



# HARMFUL ALGAE NEWS

An IOC Newsletter on toxic algae and algal blooms

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## • Greece

### The coincidence of a *Prymnesium parvum* bloom and the mass kill of birds and fish in Lake Koronia

An extremely dense bloom of the haptophyte *Prymnesium parvum* N. Carter (Fig. 1) occurred in August-September 2004 in the shallow Lake Koronia giving the water a yellow-golden colour. The bloom peaked from 9 to 11<sup>th</sup> September, 2004. This is the first record of a harmful *P. parvum* bloom in both inland and marine waters in Greece. Harmful algal blooms studied to date in Greek inland waters have been caused by cyanobacteria [for a review see 1].

Lake Koronia located in northern Greece (40° 40' 58" N; 23° 09' 33" E), at an altitude of 75 m above sea level has undergone a massive decrease in lake volume over the past 20 years, with dramatic decreases in surface area and maximum depth. In the 1970's the surface area was 46.2 km<sup>2</sup> and the maxi-

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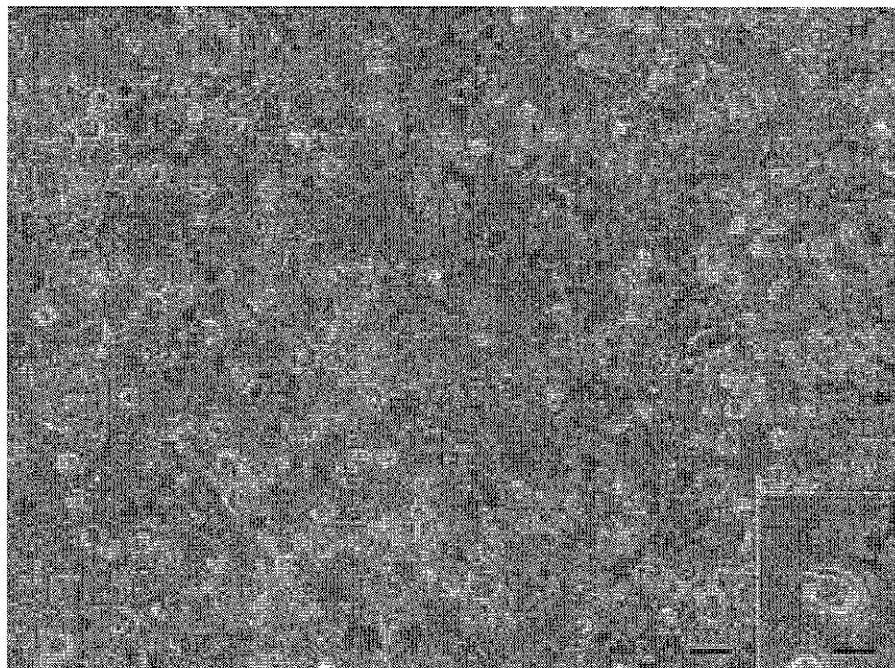


Fig. 1. Light micrograph (phase contrast) of a water sample, containing predominantly *Prymnesium parvum*, collected from Lake Koronia on 11<sup>th</sup> September, 2004. Inset: Motile *P. parvum* cell with visible flagellae and haptonema. Bars indicate 10 µm; inset 5 µm.

## • Guatemala

### Violet bloom produced by a cyanobacterium in a Guatemalan lagoon

During September 2003, violet discolorations due to cyanobacteria were observed in the water of Ipala Lagoon, 168 km from Guatemala City (Fig. 1), a crater of volcanic origin. These waters are drinkable and have been used by the nearby village for many years, without trouble. It is not known when these discolorations began, but the organism is now so abundant, that a

sample in a flask has a strong violet colour, like paint (Fig. 2). Counts with a hemacytometer gave estimates of 94,400 cells/mL. This cyanobacterium is strongly pigmented comprised approximately 99% of total cell count; there were a few Pennales and many phytoflagellates difficult to identify in the fixed sample.

