

Oceanographic Unit
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Algal situation in
Marine Waters surrounding Sweden

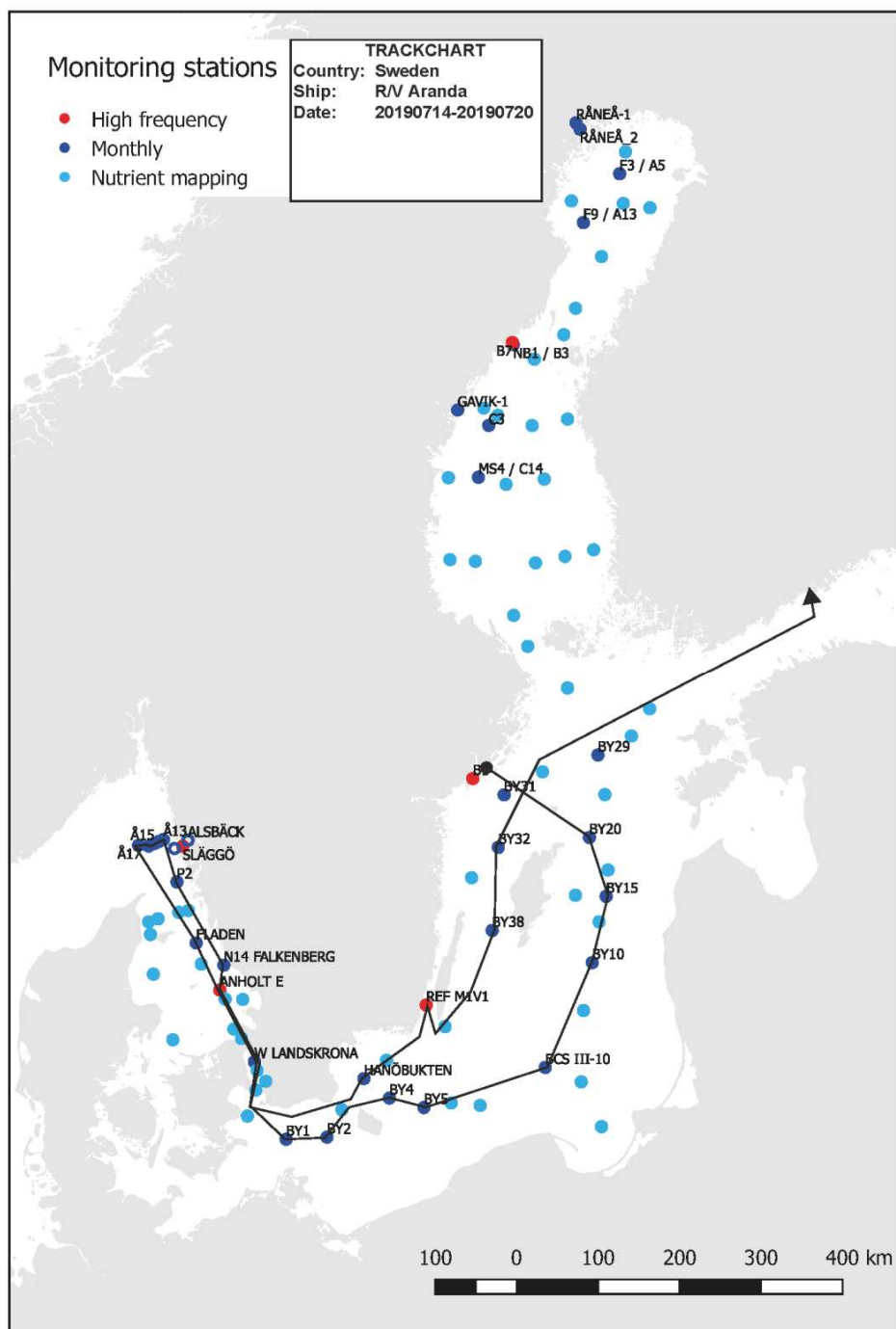


Fig. 1. Route and sampling stations July 2019

Sammanfattning

I både Skagerrak och Kattegatt dominerade kiselalgen *Proboscia alata* med relativt höga antal i slangproverna (0-10m) vid samtliga stationer. Artdiversiteten var allmänt låg och förutom *P. alata* återfanns framför allt olika dinoflagellater i slangproverna. Tydliga fluorescensmaxima noterades runt omkring 25-30 meter vid de flesta stationer. Vid samtliga fluorescensmaxima återfanns olika arter av dinoflagellatsläktet *Ceratium* i höga tätheter.

