Diarienummer: S/Gbg 2022-108

SMHI
Oceanographic Unit
No 7, July 2022

AlgAware
Algal situation in
Marine Waters surrounding Sweden

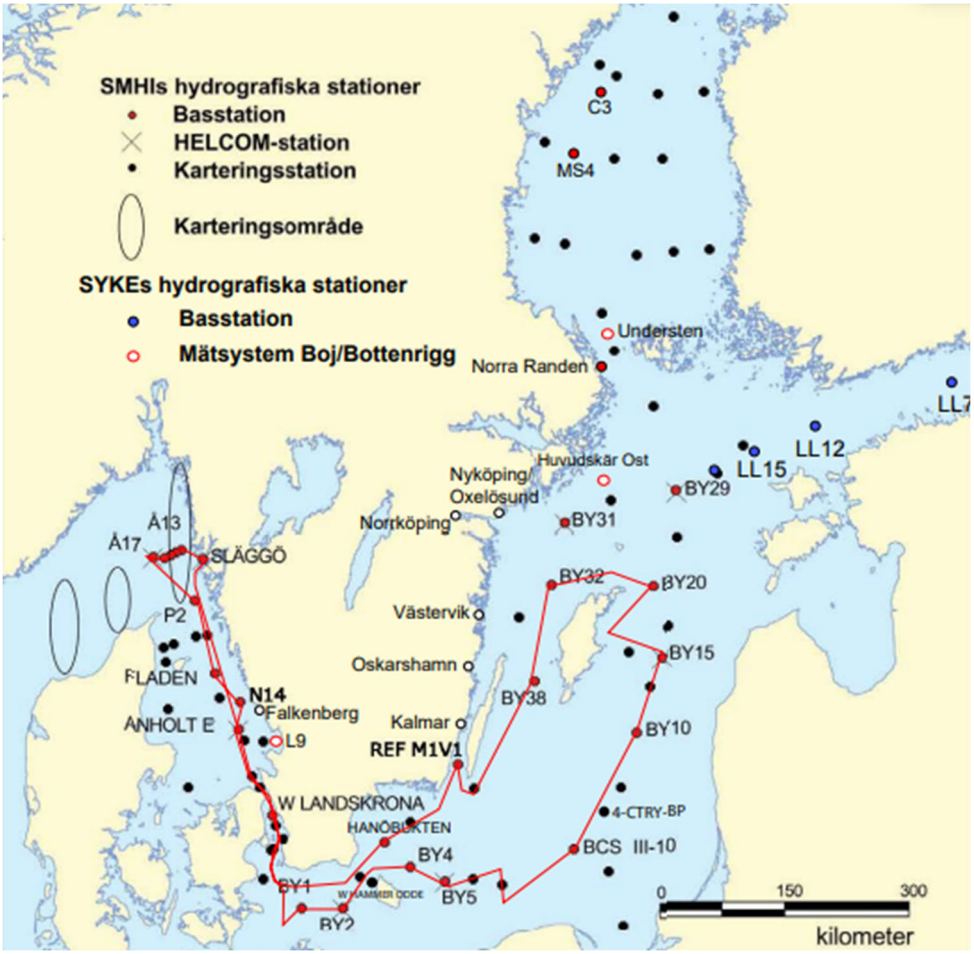

Fig 1. Sampling route of R/V Svea July 2022

Sammanfattning

Analyserna utfördes ombord på fartyget R/V Svea under expeditionens gång. Vatten från integrerade djup alternativt diskreta djup har filtrerats ner på 5µm filter och analyserats med ett rättvänt mikroskop. Metoden innebär framför allt att större celler kan identifieras medans små celler blir svårbestämda och förbises i större utsträckning.

I både Skagerrak och Kattegatt dominerades de större cellerna av kiselalgen *Proboscia alata* vid samtliga stationer med relativt höga antal i slangproverna (0-10m). De mindre cellerna var klart dominerade av *Emiliania huxleyi* som var talrik vid samtliga stationer. Artdiversiteten var annars allmänt låg. Flera mindre klorofyllfluorescens maxima noterades vid olika djup. Vid Å-snittets kustnära stationer återfanns höga tätheter av *Dinophysis acuta* vid fluorescensmaximum runt 10-12 meter.

