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# HARMFUL ALGAE NEWS

*An IOC Newsletter on toxic algae and algal blooms*

*http://ioc.unesco.org/hab/news.htm* *No. 29*

• Costa Rica

## *Alexandrium monilatum* (Howell) Balech bloom in the Gulf of Nicoya, Puntarenas

The Gulf of Nicoya, an estuary on the pacific coast of Costa Rica, extends 80 Km, from the Tempisque River to the Pacific, with a maximum width of 50 Km at the mouth, and an area of 1550 $Km^2$. Hydrography of the Gulf depends on rainfall and wind patterns. Nutrient advection into the Gulf, during the rainy season (May to November) carried by the Grande de Tárcoles and Tempisque Rivers [1], have a stimulant effect on phytoplankton abundance [1-3] and composition [4].

The Gulf of Nicoya is a very important fishing ground on the Pacific coast. About 800 families make their living from shellfish extraction in the Gulf. The Gulf waters and the surrounding mangroves are also important nursery areas for larvae and juveniles of commercially important species, and many beach areas have intense tourist activity. Therefore, harmful algal blooms pose a threat to the Gulf resources, fisheries, consumer health, the incipient aquaculture activity and tourism.

Phytoplankton blooms have been documented for the Gulf since 1954. However, the identification of the causative organisms started in 1980 when the organism responsible for a red bloom that affected the entire Pacific coast of Costa Rica was found to be *Cochlodinium catenatum* Okamura [5]. Red tides dominated by *C. catenatum* have been common in the Gulf, along with blooms of *Mesodinium rubrum* Lohmann. Other potentially harmful species of dino-

*(Cont'd on p.2)*

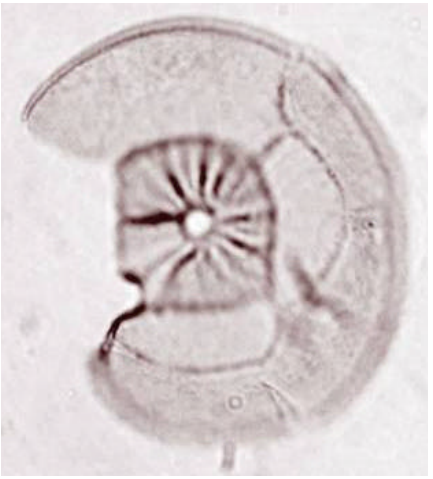

*Fig. 1. Antapical view of* A. monilatum*, showing the characteristic pore plate with a large pore an radiating striae. From the September bloom in the Gulf of Nicoya, Costa Rica.*

## Newly formed Korean Harmful Algal Bloom Research Group (KORHAB)

Huge damage to fisheries by HABs occurs every year in Korea. In 2001, Korean researchers met during the 2nd international HAB meeting at the National Fisheries Research & Development Institute (NFRDI) in Busan, Korea to discuss, and to form the Korean Harmful Algal Bloom Research Group (KORHAB). Eventually, KORHAB was organized at the first official HAB meeting in Hanyang University on June 17, 2005, with the participation of over 100 researchers from Universities, Research Institutes and relevant agencies. The ac-

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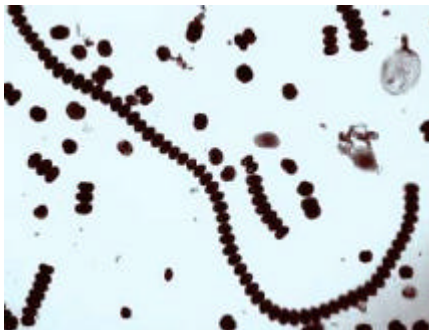

*Fig. 2. Long chains and solitary cells of* A. monilatum *(light microphotographs of Lugol´s stained cells) from the September bloom in the Gulf of Nicoya. Costa Rica.*

flagellates reported for the Gulf were *Pyrodinium bahamense* var. *compressum*, *Gymnodinium catenatum*, *Alexandrium catenella*, and *A. monilatum* [6].