Inga heltäckande ytansamlingar återfanns utefter den östliga delen av Östersjön. Vind och vågor höll filamenten omblandade ner i vattenpelaren. De riskornslänkande aggregeringar som återfanns vid samtliga stationer innehöll alla tre släkten av de filamentösa cyanobakterier som brukar förekomma vid blomningarna sommartid i Östersjön. Det vill säga *Nodularia**, *Aphanizomenon* samt *Dolichospermum* (tidigare *Anabaena*). Släktena återfanns med varierande dominans sinsemellan. I den västra delen av Östersjön med start i Hanöbukten och söder om Öland så tilltog ytansamlingarna i form av massiva kornförekomster alternativt större stråk och sjok av aggregeringar. Vid Hanöbukten var filament av *Nodularia** mest förekommande medan de återfanns i lägre antal kring Kalmar sund samt södra Öland. I de centrala delarna av Östersjön mellan Öland och Gotland återfanns stora ansamlingar av cyanobakteriefilament. Stiltje rådde vilket underlättade för filamenten att flyta upp och bilda ytansamlingar.

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

Abstract

The diatom *Proboscia alata* was found in high concentrations in the hose samples (0-10m) taken at all stations in the Skagerrak and the Kattegat area. Distinct chlorophyll fluorescence maxima were noted at 25-30 meters at most stations. These maxima were all dominated by different species from the dinoflagellate genus *Ceratium*.

No heavy surface accumulations were seen along the eastern part of the Baltic. The wind and the waves kept the cyanobacteria filaments mixed in the water column. Small aggregates visible as grains in the water column were found at all stations. These grains contained all three groups of cyanobacteria in various ratios. Some indistinct streaks were noted far away from the boat seemingly close to the east coast of Gotland. In the western part of the Baltic, from the Hanö Bight and the south of Öland, numerous grains and streaks of accumulations were visible in large areas. The toxin producing genus *Nodularia** was most common in the Hanö Bight and less common in the sound of Kalmar and south of Öland. In the central parts of the Baltic between Öland and Gotland large patches of surface accumulations were present. The lack of wind and waves had enabled the filaments to float up to the surface and accumulate in patches or large streaks.

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

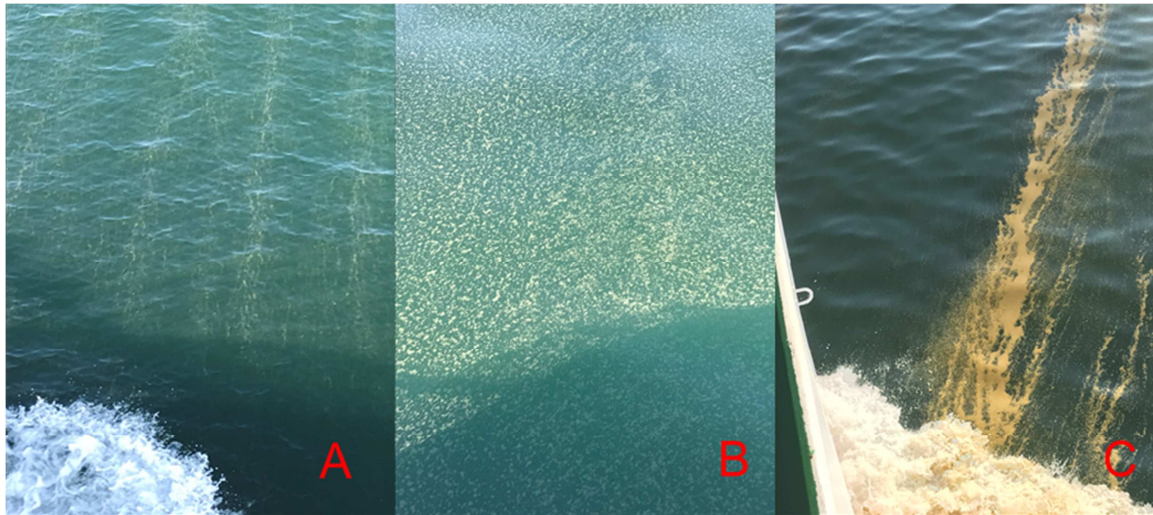


Fig. 2. Large areas with massive grain occurrences or streaks of surface accumulations were found in the south western part of the Baltic Sea (fig A and B). Larger surface accumulations in patches or streaks were found between Öland and Gotland (fig C)