Inga tydliga ytansamlingar av cyanobakterier observerades i Östersjön denna expedition. Mycket på grund av vind och vågor som blandade om vattnet. Proverna från de sydvästliga stationerna visade på fåtal filament i vattnet. Vid södra delens mitt utanför Bornholm återfanns lite fler filament i både ytprov och integrerat prov. Vid den sydöstliga delen var vattnet väl omblandat med relativt hög fluorescens ner till 20 meter. Här var både *Aphanizomenon flosaquae* och *Nodularia spumigena** vanligt förekommande i både yt- och slangprover. Den östra mellersta delen av egentliga Östersjön hade lite mer filament vid BY15 Gotlandsdjupet här noterades eventuellt även små ytansamlingar norr om stationen. Vid den nordligaste delen av expeditionen, norr om Gotland, återfanns lite större mängder av filament. Vid båda stationerna var det nedblandat till ca 12-15 meter på grund av blåst. Om vinden mojnar så kan ytansamlingar snabbt bildas. I detta område har även satellitbilder indikerat ytansamlingar de senaste dagarna. Vid BY38 mellan Öland och Gotland hade vinden mojnat lite och vågorna var mindre. Här sågs små riskorn i vattnet vilket skulle kunna vara cyanobakterier och leda till ytansamlingar om vinden avtar. Ytprovet verkade ha mer filament än slangprovet vilket indikerar att filamenten kanske är på väg upp till ytan. I de västra delarna återfanns mycket cyanobakteriefilament, släktet *Dolichospermum* dominerade.

Abstract

The analyses were made onboard the ship R/V Svea during the cruise. Water from integrated samples or discrete depths were filtrated down to filters with 5µm pore size. The method is more suitable for identifying larger and more robust cells whereas smaller cells or fragile cells are difficult to determine taxonomically and missed to a higher degree.

The diatom *Proboscia alata* was found in high concentrations in the integrated hose samples taken at all stations in the Skagerrak and the Kattegat. Among the smaller cells numerous cells of *Emiliania huxleyi* were present. The species diversity was overall low. Several smaller chlorophyll fluorescence maxima were found at several depths. Stations at the transect Å-snittet presented a fluorescens maximum at 10-12 meter and closer to the coast *Dinophysis acuta* dominated the samples.

No clear surface accumulations of cyanobacteria were found in the Baltic Sea during this expedition. This was probably due to high wind speed and waves that mixed the water. The samples from the southwest stations showed only few filaments in the water. At the middle of the southern part outside Bornholm a few more filaments were found in both the surface sample and the integrated sample. At the southeastern part, the water was well mixed with relatively high fluorescence down to 20 meters. Here, both *Aphanizomenon flosaquae* and *Nodularia spumigena** were common in both surface and hose samples. The eastern middle part of the Baltic Proper had a little more filament at BY15 Gotland Deep here small surface accumulations were also noted from the skip a bit north of the station. At the northernmost part of the expedition, north of Gotland, slightly larger amounts of filaments were found. At both stations it was mixed down to about 12-15 meters due to wind. If the wind calms down, surface accumulations can form quickly. In this area, satellite images have also indicated surface accumulations in recent days. At BY38 between Öland and Gotland, the wind had calmed down a bit and the waves were smaller. Here, small grains were seen in the water, which could be small aggregations of filaments and lead to surface accumulations if the wind decreases. The surface sample appeared to have more filaments than the hose

sample, indicating that the filaments may be on their way to the surface. In the western parts, a lot of cyanobacterial filaments were found, but mostly it was the genus Dolichospermum that dominated.

För att se satellittolkningar av ytansamlingar av cyanobakterier:

https://www.smhi.se/vader/observationer/algsituationen

Please follow the link below to see interpretations of blooms from satellite images in the Baltic:
https://www.smhi.se/vader/observationer/algsituationen

The Skagerrak

Släggö 12th of July

The integrated sample (0-10m) contained moderate total cell numbers. The diatom *Proboscia alata* dominated in cell numbers among the larger cells. The coccolithophore *Emiliania huxleyi* was found in highest cell numbers. A thin chlorophyll fluorescence maximum was found at about 17 meters. A sample was collected but unfortunately the thin layer was missed. Some cells of *Tripos fusus* were found indicating that the genus *Tripos* could be dominating in the layer.

Å17 12th of July

The integrated sample (0-10m) at Å17 contained low total cell abundance. The diatom *Proboscia alata* dominated in cell numbers. The coccolithophore *Emilinia huxleyi* was also found in high cell numbers. A thin fluorescence maximum was found at 35-40 meters mainly containing P. alata.

