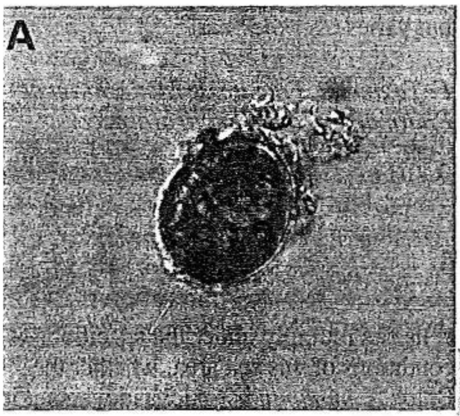
The Intergovernmental Oceanographic Commission of UNESCO 1994

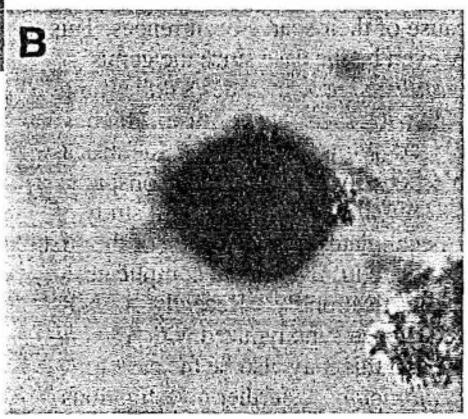
HARMFUL ALGAE NEWS

An IOC Newsletter on toxic algae and algal blooms No. 9

First living *Alexandrium minutum* resting cysts in Western Baltic

On a global scale, the frequency and intensity of toxic phytoplankton blooms seem to be on the rise, and there is also some evidence of geographical spreading of nuisance species[1]. In Europe, this has been suggested for the toxic dinoflagellate *Gymnodinium catenatum (p. 1,* HAN *No. 7).* The PSP-producing *Alexandrium minutum*, first described from Alexandria Harbour, Egypt[2], has since been reported from South Australia[3], the Atlantic coast of North America[4], Spain and Portugal[5], Italy[6,7], Turkey[8], Ireland[9], France[10], and the Netherlands[11].





Living resting cysts of (A) Alexandrium minutum and (B) Gymnodinium catenatum, both isolated from Western Baltic sediments.

In France, since 1985, toxic blooms of *A. minutum* have occurred along the Brittany coast within small embayments or shallow estuaries, especially in the northwestern area. Each time, shellfish harvesting had to be prohibited as a consequence of excess toxicity levels in bivalves[12]. At present, the region represents the main site for toxic blooms of this species in Europe.

Resting cysts of *A. minutum* were first described in 1991 from surface sediments of Port River near Adelaide, South Australia[13] and has also been recorded since then along the Brittany coast of France[12]. It was suggested that blooms of *A. minutum* are primarily initiated from their benthic seed beds[14]. During a cyst survey in the Baltic Sea (Kiel Bight, Germany) in April 1993, several living cysts of *A. minutum* were found in the topmost centimeter of sediments. The cyst is circular in apical view (21-25 mm in diameter) and reniform in lateral view. The clear cyst wall is lightly covered with mucilage and a prominent orange-red accumulation body is present. This resting cyst is similar to the descriptions and figures of specimens from Australia[13] and France[12].

As specified for *G. catenatum (p. 1,* HAN *No. 7),* the recent occurrence of *A. minutum* in coastal waters of the Netherlands may be related to increased water influx through the English Channel, transporting *A. minutum* cells from the French coast into the North Sea. Residual currents in the region and a massive salt water influx into the Baltic Sea in 1993 may have infected the Kiel Bight with *A. minutum* cysts. However, it is not yet sure whether this scenario is true, because resting cysts of *A. minutum* were not detected in sediments of the German Bight[15] nor the Kattegat area[16]. In contrast, it is quite possible that vegetative cells of *A. minutum* have been

(Cont'd on p. 2)

Is the European *Alexandrium tamarense/ excavatum* toxic?

