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AlgAware

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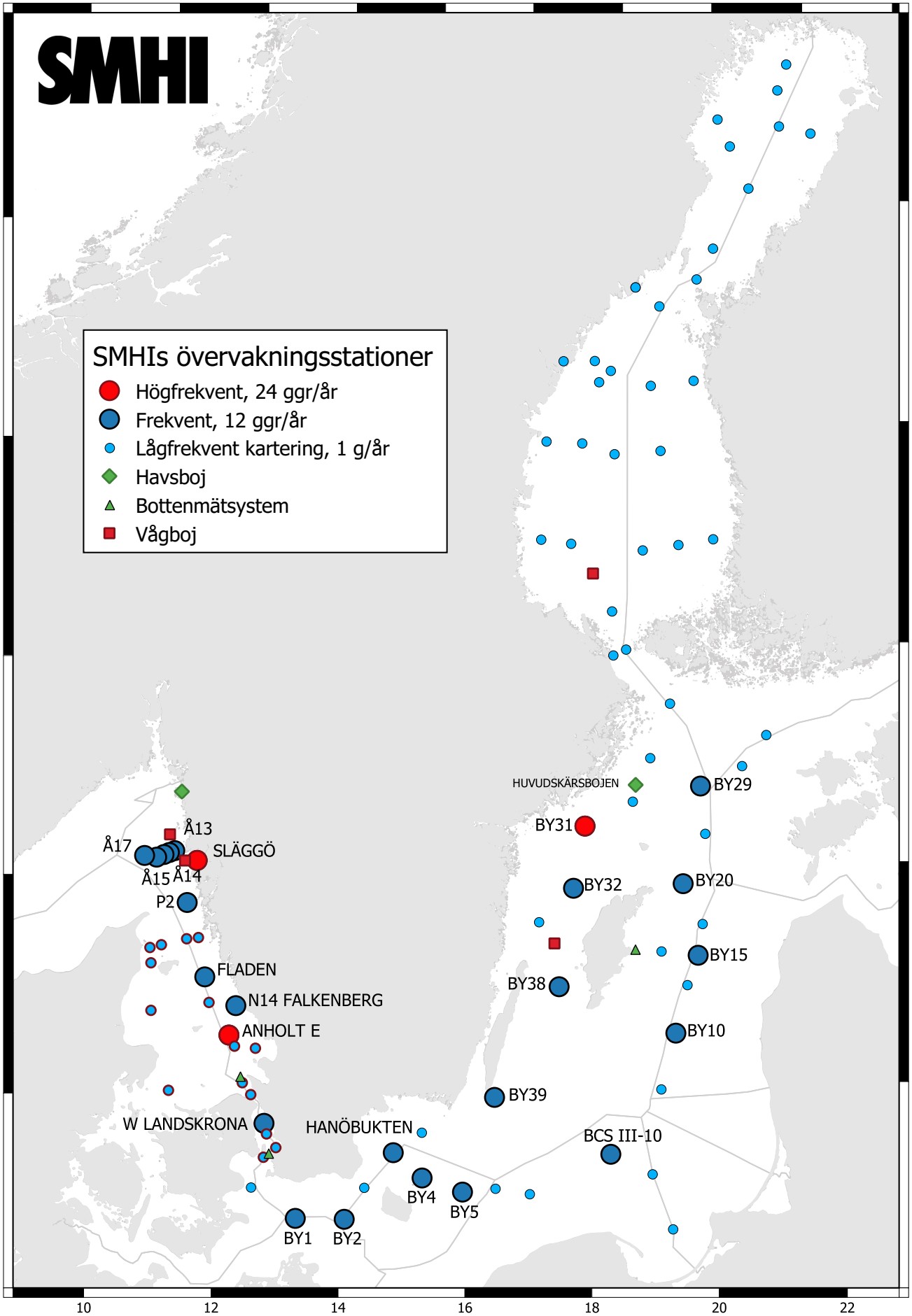
ALGAL SITUATION IN MARINE WATERS SURROUNDING SWEDEN



