Communications

The first recorded bloom of *Pseudochattonella farcimen* (Dictyochophyceae, Heterokonta), (Riisberg I., 2008) in the Gulf of Gdańsk*

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Abstract

In April 2001 a local bloom of the heterokont phytoflagellate *Pseudochattonella farcimen* (Riisberg I., 2008) (initially named *Chattonella* aff. *verruculosa*) was observed for the first time in the southern part of the Gulf of Gdańsk. The species occurred in high cell densities: the count was 11.5×10^6 cells dm^{-3} and the biomass 927.5 μgC dm^{-3}.

1. Introduction

The first large bloom of *Pseudochattonella* along the European coast (the Netherlands, Germany, Denmark, Norway and Sweden) was observed in 1998. During May 2000, a second bloom of this species was reported from the German Bight and western Denmark with a maximum density of 11.0×10^6 cells dm^{-3} (Bourdelais et al. 2002, Naustvoll et al. 2002). In spring 2001, *Pseudochattonella farcimen* formed a similar large-scale bloom in the Skagerrak, Kattegat, along the west coast of Sweden and off southern Norway. During that episode an extensive fish kill took place:

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in Norway, for example, as many as 1100 tons of reared salmon were killed (Edvardsen et al. 2007). In 2004, two smaller blooms were recorded, one off the Danish North Sea coast and the other off the Swedish west coast. *P. farcimen* produces fish-killing neurotoxins such as the brevetoxins (Bourdelais et al. 2002).

The name of the species and the taxonomic group this should be assigned to are matters of debate. Some experts believe that this organism should be classified as a raphidophyte (Khan et al. 1996). Earlier, this species from European waters had been identified as *Chattonella* cf. *verruculosa*, described from Japan (Bourdelais et al. 2002). A detailed study by Edvardsen et al. (2007) has shown, however, that this organism differs both morphologically and genetically from its Japanese counterpart. These authors propose transferring *Ch.* cf. *verruculosa* from the class Raphidophyceae to the Dictyochophyceae and suggest giving it the new name of *Verrucophora farcimen*. Another study, based on combined molecular data and morphological characteristics, places this species among the Dictyochophyceae; its authors have put forward the name *Pseudochattonella verruculosa* gen. nov., comb. nov. (Hosoi-Tanabe et al. 2007). Finally, on the basis of nuclear, mitochondrial and plastid DNA sequence data of *V. farcimen*, Riisberg has proposed the new name *P. farcimen* for the identified heterokont flagellate blooming in the Skagerrak Basin (Riisberg 2008, Riisberg & Edvardsen 2008).

2. Methods

Gulf of Gdańsk surface water was sampled near Sopot pier in spring 2001.

The organisms were studied live and with Lugol's solution under an inverted microscope (Axiovert 35; Carl Zeiss, Germany) fitted with phase contrast and differential interference contrast. Cells were photographed with a Contax 167MT (Japan) camera. The individual phytoplankters were counted in accordance with the COMBINE programme of HELCOM (HELCOM 1997). The volume of each cell was calculated from the relevant morphometric characteristics, then converted to biomass, assuming 1 μm^3 to be equivalent to 1 pg (Edler ed. 1979). The carbon content of the phytoplankton samples was calculated with a formula given in Menden-Deuer & Lessard (2000).

3. Results and discussion

Pseudochattonella farcimen formed a local bloom in the southern part of the Gulf of Gdańsk in spring 2001. Cells of this organism were identified for

the first time in phytoplankton samples collected in this basin on 20 April 2001. An intense bloom of this organism occurred between 25 and 30 April (Figure 1). Maximum cell concentrations were 11.5×10^6 cells dm^{-3}, and the biomass was 18.1 mg dm^{-3}/927 μgC dm^{-3}. This heterokont flagellate remained in the Gulf of Gdańsk until 5 May.

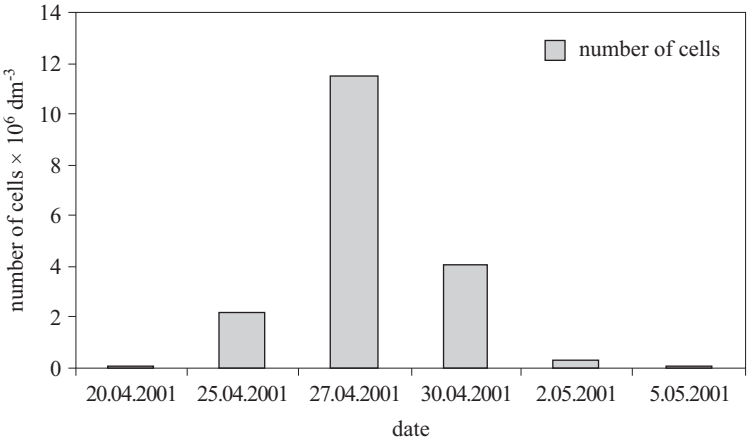

Figure 1. Densities of *Pseudochattonella farcimen* off Sopot pier during the spring 2001 bloom