There have been reports of PSP in Europe for several decades, and in many of them *Alexandrium tamarense* (= *Gonyaulax tamarensis*) was considered the causative species [1,2,3,4]. Some more recent cases have been attributed to other species such as *Gymnodinium catenatum* in Spain [5] and Portugal [6], or to *Alexandrium minutum* in Spain [7] and France [8].

Since the first reports, great progress has been made, both in the taxonomy of genus *Alexandrium*, and in the improvement of culture techniques and media. The older reports were all based on bioassays of suspected shellfish, but now the development of analytical tools like HPLC and the increased number of laboratories in which this kind of analysis is routine, provide frequent reports of the toxin composition of unialgal cultures of dinoflagellates.

Reports of the toxin composition of cultures of toxic dinoflagellates isolated from European waters are for *G. catenatum* [9], *A. minutum* (= *Alexandrium lusitanicum*) [10] and *Alexandrium ostenfeldii* [11]. But HPLC analyses of strains of *A. tamarense* [11] (the Plymouth and Vigo strains) indicate that this species is not toxic [12,13].

It is surprising that the North Sea and surrounding waters are the areas where PSP reports attributable to *A. tamarense* are more frequent, yet there are no reports of HPLC analyses of cultures of *Alexandrium tamarense* isolated from those areas, in which this species appears to be toxic.

The hypothesis, that some of the PSP outbreaks reported in the North Sea area may be attributable to either *A. minutum* or *A. ostenfeldii,* should be tested. *A. minutum* on the north coast of Brittany has proved to be toxic, but the Plymouth strain of *A. tamarense* isolated not far from there is not toxic. As Brittany is the

(Cont'd on p. 3)

Early red tides

The following extract is taken from 'The Endeavour Journal of Joseph Banks, 1768-1771', Vol. I, edited by J.C. Beaglehole (1962). The entry is dated 7 November 1768, when the *Endeavour* was in latitude 21°16'S off the Brazilian Coast (spelling has been modernized):

'About noon long ranges of a yellowish colour appeared upon the sea, many of them very large, one (the largest) might be a mile in length and 300 or 400 yards wide ... we found it to be caused by innumerable small atoms, each pointed at the end and of a yellowish colour, none of them above a quarter of a line (about 50μm) in length; in the microscope they appeared to be fasciculi interwoven one within the other, not unlike the nidi (nests) of some *Phryganeus* which we call caddices' (i.e. the houses of mayfly larvae).

Banks' journal contains several other accounts of the same phenomenon. William Randolph Taylor identified these organisms as *Trichodesmium*, the genus named by C.G. Ehrenberg in 1830 to distinguish its mode of colony formation from that of *Oscillatoria* (*Trichodesmium erythraeum*: Fila septata fasciculata nec oscillantia, fasciculi discreti muco involuti, sociales libere natantes). Ehrenberg himself witnessed red water caused by *Trichodesmium* in December 1823 and January 1824 near El Tor in Sinai on the Gulf of Suez. He described the sea as blood-coloured, and noted that the waves cast red slime on the beach.

It was accounts like those of Banks and many other navigators (most of which have never been published) which provoked early attempts to classify red water events. One of the most comprehensive of these was that of Camille Dareste (1855), who listed eleven different categories, the first three of which were due to different species of *Trichodesmium*.

Ehrenberg, C.G. (1830). *Annalen der Physik und Chemie*, vol. 94, part 4: 477-514.
Dareste, C. (1855). *Annales des Sciences naturelles*, Ser. 4, Zoologie, vol. 3: 179-239.

Tim Wyatt

Annual mollusc toxicity variation on Morocco Mediterranean shore

An investigation into the agent responsible for food poisoning events associated with eating seafood has led to the incrimination of molluscs collected on the Mediterranean shoreline of Morocco. Their gathering and sale are now banned.

The study was carried out on two species currently consumed in the region: the cockle, *Cardium tuberculatum* , and the hard-shell clam, *Cuterce chrome*. These species were sampled at regular intervals over a year, from May 1993 to May 1994, in the region of Tetouan at Kaa Stras and Oued Laou, in order to assess the toxicity of the bivalves there. Extracts of the molluscs were prepared according to the official method (Association of Official and Analytical Chemists, 1980).