Fluorescens maxima with different magnitudes were found at most stations in Skagerrak. In the transect Å13-Å17 at about 10-15 m and at the stations closer to the coastline *Dinophysis acuta* dominated but the genus *Tripos* was also often common. At P2 the most southern station in Skagerrak moderate amounts of *D.acuta* were found at the deepest maximum at 30 meters. The coccolithophore *Emiliania huxleyi* was also present in high cell numbers at the same time at all maximum.

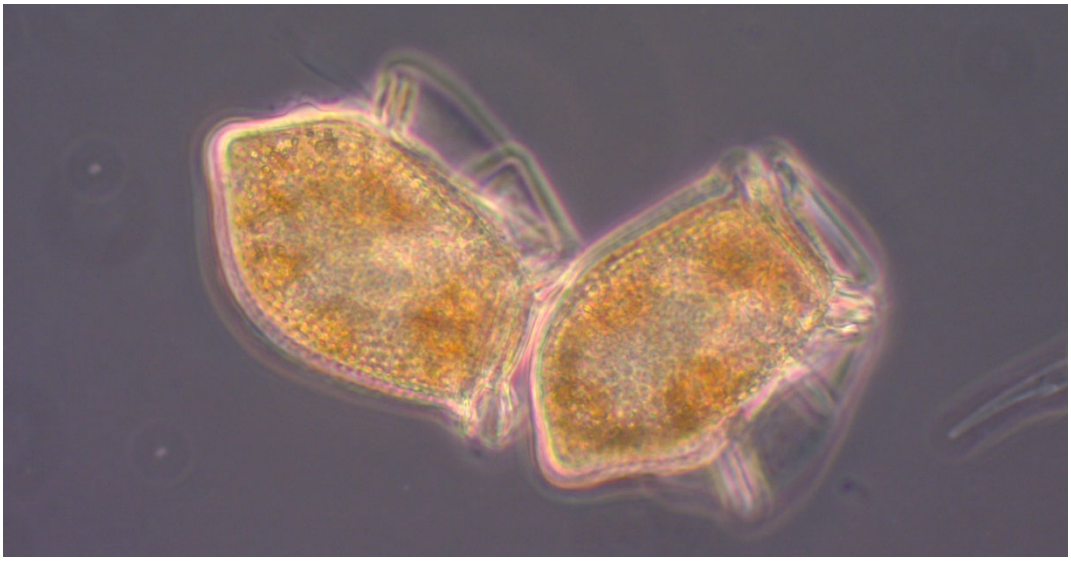

Fig 2. The dinoflagellate Dinophysis acuta dominated in several chlorophyll maximum found in Skagerrak. The species has more or less been absent for several years along the Swedish west coast. D. acuta is the largest of the genus and is considered to be the most toxic species of this genus along the Swedish west coast.

The Kattegat

Anholt E 13th and 17th of July

The biodiversity and cell abundance were moderate on both visits. Diatoms dominated among the larger cells and *Proboscia alata* was found in highest cell numbers in the hose samples (integrated 0-10m) on both occasions. Numerous cells of *Emiliania huxleyi* were also found in the hose sample. Multiple small fluorescence maxima were found at 16-22 meters on the first visit. The shallower maximum contained diatoms where *P. alata* was most numerous. The deeper maximum at 20-22 meters was dominated by different species of the dinoflagellate genus *Tripos* where *T. macroceros* was most common. At the second visit there was no fluorescens maximum.

N14 Falkenberg 13th of July

The species diversity and total cell numbers were relatively low. The larger species of the phytoplankton community was dominated by the diatom *Proboscia alata*. The small species were dominated by *Emiliania huxleyi* which were found in highest cell numbers. A small chlorophyll fluorescence maximum was found at 15 meters and mainly consisted of the same species as in the hose sample (0-10 m) but with more cells.

Fig 3. The dinoflagellate genus Tripos dominated in the deeper chlorophyll maximum at Anholt E

Several small fluorescence maxima were found at different depths in the Kattegat. Most of these contained the same species composition as the integrated surface sample (0-10m). One exception was Anholt E where the deeper fluorescens maximum was totally dominated by different species of the genus *Tripos*. At Landskrona east one fluorescens maximum was found and the sample collected contained equal numbers of *Proboscia alata* and the genus *Tripos*, like it had merged two maximums into one.