The Skagerrak

Å17, Å16 and Å15 16th of July

The integrated sample (0-10m) at Å17 contained low total cell abundances. The diatom *Proboscia alata* dominated in cell numbers. Fluorescence maxima were found at 25-30 meters at both Å17, Å16 and Å15. The samples collected at these fluorescence maxima contained many different species belonging to the same dinoflagellate genus, *Ceratium*. At station Å17, the genus *Ceratium* was found together with small dinoflagellate cells that were *Azadinium** like, although the identification was not certain.

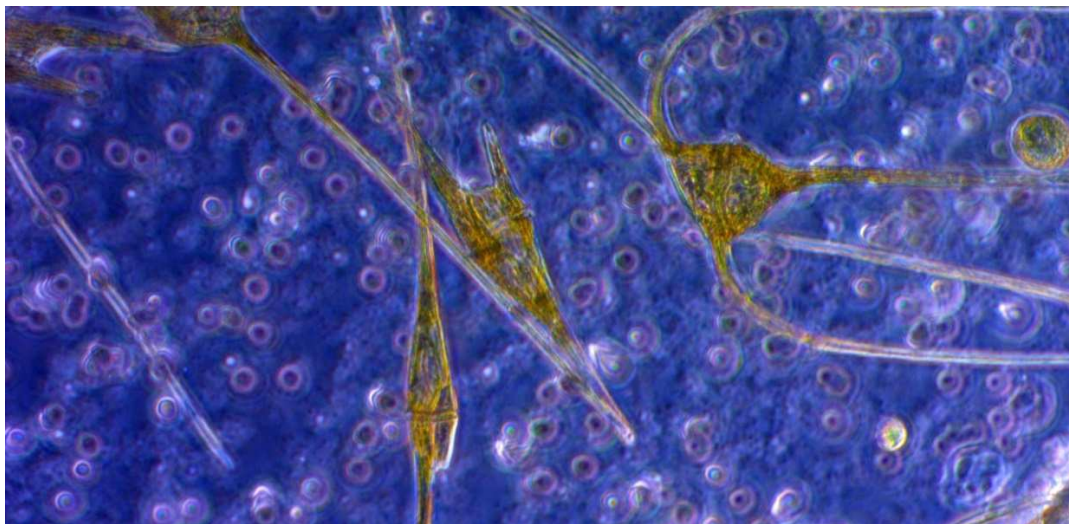


Fig.3. The dinoflagellate genus *Ceratium* dominated in all fluorescence maxima found in both the Skagerrak and the Kattegat.

The Kattegat

Anholt E 16th and 17th of July

The biodiversity and cell abundances were quite low at both visits. The diatom *Proboscia alata* dominated in cell numbers in the hose sample (integrated 0-10m) on both occasions. A fluorescence maximum was found at 25 meters at the second visit. This maximum mainly contained different species of the dinoflagellate genus *Ceratium*.

Fladen 16th of July

A minor fluorescence maximum was found at around 14-18 m. A sample was taken at 15 m and contained several species of the dinoflagellate genus *Ceratium*.

N14 Falkenberg 17th of July

The species diversity was low. The phytoplankton community was dominated by the diatom *Proboscia alata*. A minor fluorescence peak was found at 23-25 meters and mainly consisted of different species from the dinoflagellate genus *Ceratium*.



Fig 4. The diatom *Proboscia alata* dominated in all integrated samples along the Swedish west coast.

The Baltic Sea



Fig.5 In the eastern and southern part of the Baltic Sea, small grains of cyanobacteria filaments could be seen close to the surface in the beginning of the cruise. The wind and the waves kept the aggregates mixed down in the water column.

BY20 Fårö Deep 13st of July

A surface sample was taken during the night. Small amounts of filamentous cyanobacteria was found, and if the wind decreases the amount of filaments could result in quick surface accumulations in this area.