Sammanfattning

Analyserna utfördes ombord på fartyget R/V Svea under expeditionens gång. Expeditionen startade i Falkenberg och fortsatte genom Östersjön, och tillbaka till västerhavet. Ytprover togs vid alla stationer i Östersjön för att specifikt övervaka blomningen av cyanobakterier. Vatten från integrerade djup eller diskreta djup provtogs och filtrerades genom 10 µm filter, varefter proverna analyserades med ett rättvänt mikroskop. Denna metod gör det möjligt att identifiera större celler, medan mindre celler ofta blir svåra att bestämma och förbises i högre utsträckning.

Artdiversiteten var allmänt låg i både Skagerrak och Kattegatt. Centriska kiselalger dominerade växtplanktonsamhället, särskilt långa, smala celler av släktena *Proboscia* och *Rhizosolenia*. Vid de flesta stationer dominerades de större cellerna av kiselalgen *Proboscia alata*. Arter inom släktet *Tripos* var också mycket vanliga. Det är värt att nämna att vid Anholt E i Kattegatt påträffades det centriska kiselalgssläktet *Cyclotella* i större antal. Klorofyllfluorescensmaxima noterades vid olika djup och i olika intensitet vid de flesta stationer i Västerhavet. Dessa maxima dominerades av *P. alata* och *Rhizosolenia imbricata*.

Ytansamlingar av cyanobakterier observerades främst i södra och östra Östersjön under denna expedition, vilket överensstämde väl med satellitanalyserna från SMHIs övervakning. De kraftigaste ansamlingarna återfanns i sydöstra Östersjön, nära stationen BCS III-10. Mindre ansamlingar noterades även i norra Östersjön, nära station BY29. Den potentiellt giftiga arten *Nodularia spumigena** var den vanligaste cyanobakterien i södra och östra Östersjön, medan det var en mer jämn fördelning av grupperna i övriga delar av Östersjön. Vid flertalet stationer noterades högre koncentrationer av filament i ytprover jämfört med integrerade prover (0-10 m), vilket indikerar att filamenten främst var koncentrerade nära ytan. Frånvaron av ytansamlingar i norra och västra egentliga Östersjön berodde på vindstyrkan, men om vinden minskar finns potential för ytansamlingar i större delen av egentliga Östersjön.

Abstract

The analyses were conducted onboard the R/V Svea during the cruise, which began in Falkenberg, traversed the Baltic Sea, and concluded on the west coast. Surface samples were collected at all stations in the Baltic Sea specifically to monitor cyanobacteria blooms. Additionally, water from integrated depths or discrete depths was sampled, filtered through 10 µm filters, and analyzed with an upright microscope. This method primarily enables the identification of larger cells, while smaller cells are often harder to identify and more frequently overlooked.

Species diversity was generally low in both the Skagerrak and the Kattegat areas. Centric diatoms dominated the phytoplankton community, particularly long, thin cells from the genera *Proboscia* and *Rhizosolenia*. At most stations, the larger cells were dominated by the diatom *Proboscia alata*. Species from the genus *Tripos* were very common. It is worth noting that at Anholt E in the Kattegat, the centric diatom genus *Cyclotella* was found in high cell numbers. Chlorophyll fluorescence maxima were noted at various depths and with varying intensity at most stations in the Kattegat and Skagerrak areas. These maxima were dominated by *P. alata* and *Rhizosolenia imbricata*.

Surface accumulations of cyanobacteria were mainly observed in the southern and eastern Baltic Sea during this cruise, which coincided well with satellite analyses from the daily SMHI surveillance. The densest accumulations were found in the southeastern Baltic Sea, near station BCS III-10. Smaller accumulations were also noted in the northern Baltic Sea, near station BY29. The potentially toxic species *Nodularia spumigena** was the most commonly occurring cyanobacterium in the southern and eastern Baltic Sea, while there was a more even distribution of groups in other parts of the Baltic Sea. At several stations, higher concentrations of filaments were noted in surface samples compared to integrated samples (0-10 m), indicating that the filaments were mainly concentrated near the surface. The absence of surface accumulations in the northern and western Baltic Proper was due to wind strength, but if the wind decreases, there is potential for surface accumulations in larger parts of the Baltic Proper.