The Baltic Sea

W Landskrona, Flinten 7 and BY1 13th of July

Surface samples were collected. No surface accumulations of cyanobacteria were noted. Only a few filaments of *Dolichosphermum* spp. were found in the surface samples.

BY2 Arkona Deep 14st of July

The species diversity and total cell numbers were quite high. Among the larger cells the diatom *Dactyliosolen fragilissimus* was common. The dinoflagellate *Prorocentrum cordatum* was also found in high cell numbers. Only a few filamentous cyanobacteria were found in the surface sample collected with a bucket.

BY4 Christiansö 14th of July

A surface sample was collected with a bucket. The wind stress was high and waves were probably mixing the upper part of the water column. Quite a few filaments of cyanobacteria were found and mainly *Nodularia spumigena* was present.

BY5 Bornholms Deep 14 th of July

The integrated sample (0-10 m) contained quite low total cell numbers and the biodiversity was rather low. Small cells dominated and the highest cell numbers was represented by a small flagellate that could not be taxonomically determined. Colony forming cyanobacteria were also quite common and represented by different species. Filamentous cyanobacteria were only present in low amounts in both the integrated hose sample and the surface sample collected with a bucket. A quite distinct fluorescens peak was found at about 20 meters. The sample taken in close vicinity revealed a lot of small centric diatoms.

BCS III-10 15th of July

The integrated sample (0-10 m) contained moderate cell numbers but the biodiversity was quite low. The diatom *Chaetoceros castracanai* was found in many chains and dominated the sample. The filamentous cyanobacteria *Aphanizomenon flosaquae* was common, *Nodularia spumigena** was also common but to a lesser extent. A surface sample was collected and contained about the same composition as the hose sample which indicates that the wind stress is mixing the water column. This was also noted in the CTD plot where relatively high fluorescens was found down to 20 meters.

BY10 15th of July

No surface accumulations of cyanobacteria due to wind stress. The concentration of filaments at surface were moderate with equal numbers of filaments of *Nodularia spumigena** and *Aphanizomenon* spp. A minor fluorescence maximum was found at 15 meters and it mainly consisted of *Binuclearia lauterbornii* and *Dinophysis norvegica.*

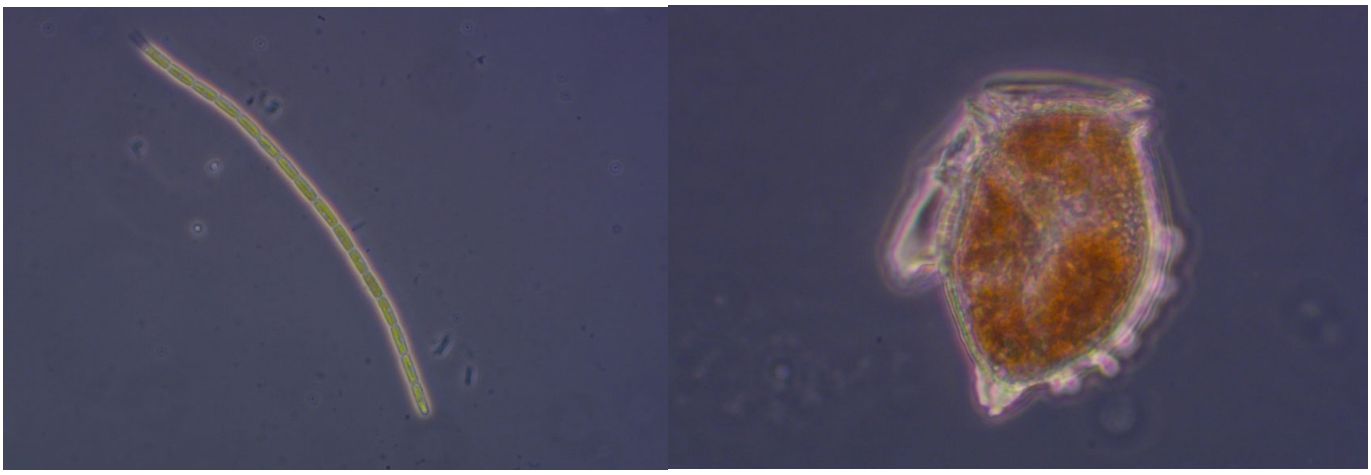

Fig 4. Binuclearia lauterbornii (left) and Dinophysis norvegica (right) were common at a couple of fluorescence maximum in the Baltic Proper