BY15 Gotlands Deep 14st of July

No surface accumulations were seen but grains of cyanobacteria were visible in the water column. The secchi depth was merely 4 m and indicated that high amounts of plankton were in the water. The surface sample contained many filaments of *Aphanizomenon*, *Dolichospermum* and *Nodularia spumigena**. The integrated sample (0-10m) was similar to the surface sample when considering cyanobacteria but also contained many chains of the diatom *Chaetoceros castracanei*. All cyanobacteria filaments looked healthy and viable. The equal amount of filaments in surface sample and integrated sample indicate a mixed water column with filaments homogenously located within the whole water column (0-10m). Among the smaller taxons lots of various pico cyanobacteria were common. Some cells of *Dinophysis acuminata** were also present in the sample

BY10 14th of July

The cell concentrations were low. Moderate and equal amounts of filaments of *Nodularia spumigena**, *Dolichospermum* spp and *Aphanizomenon* were found.

BCS-III South East of Gotland 14th of July

Due to wind no surface accumulations were noted but some grains could be seen in the water column. The biodiversity in the integrated hose sample was relatively high with diatoms from the genus *Chaetoceros*, dinoflagellates such as *Heterocapsa triquetra* and many different pico cyanobacteria. The

integrated sample also contained quite a few filaments of *Nodularia spumigena** whereas the genera *Dolichospermum* and *Aphanizomenon* were less abundant.

BY5 Bornholms Deep 15th of July

Some grains of filaments could be distinguished but the wind made it difficult to estimate the amount of aggregates. Among the filamentous cyanobacteria, *Nodularia spumigena** was the most common species. The integrated sample (0-10 m) consisted of quite a diverse plankton community mainly constituted by different diatoms and filamentous/colony forming cyanobacteria. The diatoms were mainly represented by the genus *Chaetoceros*.

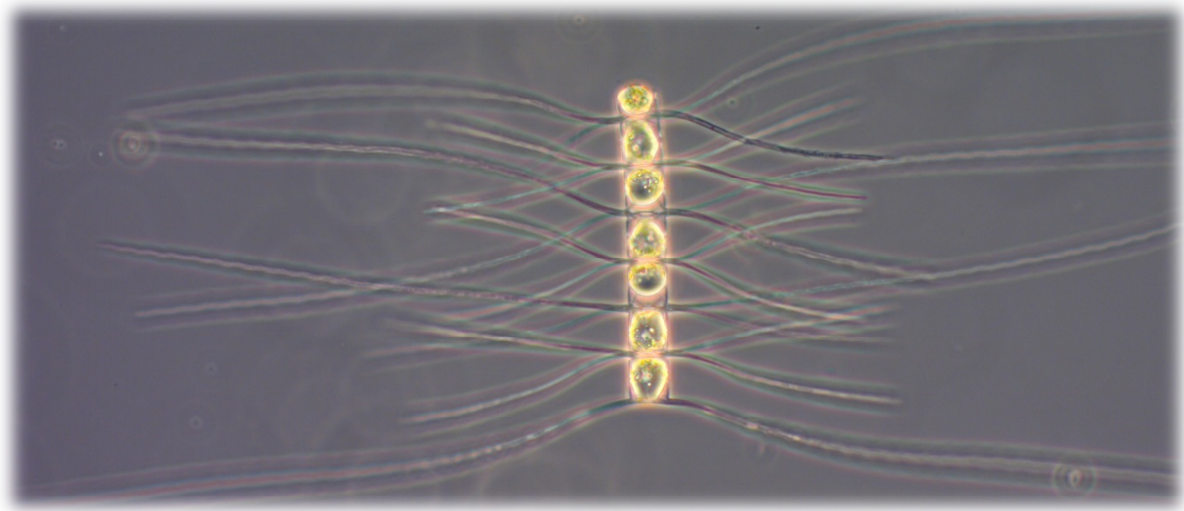


Fig. 6. The diatom Chaetoceros castracanei (previously called C. impressus) was very common at BY5 Bornholm Basin as well as at other stations in the Baltic Sea.

BY4 Christiansö 15th of July

This station was sampled when the wind was causing quite high waves. Some small grains of cyanobacteria were visible even if the waves were keeping the grains in turbulence. The surface sample revealed that all of the three filamentous cyanobacteria, including *Nodularia spumigena**, were quite common.

