigena**, but no surface accumulations could be seen probably due to the wind. Small grains were however seen at both stations. Filaments of *A. flos-aqua* and *Dolichospermum* sp. were present. There were a few diatom and dinoflagellate species in the samples.

Phytoplankton analysis and text by:

Marie Johansen

Selection of observed species	Anholt E	Anholt E	N14 Falkenberg	Släggö	Å17
Red=potentially toxic species	23/7	25/7	25/7	24/7	24/7
Hose 0-10 m	presence	presence	presence	presence	presence
<i>Cerataulina pelagica</i>			common	very common	
<i>Chaetoceros danicus</i>	present				
<i>Chaetoceros affinis</i>			present		
<i>Chaetoceros</i> spp			common	present	present
<i>Dactyliosolen fragilissimus</i>			present		
<i>Guinardia flaccida</i>	present		present		
<i>Leptocylindrus danicus</i>				present	
<i>Nitzschia longissima</i>			present		
<i>Proboscia alata</i>	very common	very common	very common	common	common
<i>Pseudo-nitzschia</i> spp				present	
<i>Skeletonema marinoi</i>	present	present	very common	present	
<i>Ceratium furca</i>	present	present			present
<i>Ceratium fusus</i>	common	present		present	common
<i>Ceratium lineatum</i>	present	present		present	
<i>Ceratium longipes</i>	present				
<i>Ceratium macroceros</i>	present	present			present
<i>Ceratium tripos</i>	present	present	present	present	common
<i>Dinophysis acuminata</i>	present		present	present	
<i>Dinophysis norvegica</i>	present		present	present	
<i>Diplopsalis</i> CPX			present	present	present
<i>Gonyaulax</i> spp	present				
<i>Karenia mikimotoi</i>				common	
<i>Phalacroma rotundatum</i>			present		present
<i>Prorocentrum micans</i>	present	present	common	common	present
<i>Prorocentrum minimum</i>	present				
<i>Protoceratium reticulatum</i>	present	present			
<i>Protoperdinium depressum</i>					present
<i>Protoperdinium pellucidum</i>		present	present		
<i>Protoperdinium</i> spp		present	present	present	
<i>Scrippsiella</i> CPX					present
<i>Dolichospermum</i> sp	present	present	present		
<i>Nodularia spumigena</i>	present	present	present	present	

Surface samples, bucket	The following filamentous cyanobacteria were observed:		
Station:	<i>Aphanizomenon flos-aquae</i>	<i>Nodularia spumigena</i>	<i>Dolichospermum</i> spp.
W Landskrona 23/7	present	present	present
BY1 23/7	common	very common	present
BY2 23/7	common	very common	present
Hanöbukten 25/7	common	common	present
BY4 22/7	present	present	present
BY5 22/7	very common	very common	common
BCSIII-10 22/7	common	common	present
REF M1V1 26/7	common	common	very common
Ölands södra udde 26/7	common	common	very common
BY32 26/7	present	common	common
BY38 26/7	present	common	common
BY10 21/7	present	present	present
BY15 21/7	present	present	present
BY20 21/7	common	present	present
LL19 / BY29 21/7	common	present	present
LL15 21/7	common	present	common
LL12 20/7	common	present	common
LL7 20/7	very common	present	common

Selection of observed species	BY2	BY5	Ref M1V1	BY15	BCSIII-10	BY38
	23/7	22/7	26/7	22/7	22/7	26/7
Hose 0-10 m	presence	presence	presence	presence	presence	presence
Chaetoceros danicus	present	very common			present	
Chaetoceros impressus	common	present	common		common	common
Chaetoceros wighamii			present			
Cyclotella choctawhatcheana			present			present
Nitzschia longissima		common				present
Skeletonema costatum					present	present
Ceratium tripos	present					
<i>Dinophysis acuminata</i>				common		
<i>Dinophysis norvegica</i>	present			present		present
<i>Dinophysis rotundata</i>				common	present	
Diplopsalis CPX	present	present		present		
Gymnodiniales	common	present	present			present
Heterocapsa triquetra		common	present			
Prorocentrum minimum	very common	common				
Protopteridium spp				present		
Scrippsiella CPX			present	present		
Oocystis sp.				present		present
Planctonema lauterbornii				present		
Cryptomonadales	present	present	present		present	present
Ebria tripartita		present	present			
pico cyanobacteria colonies	common	present	present	present	common	common
Dolichospermum spp.	present	common	very common	present	present	common
Aphanizomenon flos-aquae	common	common	common	present		present
<i>Nodularia spumigena</i>	common	very common	common	present	common	common

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