BY15 Gotlands Deep 15st of July

No surface accumulations were seen at the station due to wind stress. A sample was taken at the surface and contained moderate amounts of *Aphanizomenon flosaquae* and *Nodularoa spumigena**. The CTD plot showed a homogenous chlorophyll column to about 15 meters which indicates that the filaments were mixed down. The hose sample (0-10 meters) had a dominance of *Binuclearia lauterbornii* but *Aphanizomenon flosaquae* and *Nodularia spumigena** were also present in relatively high filament numbers. Colony forming cyanobacteria were also common and *Aphanothese paralelliformis* was most common. The equal amount of filamentous cyanobacteria in surface sample and hose sample indicates that the filaments were dispersed into the top layer (0-10 m) of the water column.

Östergarnsholm 15th of July

The wind stress was less prominent at this station located closer to the east of Gotland but even so no grains or accumulations were visible. The collected surface sample had a few filaments of *Aphanizomenon flosaquae* and even less *Nodularia spumigena**.

BY 20 Fårö Deep 16th of July

The integrated sample was dominated by both filamentous and colony forming cyanobacteria and few other species was found. The station was sampled during night which means that surface accumulations could not be noted. The surface sample contained quite many filaments where *Aphanizomenon flosaquae* was most common but *Nodularia spumigena** was also present in high amounts. The integrated sample indicated that the filaments were equally distributed in the first 10 meters as it contained more or less the same amount.

Fig 5. Both Nodularia spumigena and Aphanizomenon flosaqaue were common in the northern part of the Baltic Proper.

BY32 Norrköping Deep 16th of July

No visible aggregations at surface. Only a surface sample was collected. The sample contained mostly *Aphanizomenon flosaqaue* in relative high amount but some *Nodularia spumigena** was also present. Less filaments were found compared to BY20.

BY 38 Karlsö Deep 16th of July

The hose sample (0-10 m) was dominated by filamentous cyanobacteria. Filaments of *Aphanizomenon flosaquae* was most numerous but *Nodularia spumigena** was also common. Small grains could be noted close to the surface. The wind had decreased and the waves. The surface sample seemed to have a bit more filaments than the hose sample indicating that the decreased wind and waves were slowly enabeling the filaments to reach the surface.

BY 39 Öland south 16th of July

This station was sampled in the evening. A surface sample was collected. Filaments of both *Aphanizomenon flosaquae* and *Nodularia spumigena** were common in the sample. The CTD'c cast and a sample analysed from 10 meters indicated that the first 10 meters contained filaments.

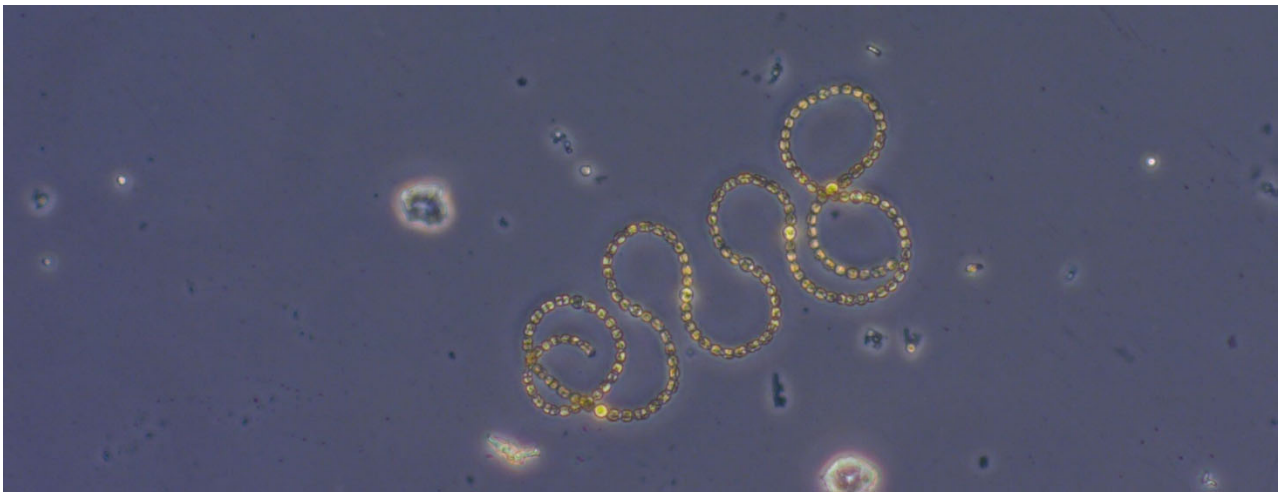

Fig 6. The genus Dolichospermum was dominating in the samples in the western part of the Baltic Proper