*Alexandrium monilatum* has been found associated with other bloom organisms in the Gulf but, even when it reached high concentrations, was never previously the dominant organism [6]. But since August 27, 2005, a greenish coloured bloom has been developing, and *A. monilatum* is the most abundant organism present. Solitary cells as well as chains up to 108 cells long were observed (Fig. 2). Water samples collected off the Puntarenas peninsula, on August 31st, at depths of 1, 5 and 10 m, showed concentrations of 4.95 x $10^5$ cells/L (99.5% *A. monilatum*), 2.6 x $10^5$ cells/L (98.1% of *A. monilatum*) and 7.2 x $10^3$ cells/L (55.4% of *A. monilatum*) respectively. Other dinoflagellates accompanying this bloom were species from the genus *Ceratium* and *Prorocentrum*. Surface water samples from Isla Jesucita showed maximum concentrations of 4.3 x $10^5$ cells/L.

*Table 1. Dinoflagellate concentration (cells/L and % of total number), at the Puntarenas dock, (9º 58' 025'' N and 84º 49' 769'' W), Gulf of Nicoya. Costa Rica, 02 September 2005.*

| Species | Depth | | | | | |
|---|---|---|---|---|---|---|
| | 1m | | 5m | | 8m | |
| | cells/L | % | cells/L | % | cells/L | % |
| *A. monilatum* | 2,053,000 | 98.4 | 325,000 | 82.3 | 96,500 | 95 |
| *P. bahamense var. compressum* | 17,000 | 0.81 | 3,500 | 0.9 | 0 | 0 |
| *G. catenatum* | 3,000 | 0.14 | 61,000 | 15.5 | 1,000 | 1 |
| *G. splendens* | 6,000 | 0.30 | 2,500 | 0.6 | 500 | 0.5 |
| *C. catenatum* | 1,000 | 0.05 | 0 | 0 | 500 | 0.5 |

Water sampling was repeated on September 2nd at the Puntarenas dock and *A. monilatum* continued to be the most abundant species. However, other toxic dinoflagellates were observed as well (Table 1).

Surface water samples collected on September 09, south of the Puntarenas peninsula (09°55'78''; 84°48'08''), showed a maximum concentration of 3.2 x $10^6$ cells/L.

During the sampling periods, salinity ranged from 29 to 30‰ and temperature from 30 to 31.5ºC.

In areas where concentrations were below 5 x $10^5$ cells/L, water was greenish-grey in colour but, when concentrations were higher, water colour turned olive green. This bloom produced cream or beige colour foam at the tidal break line. Skin contact with the water during sampling in bloom areas produced intense itching, far more intense than the itching produced during sampling of *C. catenatum* blooms.

*Alexandrium monilatum* produces ichthyotoxin that has not been found to accumulate in filter feeding shellfish [7, 8], but is however lethal to many animals [9]. It is a warm water species that has been reported from the Gulf of México, the Caribbean, Venezuela and the Pacific coast of Ecuador [8, 10]. Juhl [9] indicates that it requires a high N cell quota which can help explain the rareness of the blooms in the Gulf of Nicoya since phytoplankton in the Gulf is N-limited during the rainy season [2, 4] when growth conditions are optimal in terms of water temperature and salinity.

***References***


1. Kress, N., *et al*., 2001. Continental Shelf. Res. 22: 1-16.
2. Brugnoli, E., 1998. Thesis. Escuela de Biología, Universidad de Costa Rica. San José, Costa Rica 132 p.
3. León S., *et al*. 1998-1999. Uniciencia 15-16: 35-37.
4. Calvo, E., 2002. Thesis. Escuela de Ciencias Biológicas, Universidad Nacional, Heredia, Costa Rica. 55 p.
5. Hargraves, P.E. & R. Víquez, 1981. Rev. Biol. Trop. 29: 31-38.
6. Víquez, R. & P.E. Hargraves, 1995. Bull. Mar. Sci. 57:467-475.
7. Bass, E.L. & B.W. Kuvshinoff, 1982. Comp. Biochem. Physiol. 75C: 131.
8. Walker, L.M. & K. Steidinger, 1979. J. Phycol. 15: 312-315.
9. Bass, E.L., *et al*., 1983. Aquat. Toxicol. 3: 15-22.
10. Taylor, F.J.R., *et al*., 1995. In: Hallegraeff, G.M., *et al*. (eds.), IOC Manuals and Guides No. 33, UNESCO, p. 297.
11. Juhl, A.R., 2005. Harmful Algae 4(2): 287-295.


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