The toxicity of the extracts was assayed on Swiss Albino mice. *Cardium tuberculatum* gave the highest toxicities at Kaa Stras, but in both cases toxicity levels remained high throughout the year and produced rapid death, preceded by PSP-type symptoms, while *Cuterce chrome* gave lower levels, whatever the period of collection.

Cardium tuberculatum:
- Kaa Stras, toxicity 1207 Mouse Units (MU)/100g of meat.
- Oued Laou, 773 MU/100g

Cuterce chrome: 190 MU/100g

Comparative investigation of the toxicity in different organs of the cockles showed that toxicity levels were clearly higher in the foot (5580 MU/100g) than in the mantle (1030 M/U/100g).

The investigation carried out has shown that biotoxin presence is permanent in cockles in the region of Tetouan, but varies over the year.

F. Tagmouti, Faculté de Médecine et de Pharmacie, Casablanca, Morocco

(Cont'd from p. 1, 'Western Baltic')

overlooked in the plankton of the region because of their scarce occurrences. This may even be the case since the genus *Alexandrium* now includes a rather long list of species, easy to confuse, which may lead to misclassification. Identification especially of the small, inconspicuous *A. minutum* requires careful study of the thecal plates. The variation of the first apical plate in *A. minutum* complicates the identification[3,6,12]. Recently, *A. ibericum* has been synonymized with *A. minutum*[4] and this may also be the case for *A. lusitanicum*[11]. Further investigations will be needed to ascertain whether its cysts can germinate and if vegetative cells can multiply under the specific conditions of this sea area, whether the Baltic *A. minutum* is toxic, and whether it is genetically distinct from other *A. minutum* populations.

In the study of harmful algae, there is an increasingly urgent need for correct identification of species. Cyst studies offer a valuable tool for an early warning on the presence and potential of toxic species in a given area and should be considered also in monitoring systems.

Stefan Nehring, Institut für Meereskunde an der Universität Kiel, Düsternbrooker Weg 20, D-24105 Kiel, Germany.

(1) Smayda, T.J. (1990). In: Granéli, G. *et al.* (eds.), *Toxic Marine Phytoplankton*. Elsevier, New York: 29-40.
(2) Halim, Y. (1960). *Vie et Milieu*, 11: 102-105.
(3) Hallegraeff, G.M. *et al.* (1988). *J. Plankton Res.*, 10: 533-541.
(4) Balech, E. Personal communication in (3).
(5) Balech, E. (1985). In: Anderson, D.M. *et al.* (eds.), *Toxic Dinoflagellates*. Elsevier, New York: 33-38.
(6) Montresor, M., *et al.* (1990). In: Granéli, G. *et al.* (eds.), *Toxic Marine Phytoplankton*. Elsevier, New York: 82-87.
(7) Honsell, G. (1993). In: Smayda, T.J. and Shimizu, Y. (eds.), *Toxic Phytoplankton Blooms in the Sea*. Elsevier, New York: 127-132.
(8) Koray, T. and Buyukisik, B. (1988). *Rev. Internat. Océanogr. Médicale*, 91-92: 25-42.
(9) Duncan, K. and Holland, C. (1988). *Red Tide Newsletter*, 1(4): 5-6.
(10) Nezan, E. and Ledoux, M. (1990). *Red Tide Newsletter*, 3(4): 1-2.
(11) Elbrächter, M. Personal communication.
(12) Erard-Le Denn, E. *et al.* (1993). In: Smayda, T.J. and Shimizu, Y. (eds.), *Toxic Phytoplankton Blooms in the Sea*. Elsevier, New York: 109-114.
(13) Bolch, C.J. *et al.* (1991). *Phycologia*, 30: 215-219.
(14) Cannon, J.A. (1990). In: Granéli, G. *et al.* (eds.), *Toxic Marine Phytoplankton*. Elsevier, New York: 110-115.
(15) Nehring, S. (in press). *Helgoländer Meeresuntersuchungen*.
(16) Ellegaard, M. Personal communication.