Ref M1V1 Kalmar sound 17th of July

The integrated sample (0-10 m) was dominated by filamentous cyanobacteria where the genus *Dolichospermum* was found in highest cell numbers. *Aphanizomenon flosaquae* was also found but only a few filaments of *Nodularia spumigena**. A fluorescence maximum was found at 15 meters and contained mainly *Chaetoceros castracanai*, *Dinophysis norvegica** and small cells that could not be taxonomically determined. The surface sample had many cyanobacteria filaments dominated by the genus *Dolichospermum* and only a few other filaments.

Hanö Deep 17th of July

The surface sample contained many cyanobacteria filaments clearly dominated by the genus *Dolichospermum* and only a few other filaments. A fluorescence maximum was found at 18 meters and mainly contained *Binuclearia lauterbornii* but also some *Chaetoceros castracanai*

Selection of observed species	Anholt E	Anholt E	N14 Falkenberg	Släggö	Å17
Red=potentially toxic species	13/7	17/7	13/7	12/7	12/7
Hose 0-10 m	presence	presence	presence	presence	presence
Cerataulina pelagica				present	
Chaetoceros		present		present	
Chaetoceros affinis	present				
Chaetoceros contortus	present	present			
Chaetoceros danicus	present				
Chaetoceros subtilis				present	present
Chaetoceros tenuissimus				present	
Chaetoceros throndsenii				common	
Cylindrotheca closterium		present			
Dactyliosolen fragilissimus	present	present	present		present
Guinardia delicatula	present	present	present		
Guinardia flaccida	present	present	present		
Leptocylindrus danicus				present	present
Proboscia alata	common	very common	common	common	common
Rhizosolenia setigera f. pungens		present			
Thalassionema frauenfeldii			present		
Thalassionema nitzschioides	present				
Alexandrium pseudogonyaulax	present		present		
cf. Azadinium		present		present	
Dinophysis acuta				present	
Dinophysis norvegica				present	
Gymnodiniales	present	present	present		common
Heterocapsa rotundata		present		present	
Heterocapsa triquetra				present	
Peridiniella danica				present	
Phalacroma rotundatum				present	
Prorocentrum cordatum				present	present
Prorocentrum micans	present				
Protoperidinium crassipes					present
Tripos longipes					present
Tripos macroceros	present				
Tripos muelleri	present	present	present		present
Emiliania huxleyi	very common	very common	very common	very common	common
Cryptomonadales	present				present
Octactis speculum			present		
Dolichospermum		present			
Dolichospermum flosaquae	present		present		
Ebria tripartita					present

Selection of observed species	BY2	BY5	Ref M1V1	BY15	BCSIII-10	BY20	BY38
Red=potentially toxic species	15/7	14/7	16/7	15/7	15/7	16/7	16/7
Hose 0-10 m	presence	presence	presence	presence	presence	presence	presence
Centrales			present				
Chaetoceros castracanei	common	present		present	very common		present
Chaetoceros danicus	present	present					common
Cyclotella		present					
Cyclotella choctawhatcheeana	present	present			present		
Cylindrotheca closterium					present		
Dactyliosolen fragilissimus	very common						
Pennales					common		present
Proboscia alata		present					
Skeletonema marinoi	present	present					
Dinophysis acuminata							present
Dinophysis norvegica			present				present
Gymnodiniales	present			present			present
Phalacroma rotundatum							present
Prorocentrum cordatum	very common						
Tripos muelleri	present						
Dinobryon faculiferum	present			present			
Oocystis	present	present			present	present	present
Binuclearia lauterbornii	common			common	common	present	common
Cryptomonadales		present					
Aphanizomenon flosaquae		present	common	common	common	very common	common
Aphanocapsa	present	present		present	present	present	present
Aphanothece		present	present	present	present	present	present
Aphanothece paralleliformis		present	present	common	present	common	present
Dolichospermum	present		very common				present
Dolichospermum flosaquae		present					
Nodularia spumigena	present	present	present	common	common	common	common
Snowella	present	present		present	present	present	
Ebria tripartita	present	present		present			present
Helicostomella subulata			present				

Om AlgAware
SMHI genomför månatliga expeditioner i Östersjön och Västerhavet. Resultat baserade på semikvantitativ mikroskopanalys av planktonprover samt klorofyllmätningar presenteras kortfattat i denna rapport. Information från SMHIs satellitövervakning av algblomningar finns under perioden juni-augusti på www.smhi.se. Resultat från provtagningarna kan hämtas från SMHI:s databas på sharkweb.smhi.se. Hydrografidata läggs ut varje månad, växtplanktondata läggs ut en gång per år.