Below follows a more detailed information on species composition and abundance. Species marked with * are potentially toxic or harmful.

The Skagerrak

P2 20th of July

A fluorescence maximum was found at 20 meters, mainly containing a diverse diatom community dominated by thin *Rhizosolenia imbricata* cells. Other common species were *Proboscia alata* and *Guinardia flaccida*.

Å17 20th of July

The integrated sample (0-10m) at Å17 showed very low total cell abundance and low biodiversity. Among the larger cells, the diatoms *P. alata* and *R. imbricata* were dominant, but the dinoflagellate genus *Tripos* was also fairly common. Smaller cells were represented by small naked dinoflagellates. A fluorescence maximum was found at 30 meters, but the sample contained hardly any cells. The peak was either dominated by taxa smaller than 10 µm or was missed.

Å13 20th of July

A distinct fluorescence maximum was found at 15 meters, mainly containing a diverse diatom community dominated by thin *R. imbricata* and *P. alata*.

Släggö 20th of July

The integrated sample (0-10m) contained high total cell numbers and had the highest biodiversity on the west coast during the cruise. The centric diatom *P. alata* dominated the sample. Dinoflagellates belonging to the genus *Tripos* were also common, together with *Prorocentrum micans*.

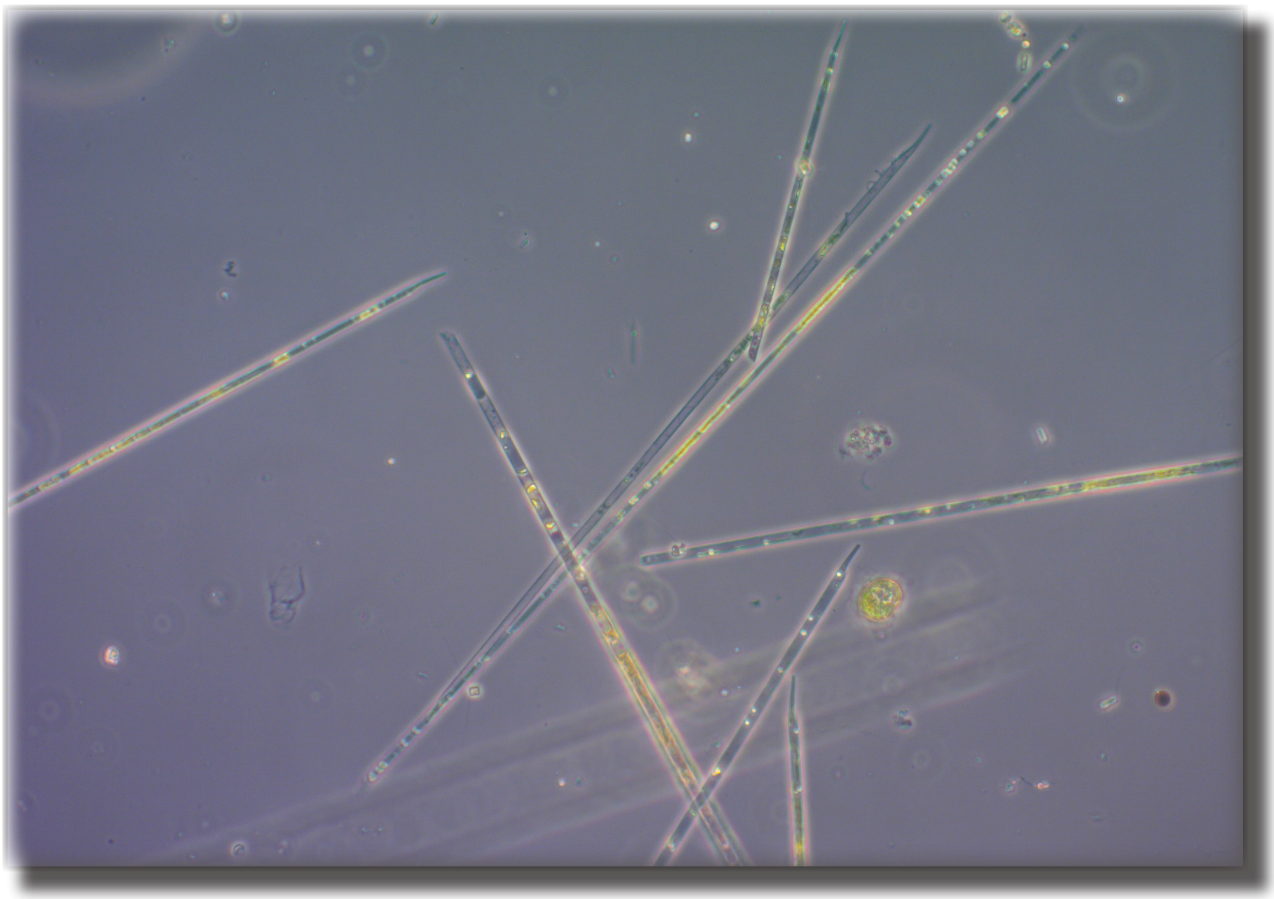


Fig 1. The samples on the west coast was generally dominated by the diatom *Proboscia alata*. Photo: A. Torstensson.

The Kattegat

Anholt E 14th of July

The biodiversity was low, but the total cell numbers were moderate. The sample was dominated by larger diatoms, primarily *P. alata*. Various chain-forming diatom species were observed. Among the smaller diatoms, the genus *Cyclotella* was found in the highest amount. A fluorescence peak at 15 meters depth was also dominated by *P. alata*.

Anholt E 19th of July

Anholt E was sampled twice during the July cruise. The biodiversity remained low, but the total cell numbers were moderate. The sample continued to be dominated by *P. alata* and various chain forming diatom species, such as *G. flaccida*. Among the smaller diatoms, the genus *Cyclotella* was found in the highest amount. A fluorescence peak at 15 meters depth was again dominated by *P. alata*.