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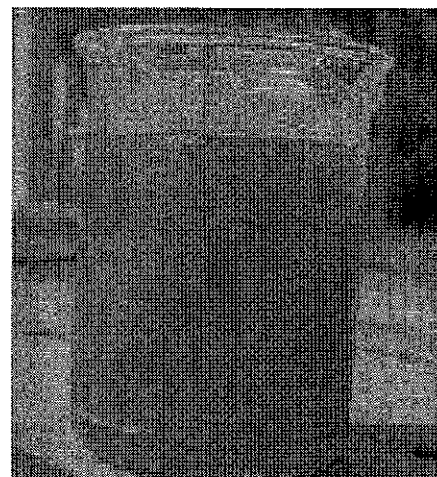


Fig. 2.

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maximum depth was 8 m. In 1995 the surface area was 30 km<sup>2</sup> and the maximum depth 1 m and finally in the summer of 2002 the lake dried up completely. Early in 2003 water started accumulating again in the lake and to date the maximum depth is about 0.9 m.

The physical and chemical conditions of the lake water at the peak of the *P. parvum* bloom were as follows: the water temperature was 20.9 °C, the pH 8.2, the transparency 0.18 m Secchi depth, the salinity 5.3‰, the conductivity 9.2 mS cm<sup>-1</sup>, the surface water dissolved oxygen concentration 9.9 mg L<sup>-1</sup> and the above bottom water concentration was 7.9 mg L<sup>-1</sup>. The phosphate phosphorus concentration was 118.9 µg L<sup>-1</sup>, the dissolved inorganic nitrogen concentration was 543.6 µg L<sup>-1</sup> and the N:P atomic ratio was 10.1.

*Prymnesium parvum* population densities ranged from 120 to 1450 x 10<sup>6</sup> cells L<sup>-1</sup>, at the peak of the bloom, at different sampling stations in L. Koronia. The phytoplankters *Pediastrum boryanum* (Turpin) Meneghini and *Cryptomonas* sp. were also present in abundance, with population densities of 1.8 x 10<sup>6</sup> and 2.1 x 10<sup>6</sup> individuals L<sup>-1</sup>, respectively.

A massive bird kill was observed to coincide with the bloom peak of *P. parvum*, while one week later a mass fish kill was also observed. The number of dead birds reported at a meeting organised by the Prefecture of Thessaloniki was estimated to be in the

tens of thousands. Thirty species of water bird were found dead, including over 200 young individuals of *Pelecanus crispus*, a world-endangered species, and individuals of *Platalea leucorodia* and *Egretta alba*, as reported by the Hunting Federation of Macedonia and Thrace. Reports from the local authorities estimate that the number of dead fish is in the order of hundreds. From the literature it is known that fish kills can be caused by *P. parvum* and *Prymnesium* sp. [2, 3, 4, 5]. For example, fish died in the epilimnion where the density of *Prymnesium* sp. was 10-40 x 10<sup>6</sup> cells L<sup>-1</sup> [4]. However, to the best of our knowledge, there are no reports to date of bird kills associated with blooms of *P. parvum*. It is known that *P. parvum* produces prymnesins, potent haemolytic, ichthyotoxic and cytotoxic glycosides and other allelopathic substances [6, 7, 8]. Allelopathic compounds released by *P. parvum* induce changes in the plankton community structure [9].

Investigations are underway to elucidate the cause(s) of this ecological catastrophe in L. Koronia. The lake is covered by the Directives 79/409/EEC [10] and 92/43/EEC [11], the RAMSAR Convention (<http://www.ramsar.org>) and is a part of a National Wetland Park [12]. The ecological importance of Lake Koronia cannot be underestimated and it is an invaluable haven for large populations of resident and migratory birds.

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The dominant cyanobacterium is *Merismopedia aeruginea*, in colonies of 2, 4, 8 and 16 small cells arranged in quadrangular lamelliform colonies. The shape of the cells ranges from oval to hemispherical, the diameter is 2.5-4 µm and length 3-4 µm, with a very fine granular content of violet color, sometimes concentrated (Fig. 3). The colour distinguishes it from *Merismopedia glauca* (Ehr.) Naegeli, a species very common in fresh waters but of blue-green colour, though some authors con-

sider it the same species [1]. Other authors [2, 3] differentiate it and give values of 3-5 µm diameter, and we did not find colonies this size. There are no signs of toxicity and there are no deaths related to its consumption. This is the first time the species has been known to cause discoloration, although it was already characterized for its violet color. After eight months the water still has this violet pigmentation, even though the organism is no longer present.