Short Communication

First Report of a Microcystin-Containing Bloom of the Cyanobacterium Microcystis aeruginosa *in the La Plata River, South America*

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This communication is the first registration of a toxin-containing bloom of the cyanobacterium *Microcystis aeruginosa* Kützing in the La Plata River, Uruguay, South America. The occurrence of the species *M. aeruginosa* in the La Plata River was first registered in 1981 by CARP (1989) but without any toxicological evaluation. During the summer of 1999, short-term *M. aeruginosa* blooms were observed at Colonia, in the country's southwest (34°27′S, 057°20′W), in two locations on the Uruguayan side of the La Plata River. *Microcystis* blooms coincided with an important tourist influx to the area and a peak of water use for recreational and domestic purposes. Two sites were chosen in the area for sampling, a protected area within a harbor, Puerto Juan Lacaze (JL), and an open area within a beach resort, Playa Fomento (see Fig. 1). Samples were taken on 5, 8, 10, 22, and 24 February 1999 at both sites. The water during the bloom had a high pH (average $\sim$8.3), low transparency (0.15–0.3 m Secchi), variable surface temperatures (21–29°C), and a N:P ratio also favorable for the event, 7:1 to 19:1. No rainfalls and very slow winds (0–34 km h^{-1}) were ideal conditions for *M. aeruginosa* bloom development and accumulation. During the 5 days of monitoring, phytoplankton density was within the range of 600–6000 organisms mL^{-1}. At all sampling sites and dates, *M. aeruginosa* were dominant among cyanobacteria and other taxa, diatoms, green algae, dinoflagelates, and phytoflagelates (<20 μm). Phytoplankton chlorophyll *a* (chl-*a*) concentration was variable, with differences between depths. The highest chl-*a* value in JL was 110 $\mu g\ L^{-1}$. *M. aeruginosa* colony density varied between 0.9 and 2417 colonies mL^{-1}. Microcytin levels were determined in whole cells with a polyclonal antibody test kit (Envirogard, SDI, Newark, DE, USA). The results were positive in all analyzed samples ($n = 9$), with values between 101.7 and 1074.3 $\mu g\ g^{-1}$ d.w. Toxin levels were similar at the two sampling sites, except for the last sample in JL, which presented an increment of one order of magnitude in 48 h, from 208 to 1074 $\mu g\ g^{-1}$. This range of concentrations was similar to the values found in environmental blooms of microcystin-producing cyanobacteria in Brazil (Yunes et al., 1996), France (Vezie et al., 1997) and Germany (Fastner et al., 1999).

The La Plata River Basin is the second widest in South America (3,100,000 km^2), with a population of 120 million inhabitants. Some of the largest dams in South America were built in its tributaries (Itaipú in the Paraná River, Salto Grande in the Uruguay River, Barra Bonita in the Tietê River). The volume of waters accumulated in these large water reservoirs, like many

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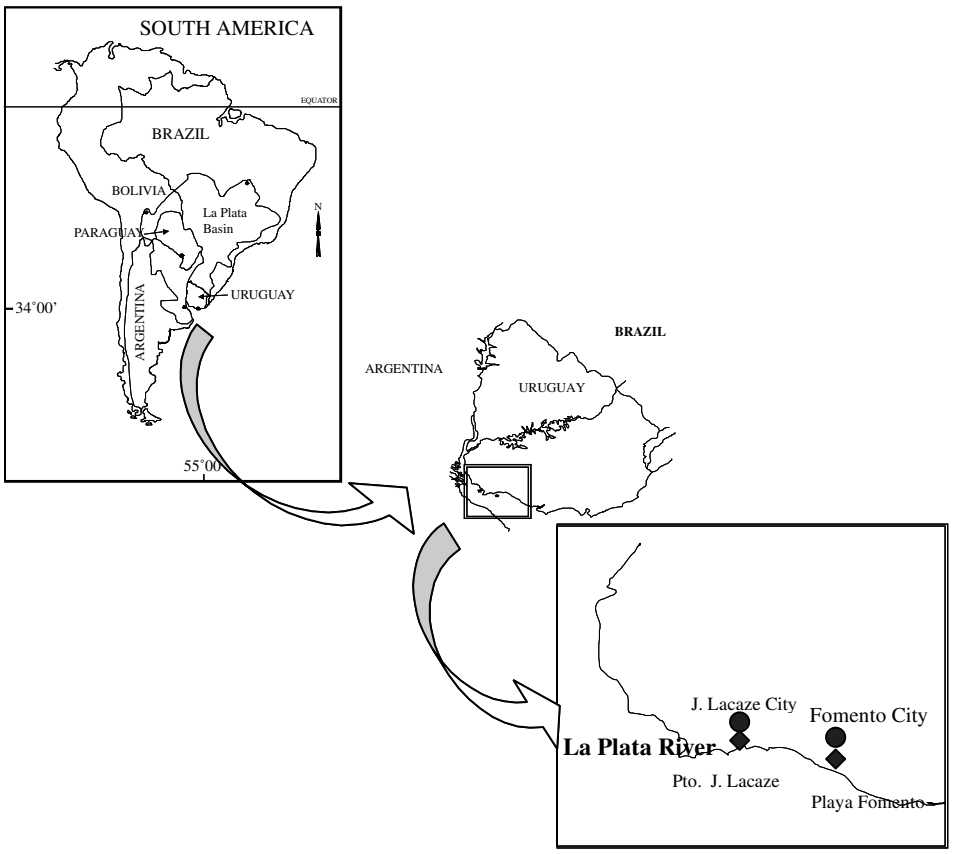

Fig. 1. Location of the study site, the La Plata River, indicating the sampling stations (♦) in the harbor of Juan Lacaze (•) and the beach resort of Fomento (•).

others in the basin, favored the development of cyanobacterial bloom, which are transported downstream toward the La Plata River, where they may encounter ideal conditions for bloom development. In addition to blooms, there is also the risk of toxicity during these events and the lack of awareness of their implications. In the whole region, blooms may repeatedly occur in recreational areas, where the population has direct contact with the cells, and next to urban water sources. Under such conditions, *M. aeruginosa* blooms become a sanitary risk, in addition to being aesthetically unpleasant (Codd et al., 1989; Falconer, 1996; Falconer and Humpage, 1996). Microcystin causes alterations in the hepatocyte cytoskeleton and has been associated with the death of domestic animals, due to the accidental ingestion of microcystin (Carmichael, 1981; Falconer, 1993, 1996; Sivonen et al., 1990) and humans (Pouria et al., 1998). Toxic bloom formation is impossible to predict without knowledge of local environmental factors. Studies would be necessary to determine the distribution and features of potentially toxic cyanobacteria, toward an implementation of risk assessment and management policies. The studies to improve the environmental quality of La Plata Basin need to start within a comprehensive research program with regional coordination and the gathering of research teams. There are already research centers for toxic cyanobacteria in some countries of the Basin (including Argentina, Brazil, and Uruguay). It is needed then to add efforts, to develop joint objectives, and to seek financial support from international development agencies considering the strategic situation of the river basin and its estuarine waters in the South Atlantic Coast.

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