N14 Falkenberg 19th of July

The biodiversity was low, but the total cell numbers were high. Similar to Anholt, the sample was dominated by *P. alata*. The larger cells were mainly various species of the genus *Tripos*, with *T. muelleri* and *T. longipes* found in the highest amounts, along with *P. micans*.

The Baltic Sea

W Landskrona 15thof July

No surface accumulations were seen. A sample from the chlorophyll peak at 15 meters was analyzed and was dominated by the diatom *P. alata*.

BY1 15th of July

No surface accumulations were seen. The surface sample contained moderate amounts of *Nodularia spumigena** and *Aphanizomenon flosaquae*.

BY2 Arkona Deep 15th of July

Some surface accumulations were observed. The surface sample contained high amounts of *N. spumigena* and moderate amounts of *A. flosaquae*. The integrated sample (0-10m) had moderate biodiversity and total cell numbers. The larger cells were represented by filamentous cyanobacteria and the diatom *Chaetoceros castracanei*. Among the smaller cells, the dinoflagellate *Prorocentrum cordatum* and the diatom *Cyclotella choctawhatcheeana* were found in low cell numbers.

BY4 Christiansö 15th of July

Surface accumulations were observed. The surface sample was dominated by *N. spumigena** and contained low amounts of *A. flosaquae*. The fluorescent peak at 12 meters depth was dominated by a mix of *N. spumigena** and *A. flosaquae*.

BY5 Bornholms Deep 16th of July

The station was sampled at night, so surface accumulations could not be recorded. The surface sample contained plenty of filaments of both *N. spumigena** and *A. flosaquae*. The integrated sample (0-10m) had quite low total cell numbers and low biodiversity. The lower amount of cyanobacteria filaments in the integrated sample compared to the surface sample suggests that the filaments were concentrated in the first few meters of the water column. The diatoms *Chaetoceros danicus* and *C. castracanei* were found in higher amounts.