The hydrological parameters of the surface water layer were recorded during the bloom period: water temperature 7.2–9.8°C, salinity 7.3–7.5 PSU and pH 8.01–8.27. *P. farcimen* is a cold-water species, with optimal growth at temperatures between 2 and 10°C (Edvardsen et al. 2007), and has been recorded in waters of different salinities between 12 and 35 PSU. These figures are corroborated by the results of laboratory studies. All the available data indicate that *P. farcimen* is unable to survive in water of salinity < 10 PSU, a threshold likely to prevent its spread into the Baltic Proper (Naustvoll L.-J. 2006, Edvardsen et al. 2007). This may be the reason why this species was not recorded in the Gulf of Gdańsk in the following years.

The examined organisms displayed morphological variations: cells varied in shape from the typical pyriform to spherical (Figure 2) and were 10–39 μm in length (mean length 21 μm, n = 200) (Figure 3). *P. farcimen* has two flagella of unequal length, but microscopic examination revealed only the longer one, along with numerous, golden-brown chloroplasts and many mucocyst-like bodies.

Studies of the alga's morphology and genetics, as well as of its sterol and fatty acid composition, have shown that the European *P. farcimen* differs from the Japanese *Chattonella* (Edvardsen et al. 2007, Giner et al. 2008). The present report almost certainly rules out the possibility that the

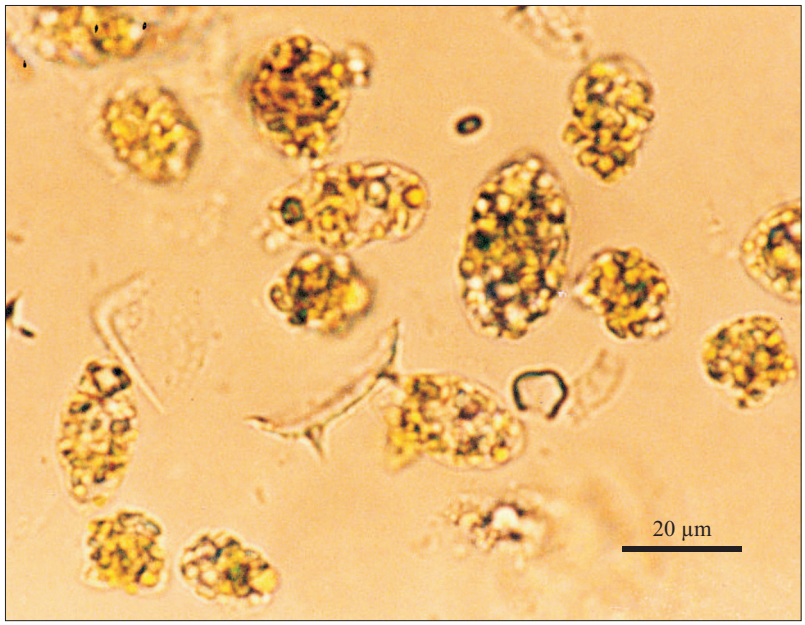

Figure 2. *Pseudochattonella farcimen* bloom in the Gulf of Gdańsk in spring 2001

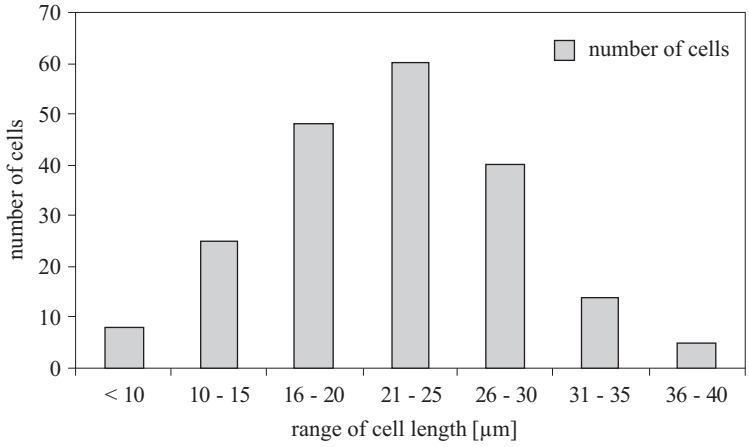

Figure 3. Length of *Pseudochattonella farcimen* cells sampled from the Gulf of Gdańsk during the spring 2001 bloom

species was introduced from Japanese waters. Nevertheless, the pathway by which *P. farcimen* reached the coastal waters of the Gulf of Gdańsk from the western Baltic remains unclear. Routine programmes to monitor this species, run at different localities on the Baltic coast, will be needed if the harmful effects of toxic blooms are to be prevented in the future.

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