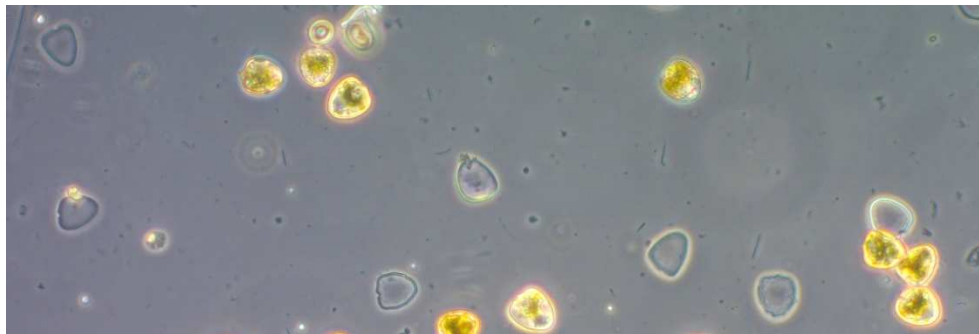


Fig. 7. Relatively high cell numbers of the dinoflagellate Prorocentrum cordatum were recorded in the integrated hose sample (0-10 m) taken at BY2 Arkona Basin.

BY2 Arkona 15th of July

Large and small grains of aggregates could clearly be seen even though it was quite windy. No specific cyanobacterium genus dominated, but the genus *Dolichospermum* was found in higher number of filaments than in the eastern parts. Both *Nodularia spumigena**, *Aphanizomenon flosaquae* and *Dolichospermum* spp. were present in high numbers. Besides cyanobacteria significant concentrations of the dinoflagellate *Prorocentrum cordatum** and *Ceratium tripos* were recorded in the hose sample from 0-10 meters.

BY1 15th of July

Some small grains were visible in the water column. The genus *Dolichospermum* spp. was found in highest numbers and small amounts of *N. spumigena* and *Aphanizomenon* were present.

W Landskrona 16th of July

No surface accumulations were noted. Only a few filaments of *Dolichospermum* spp. were found in the surface sample.

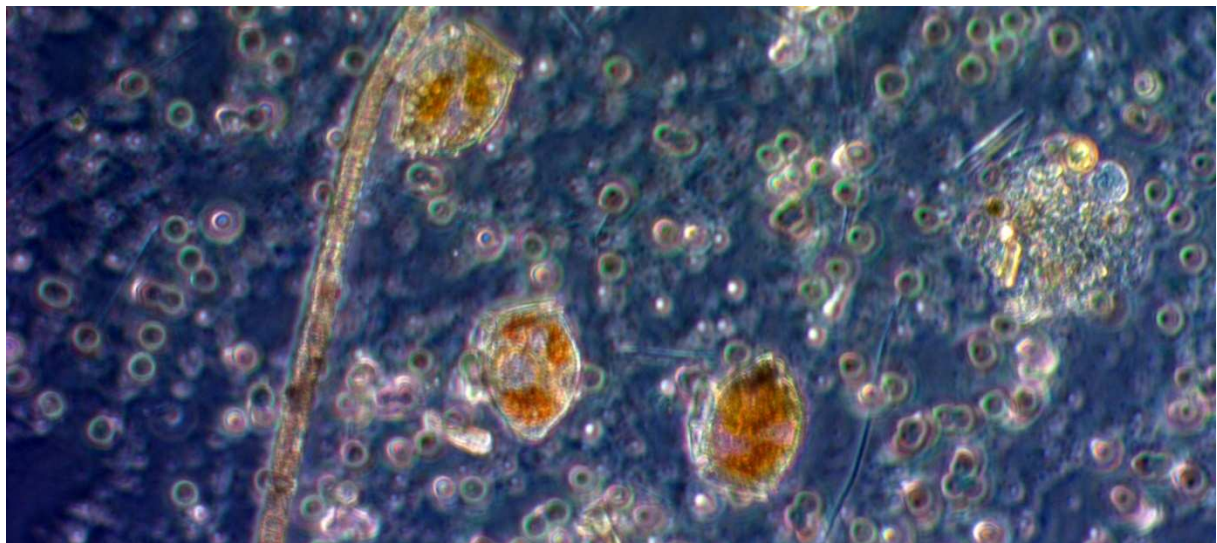


Fig. 8. The potentially toxic dinoflagellate *Dinophysis norvegica** was found in high cell numbers at several stations in the central part of the Baltic Sea between Öland and Gotland.