BCS III-10 16th of July

Surface accumulations were observed at this station. *N. spumigena** was very common in the surface sample, and *A. flosaquae* was also common. The integrated sample (0-10m) contained low amounts of cyanobacteria filaments, supporting that the filaments were mainly in the surface water. Few cells were observed in general; some diatom cells, such as *Actinocyclus*, *Chaetoceros danicus*, and *C. castracanei*, were present.

BY10 16th of July

Some surface accumulations were observed. The surface sample contained high amounts of *N. spumigena**, and *A. flosaquae* was common, along with *Dolichospermum*. The integrated sample had a higher diversity than in the southern Baltic Sea, with an equal dominance of *A. flosaquae* and *N. spumigena**. Other taxa included *Woronichinia* spp. and *C. castracanei*. Both the dinoflagellates *Dinophysis norvegica** and *Dinophysis acuminate** were present in the sample.

BY15 Gotlands Deep 17th of July

The station was sampled at night, so no observations of surface accumulations were made. The surface sample was dominated by *N. spumigena**, with *A. flosaquae* common and *Dolichospermum* present. The hose sample (0-10m) contained a higher diversity compared to the southern Baltic Sea samples, with a dominance of *A. flosaquae*, *N. spumigena**, and *Dolichospermum* spp. Other cyanobacteria such as *Woronichinia* spp. and cf. *Planktolyngbya* spp. were also present. Several cells of the diatom *C. castracanei* were observed. Among the colony forming cyanobacteria, *Aphanothese paralelliformis* was the most common. The equal amount of filamentous cyanobacteria in the surface sample and hose sample suggests that the filaments were evenly distributed in the water column.

BY20 Fårö Deep 17th of July

The wind stress created waves, and no aggregations were seen with the naked eye. The surface sample however, contained many filaments, with *N. spumigena**, *A. flosaquae*, and *Dolichospermum* spp. all very common.

Fig 2. Surface accumulations of cyanobacteria were common in the Southern Baltic Sea. This image is taken at BY4 Christiansö. Photo: A-K. Thell.

BY29 17th of July

No aggregations were seen from the ship. The surface sample however, contained several filaments and was dominated by *A. flosaquae*, followed by *N. spumigena**. *Dolichospermum* spp. was also present. The integrated sample (0-10m) had a large amount of filamentous cyanobacteria in equal amounts to the surface sample, suggesting that the filaments were dispersed throughout the water column. Additionally, there were a few cells of *Dinophysis norvegica** and numerous colonies of the cyanobacterium *Snowella* spp.

Huvudskär buoy 17th of July

No aggregations were seen from the ship. A surface sample was collected, revealing a relatively high total amount of filaments. The sample was dominated by *A. flosaquae*, followed by *Dolichospermum* spp.. *N. spumigena** was present.

BY31 Landsort Deep 17th of July

No visible surface aggregations were seen, most likely due to wind stress and waves. The surface sample contained mostly *Dolichospermum*, with *A. flosaquae* also present. No filaments of *N. spumigena** were found. The integrated sample (0-10m) was dominated by filamentous cyanobacteria and *Ebria tripartita*. The hose sample (0-10m) and the surface sample contained equal amounts of filaments, suggesting that the filaments were equally distributed in the first 10 meters of the water column. A chlorophyll peak at 12.5 meters was dominated by *Dolichospermum*, followed by *A. flosaquae*.

