

NOBANIS - Invasive Alien Species Fact Sheet

Chattonella aff. *verruculosa*

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Species description

Scientific names: *Chattonella* aff. *verruculosa*

Synonyms: In the North Sea and Skagerrak area the species is known as *Chattonella* aff. *verruculosa*. The first time the species formed a bloom in the area it was initially identified as *Chattonella* aff. *verruculosa* since it resembled *Chattonella verruculosa* described from Japan, but differed in some aspects. A detailed taxonomic study by Edvardsen *et al.* (submitted) suggests giving the species the name *Verrucophora fascima*. Even though we are aware of the taxonomical changes, the species will be referred to as *Chattonella* aff. *verruculosa* in this text. As soon as the above mentioned study is published we recommend that the name be changed to *Verrucophora fascima* gen. et sp. nov. (Eikrem, Edvardsen et Thronsen) Dictyochophyceae, Heterokontophyta.

Common names: none

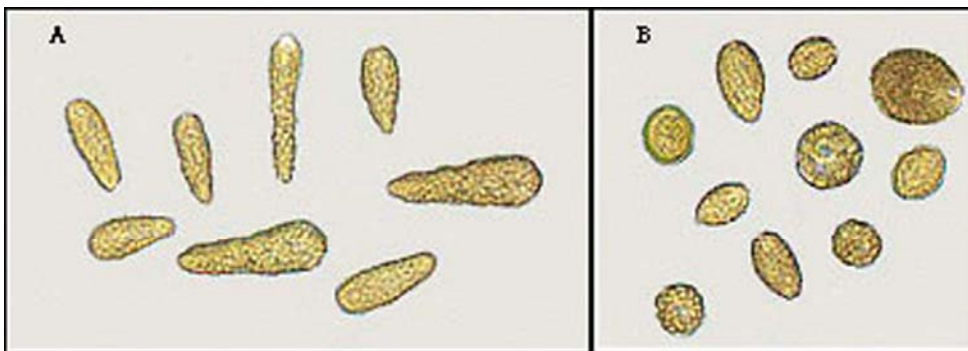


Fig. 1. *Chattonella* aff. *verruculosa*, photo by Lars-Johan Naustvoll, Institute of Marine Research.

Species identification

The overall morphology of *Chattonella* aff. *verruculosa* is very variable, and size and form seem to change in response to growth conditions. Cells in exponential growth (optimal conditions) are usually elongated or pear-shaped (mean length 19 μm , range 12-34 μm , $n = 194$) and can be wider in the anterior end (up to 9 μm width) than in the posterior end (4 μm). Cells longer than 40 μm were however, observed in water samples during the blooms. They possess many chloroplasts (up to 30-35, golden brown, round to elongated in shaped). The cells have numerous oval mucocyst-like organelles that give the cells a warty (verruculose) appearance.

Grown under sub-optimal conditions, the size often decreases and the shape turns oval or round (5-9 µm in diameter). In this state the mucocyst-like bodies are very pronounced, and the cells often possess a trailing pseudopodium, and have only a few chloroplasts.

Under the light microscope, usually only one forwardly directed flagellum (about 20-30 µm long) is visible, but a second short flagellum may also be seen. The cells are heterokont thus the longer anteriorly directed flagellum, pulls the cells forward during swimming, whereas the shorter flagellum may bend backwards.

Native range

The species *Chattonella* aff. *verruculosa* is a new species, with a description based on material from Skagerrak sampled during a large bloom in 2001. At the moment the species has only been observed along the German coast (North Sea coast of Schleswig-Holstein), Danish coast (mainly the North Sea and Skagerrak coast), the Swedish west coast, the Norwegian coast from Hvaler to Bergen. It is uncertain whether some of the earlier observations of *Chattonella* species in Dutch coastal waters, French coastal waters, and central North Sea (Mignot 1976, Vrieling *et al.* 1995, Billard *et al.* 1998) also could include observations of *Chattonella* aff. *verruculosa*.

Alien distribution

History of introduction and geographical spread

The first time *Chattonella* aff. *verruculosa* (*Verrucophora fascima*) formed a large bloom was in April-May 1998. The species was observed in high concentrations along the Danish North Sea coast, spreading to the Skagerrak region. At its peak it covered the entire Skagerrak area and along the south and west coast of Norway up to Stavanger (Aure *et al.* 2001, Backe-Hansen *et al.* 2001). Another bloom took place in April-May 2000 in the German Bight and off the Danish Jutland coast (Lu and Göbel 2000). In March - April 2001 *Chattonella* aff. *verruculosa* formed a massive bloom in the Kattegat and Skagerrak, a bloom that terminated at the southern coast of Norway (Naustvoll *et al.* 2002 a,b). In 2004 there were two smaller blooms, both geographically and in abundance, one at the Danish North Sea coast and the other along the Swedish west coast, none of them reaching the coast of Norway. Since the first bloom in 1998, the species has been included in ongoing monitoring programs in the region. Data from Norway shows that the species continues to spread along the coast and is today found from the Swedish boarder to “Sogn og Fjordane” on the west coast of Norway (See also final report from the EU project HABILE “Harmful Algal Bloom Initiation and Prediction in Large European Marine Ecosystems” WP 1 and WP 2.)

It is likely that the species will be able to continue spreading along the west coast of Norway, and it is likely that the species could appear or be present in the North Sea region and along these coastlines.