About AlgAware
SMHI carries out monthly cruises in the Baltic and the Kattegat/Skagerrak. Results from semi quantitative microscopic analysis of phytoplankton samples as well as chlorophyll measurements are presented in brief in this report. Information from SMHIs satellite monitoring of algal blooms is found on www.smhi.se during the period June-August. Results from the expeditions are found in the SMHI database, sharkweb.smhi.se. Data are published monthly, phytoplankton data however, are published once a year.

Art / Species	Gift / Toxin	Eventuella symptom	Clinical symptoms
Alexandrium spp.	Paralytic shellfish poisoning (PSP)	**Milda symptom:** Inom 30 min.: Stickningar eller en känsla av bedövning runt läpparna, som sprids gradvis till ansiktet och nacken; stickningar i fingertoppar och tår; Huvudvärk; yrsel, illamående, kräkningar, diarré **Extrema symptom:** Muskelförlamning; andningssvårigheter; känsla av att kvävas; Man kan vara död inom 2-24 timmar efter att ha fått i sig giftet, på grund av att andningsmuskulaturen förlamas.	**Mild case:** Within 30 min: tingling sensation or numbness around lips, gradually spreading to face and neck; prickly sensation in fingertips and toes; headake, dizziness, nausea, vomiting, diarrhoea. **Extreme case** Muscular paralysis; pronounced respiratory difficulty; choking sensation; death trough respiratory paralysis may occur within 2-24 hours after ingestion.
Dinophysis spp.	Diarrehetic shellfish poisoning (DSP)	**Milda symptom:** Efter cirka 30 minuter till några timmar: yrsel, illamående, kräkningar, diarré, magont **Extrema symptom:** Upprepad exponering kan orsaka cancer	**Mild case:** Within 30 min-a few hours: dizziness, nausea, vomiting, diarrhoea, abdominal pain. **Extreme case:** Repeated exposure may cause cancer.
Pseudo- niztschia spp.	Amnesic shellfish poisoning (ASP)	**Milda symptom:** Efter 3-5 timmar: yrsel, illamående, kräkningar, diarré, magkramper **Extrema symptom:** Yrsel, hallucinationer, förvirring, förlust av korttidsminnet, kramper	**Mild case:** Within 3-5 hours: dizziness, nausea, vomiting, diarrhoea, abdominal cramps. **Extreme case:** dizziness, hallucinations, confusion, loss of memory, cramps.
Chaetoceros concavicornis/ C.convolutus	Mechanical damage through hooks on setae	**Låg celltäthet:** Ingen påverkan. **Hög celltäthet:** Fiskens gälar skadas, fisken dör.	**Low cell numbers:** No effect on fish. **High cell numbers:** Fish death due to gill damage.
Pseudochattonella spp.	Fish toxin	**Låg celltäthet:** Ingen påverkan. **Hög celltäthet:** Fiskens gälar skadas, fisken dör.	**Low cell numbers:** No effect on fish. **High cell numbers:** Fish death due to gill damage.

Översikt över några potentiellt skadliga alger och det aktuella giftets effekt. Overview of potentially harmful algae and effects of toxins. Manual on harmful marine microalgae (2003 - UNESCO Publishing).

Kartan på framsidan visar viktat medelvärde för klorofyll *a,* µg/l (0-10 m) vid de olika stationerna. Pil upp eller ned indikerar om resultatet är över eller under en standardavvikelse från medel. Medel är beräknat utifrån aktuell månad under perioden 2001-2015. Förekomst av skadliga alger vid stationer där arter analyseras markeras med symbol.

The map on the front page shows weighted mean of chlorophyll *a*, µg/l (0-10 m) at sampling stations. The arrow up or down indicate whether the result is above or below one standard deviation from mean. The mean value is calculated using results from the actual month during the period 2001-2015. Presence of harmful algae at stations where species analysis is performed is shown with a symbol.


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