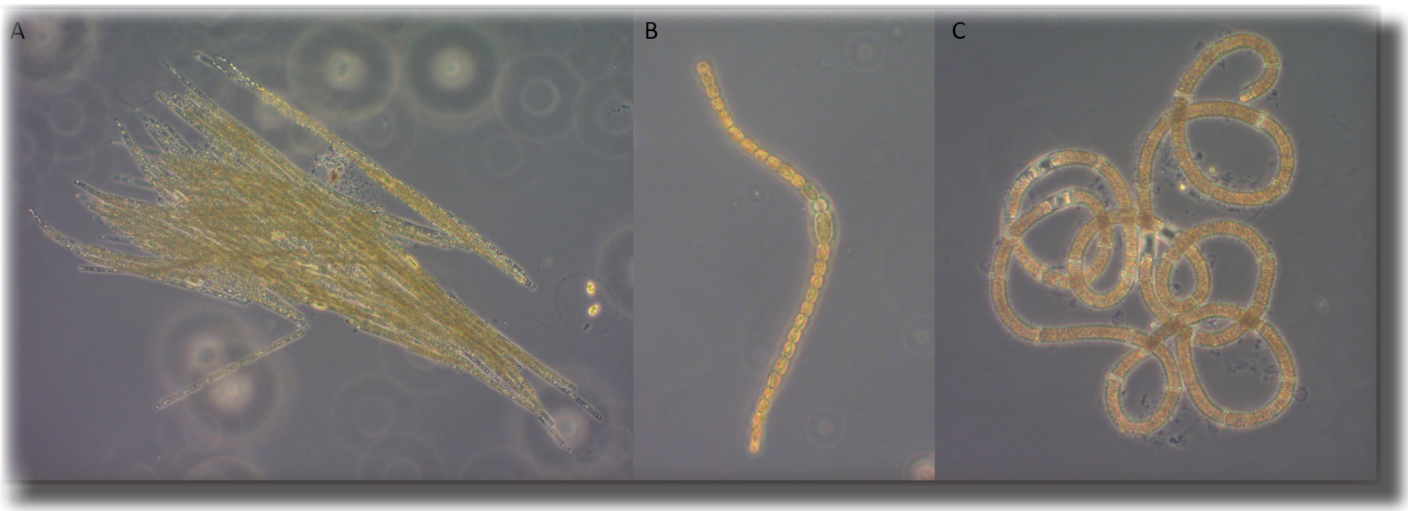


Fig 3. The three groups of filamentous cyanobacteria dominant in the Baltic Sea A) *Aphanizomenon flosaquae*, B) *Dolichospermum* and C) *Nodularia spumigena*. Photo: A. Torstensson.

BY32 Norrköping Deep 17th of July

The station was sampled at night, so no aggregations could be seen from the ship. The surface sample contained a mix of filamentous cyanobacteria, with *A. flosaquae*, *Dolichospermum*, and *N. spumigena**. The integrated sample (0-10m) had moderate diversity and was dominated by *A. flosaquae* and *Dolichospermum*.

BY38 Karlsö Deep 18th of July

No visible surface aggregations were seen, most likely due to wind stress and waves. The surface sample contained many filaments of *N. spumigena**, followed by *A. flosaquae*. *Dolichospermum* was not observed in the surface water but was abundant further down in the water. The hose sample (0-10m) contained fewer filaments than the surface sample, suggesting that most filaments were at the surface despite no aggregations being seen. Interestingly, *Dolichospermum* was very common in the integrated sample, although no cells were observed in the surface.

BY39 Öland south 18th of July

No visible surface aggregations were seen, most likely due to wind stress and waves. A surface sample was collected, revealing many filaments of *Dolichospermum*. Both *N. spumigena** and *A. flosaquae* were also common. The integrated sample (0-10m) had low biodiversity, mainly comprising filamentous cyanobacteria. The presence of filamentous cyanobacteria at the surface and in the integrated sample suggests that most of the filaments were at the surface.

Bay of Hanö 18th of July

The station was sampled at night, so surface accumulations could not be recorded. The surface sample contained a few cyanobacteria filaments of *A. flosaquae* and *N. spumigena**.

Phytoplankton analysis and text:
Anders Torstensson.