Pathways of introduction

Before the 1998 bloom *Chattonella* aff. *verruculosa* had not previously been reported from European waters, and it was speculated that it had been introduced to Europe from Japan by *e.g.* ballast water (Nehring 1998, Hopkins 2001). However, reanalyses of older samples from the Swedish coast has shown that *Chattonella* like cells have been present in low concentrations since 1993 (Mats Kuylenstierna, pers.comm.). Edvardsen *et al.* (submitted) shows that *Chattonella* aff. *verruculosa* is not related to the *Chattonella* species within the class Raphidophyceae (*e.g.* *Chattonella marina*, *C. antiqua*, *C. ovata*, and *C. subsalsa*), mainly described from Japanese waters. Based on these analyses it is suggested to give the species the name *Verrucophora fascima*. The studies by Edvardsen *et al.* also shows that *C. verruculosa* from Japan is a separate, but closely related species to *Chattonella* aff. *verruculosa*, or *V. fascima*, and that both should be transferred

from the class Raphidophyceae to the class Dictyochophyceae. The new information will to some degree rule out the possibility that the species was introduced from Japanese waters. Based on the information available today it is dubious whether the species has been introduced to the region, or only overlooked until it caused a massive bloom.

Alien status in region

Based on routine monitoring in the countries around Skagerrak it appears that *Chattonella* aff. *verruculosa* has become a natural part of the spring phytoplankton community. The species is observed in Denmark, Germany, Sweden, and Norway in routine sampling programs. Whether the species is present in other European waters is uncertain (see table 1).

Country	Not found	Not established	Rare	local	Common	Very common	Not known
Denmark					X		
Estonia							X
European part of Russia							X
Finland							X
Faroe Islands							X
Germany				X			
Greenland							X
Iceland							X
Latvia							X
Lithuania							X
Norway					X		
Poland							X
Sweden					X		

Table 1. The frequency and establishment of *Chattonella* aff. *verruculosa*, please refer also to the information provided for this species at www.nobanis.org/search.asp. Legend for this table: **Not found** –The species is not found in the country; **Not established** - The species has not formed self-reproducing populations (but is found as a casual or incidental species); **Rare** - Few sites where it is found in the country; **Local** - Locally abundant, many individuals in some areas of the country; **Common** - Many sites in the country; **Very common** - Many sites and many individuals; **Not known** – No information was available.

Ecology

Habitat description

The species is planktonic and is present in fjords, open water, and open coastal area in the North Sea, Skagerrak, and Kattegat.

Reproduction and life cycle

Since this is a “new” species there is not much information on the autecology of *Chattonella* aff. *verruculosa*.

The species is a cold water species, showing optimal growth at temperatures between 2 and 10 degrees Celsius, and all blooms have occurred when the water temperature was below ~10 degrees Celsius (Naustvoll, unpublished data). The species has been observed in water masses with different salinities (between 12 and 35), a pattern that has been confirmed by laboratory studies. All available data indicate that the species is not able to survive in water masses with a salinity below 10, thus

excluding it from spreading to the Baltic proper (Naustvoll, unpublished data). The species could utilize low light intensity for rapid growth (Naustvoll, unpublished data).

Data on the lifecycle of *Chattonella* aff. *verruculosa* is at the present limited. Some preliminary experiments indicate that the species may form resting stages (cysts) under certain conditions. However, it is uncertain if these resting stages are part of a sexual reproduction. Vegetative growth is by ordinary cell division (Naustvoll, unpublished data).

Dispersal and spread

It looks as if the species is well adapted to the conditions in the Skagerrak in the spring (low water temperature and light intensity and highly variable salinity).

It is likely that the species is spreading along the coast of Norway by the Norwegian coastal current system.

Impact

Affected habitats and indigenous organisms

The blooms in 1998 and 2001 resulted in fish mortality of farmed salmon along the coast of Norway. During the 1998 bloom there were reports on mortality among wild fish along the coast of Denmark. During the 2001 bloom toxin analyses of seawater containing high density of *Chattonella* aff. *verruculosa* were performed (Chris Miles, unpublished data). They could, however, not detect any known algal toxins in this seawater. The mechanism behind the fish mortality is still unknown. Studies on the effect of *Chattonella* aff. *verruculosa* on zooplankton have been performed. However, there is no clear effect of the presence of *Chattonella* aff. *verruculosa* on the survival of the zooplankton (Naustvoll, unpublished data).

Genetic effects

Not known.

Human health effects

No human health effects.

Economic and societal effects (positive/negative)

The blooms in 1998 and 2001 resulted in economical loss for the affected fish farms (salmon farms only).

Management approaches

Prevention methods

No prevention methods are available at the moment.

Eradication, control and monitoring efforts

The species has been included in the national monitoring programs on phytoplankton in the countries surrounding Skagerrak and North Sea. If the species occurs in high density in some areas, the information is shared between the monitoring programs.

Information and awareness

In Norway, the Directorate of Fisheries has, in collaboration with monitoring institutes, been responsible for information to the public about the occurrence of *Chattonella* aff. *verruculosa* during blooms. The presence of the species will also be announced on the IMR's web page "Algeinfo". In Sweden the presence of *Chattonella* aff. *verruculosa* is announced on SMHI's web page AlgAware and through the Information Central of the Swedish West Coast.

Knowledge and research

Since *Chattonella* aff. *verruculosa* is a "new" species there is not much information available. However, during the latest years there have been two projects dealing with the ecology and biology of the species. The knowledge from these projects are planned to be published in international journals during 2006.

Recommendations or comments from experts and local communities

It is important to build up a reliable information system between the different countries that monitor phytoplankton in the region where the species is established. A fast flow of information will be important to reduce the economic loss due to blooms of the species.

References and other resources

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Links

IMR's web page ["Algeinfo"](#)

SMHI's web page [AlgAware](#)

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