Hanö Bight 18th of July

Cyanobacteria aggregates in the shape of grains were clearly seen in the water. The grains at the surface consisted mainly of the filamentous cyanobacterium *N. spumigena**. *Dolichospermum* and *Aphanizomenon* were quite abundant too but seemed to be present a bit further down in the water column.. The accumulations increased as the cruise continued and in the middle of the Bight clear streaks of surface accumulations could be observed.

REF M1V1 Kalmar Sound 18th of July

The surface sample was dominated by filaments of the genera *Dolichospermum* and *Aphanizomenon*. *N. spumigena** was found in low amounts. The integrated sample (0-10 m) contained a community of low biodiversity. *C. castracaneis* was the most common among the diatoms and *Heterocapsa triquetra* among the dinoflagellates.

4.5 NE Ölands Södra 18th of July

The surface sample was dominated by filaments of *Aphanizomenon flosaquae*. *N. spumigena** and *Dolichospermum* were only found in small amounts.

BY38 Karlsö Deep and BY32 Norrköping 19th of July

Large areas with surface accumulations were observed. Station BY38 was dominated by the filamentous cyanobacterium *N. spumigena** whilst BY32 was dominated by *Aphanizomenon* filaments. Plenty of *Dinophysis norvegica** cells were found in the samples at both stations.

Selection of observed species	Anholt E	Anholt E	N14 Falkenberg	Å17
Red=potentially toxic species	16/7	17/7	17/7	16/7
Hose 0-10 m	presence	presence	presence	presence
Chaetoceros affinins		present		
Chaetoceros spp			present	present
Leptocylindrus danicus			present	
Proboscia alata	very common	very common	very common	very common
Ceratium furca	present	present		present
Ceratium fusus	present	present		common
Ceratium lineatum				present
Ceratium longipes	present	present		present
Ceratium macroceros		present		present
Ceratium tripos	present	common	present	common
<i>Dinophysis acuminata</i>	present	present		
Diplopsalis CPX	present			
Prorocentrum micans	present	present	present	present
<i>Prorocentrum cordatum</i>	present			
Protoceratium reticulatum	present			
Protoperidinium spp	present	present	present	present
Scrippsiella CPX				present
Dolichospermum sp		present	present	

Selection of observed species	BY2	BY5	Ref M1V1	BY15	BCSIII-10	BY32
Red=potentially toxic species	15/7	15/7	18/7	14/7	14/7	26/7
Hose 0-10 m	presence	presence	presence	presence	presence	presence
Chaetoceros danicus		present		common	common	present
Chaetoceros castracanei		common	present	very com- mon	common	common
Nitzschia longissima		present				
Ceratium tripos	present					
Dinophysis acuminata		present	present	present	present	present
Dinophysis norvegica	present			present	present	common
Dinophysis rotundata					present	
Diplopsalis CPX	present				present	
Gymnodiniales	present	present	present	present		present
Heterocapsa triquetra		present	common		common	
Prorocentrum minimum	very com- mon					
Protoperdinium spp			present			
Scrippsiella CPX	present					
Oocystis sp.					present	
Planctonema lauterbornii	present	present				
Cryptomonadales	present	present	present		present	
Ebria tripartita	present	common	present		present	
pico cyanobacteria colonies	common	very com- mon	present	very com- mon	very com- mon	present
Dolichospermum spp.	common	common	common	common	common	present
Aphanizomenon flosaquae	common	common	common	common	common	very com- mon
Nodularia spumigena	common	common	present	common	common	common

Surface samples, bucket	The following filamentous cyanobacteria were observed:		
Station:	<i>Aphanizomenon flosaquae</i>	<i>Nodularia spumigena</i> *	<i>Dolichospermum</i> spp.
BY20 14/7	present	present	present
BY15 14/7	common	common	common
BY10 14/7	common	common	common
BCSIII-10 14/7	present	common	present
BY5 15/7	present	common	present
BY4 15/7	common	common	common
W Hammer Odde 15/7	present	common	common
BY2 15/7	common	common	common
BY1 15/7	present	present	common
W Landskrona 16/7	common	present	present
Hanöbukten 18/7	common	very common	common
Ref M1W1 18/7	common	present	common
4.5 NE Ölands södra 18/7	common	present	present
BY38 19/7	common	very common	present
BY32 19/7	very common	common	present
Huvudskärs Buy 19/7	very common	very common	present