Selection of observed species	Anholt E	Anholt E	N14 Falkenberg	Släggö	Å17
Red=potentially toxic species	2024-07-14	2024-07-19	2024-07-19	2024-07-20	2024-07-20
Hose 0-10 m	presence	presence		presence	presence
Centrales			present	present	present
Cerataulina pelagica	present	present			
Chaetoceros		present		present	
Chaetoceros minimus				present	
Chaetoceros throndsenii				present	
Coscinodiscus radiatus		present	present		present
Cyclotella	present		present		
Cylindrotheca closterium		present	present	present	
Dactyliosolen fragilissimus	present	present		present	present
Guinardia delicatula		present	present		
Guinardia flaccida		common		present	
Leptocylindrus danicus				present	present
Proboscia alata	very common	very common	dominating	very common	common
Pseudo-nitzschia				present	present
Rhizosolenia imbricata					present
Skeletonema marinoi	present				
Thalassionema nitzschioides				present	
Thalassiosira anguste-lineata	present				
Octactis speculum				present	
Alexandrium				present	
Alexandrium pseudogonyaulax		present			
Dinophysis acuminata		present			
Dinophysis norvegica			present	present	
Gonyaulax spinifera				present	
Gymnodiniales		present	present	present	present
Lingulodinium polyedra		present		present	
Peridiniales			present		
Phalacroma rotundatum		present			
Prorocentrum micans	present	present	present	present	
Protoperidinium	present				
Tripos furca				present	
Tripos fusus		present	present	present	present
Tripos lineatus		present		present	present
Tripos longipes			present		
Tripos muelleri		present	present	present	present
Ebria tripartita			present		
Salpingella					present
Oocystis		present			

Selection of observed species	BCSIII-10	BY10	BY15	BY29	BY2	BY31	BY38	BY39	BY5
Red=potentially toxic species	2024-07-16	2024-07-16	2024-07-17	2024-07-17	2024-07-15	2024-07-17	2024-07-18	2024-07-18	2024-07-16
Hose 0-10 m	presence	presence	presence	presence	presence	presence	presence	presence	presence
Ciliophora							present		present
Actinocyclus	present					present			present
Centrales	present	present					present	present	
Chaetoceros castracanei	present	present	present		common		present		present
Chaetoceros danicus	present	present			present	present		present	common
Cyclotella		present							
Cyclotella choctawhatcheeana					present				
Dactyliosolen fragilissimus					present				
Aphanizomenon								common	
Aphanizomenon flosaquae	present	common	common	very common	common	common	present		present
Aphanothece						present			
Dolichospermum		present	common	common		common	very common	common	
Nodularia spumigena	common	common	present	very common	common	present	common	common	very common
Planktolyngbya		present	common						
Snowella				present		present	present		
Woronichinia		present	present						
Dinophysis acuminata		present							
Dinophysis norvegica		present	present	present		present		present	
Gymnodiniales	present	present	present	present					
Prorocentrum cordatum					present				present
Tripos muelleri					present				
Ebria								present	
Ebria tripartita				present		present	present		
Colacium vesiculosum				present		present	present		
Mesodinium rubrum	present								
Helicostomella subulata							present		
Oocystis		present	present	present	present	present			
Binuclearia lauterbornii		present							

Station:	*Aphanizomenon flosaquae*	*Nodularia spumigena**	*Dolichospermum spp.*
West Landskrona 15/7			
BY1 15/7	common	common	
BY2 Arkona 15/7	common	very common	
Hanöbukten 18/7	present	present	
BY4 Kristiansö 15/7	present	very common	
BY5 Bornholm 16/7	very common	very common	
BCS III-10 16/7	common	very common	
BY10 16/7	common	very common	present
BY15 17/7	common	very common	present
BY20 17/7	common	common	common
BY29 17/7	very common	common	present
Huvudskär buoy 17/7	very common		common
BY31 Landsortdjupet 17/7	present		very common
BY32 Norrköpingsdjupet 17/7	very common	very common	present
BY38 Karlsödjupet 18/7	common	very common	
BY39 Öland södra 18/7	common	common	very common

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).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