

# Which factors determine the abundance and distribution of picocyanobacteria in inland waters? A comparison among different types of lakes and ponds

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With 3 figures and 2 tables

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**Abstract:** In a limnological survey including 45 lakes and ponds from central-eastern Spain, we studied the main factors associated with the abundance of autotrophic picoplankton (APP), mostly formed by unicellular picocyanobacteria (APP-Pcy). The study covers a wide range of trophic conditions, salinity, water flow regimes and lake typologies. Phycoerythrin (PE)-rich picocyanobacteria (PE-APP) were abundant in the metalimnion and upper hypolimnion of deep stratified lakes, exhibiting low nutrient availability in the epilimnion. Among these lakes, higher PE-APP abundances were found in lakes with higher retention time during periods of stability, whereas lakes with low retention time lacked conspicuous Pcy populations. They usually formed deep chlorophyll maxima in the nutrient-richer metalimnetic layers, especially when epilimnetic nutrient exhaustion occurred during stratification. The ratios of PE with respect to other photosynthetic pigments in deep lakes usually increased with depth. In these lakes, the available light is selectively enriched in the yellow-green range as depth increases, and these wavelengths can be selectively harvested by PE. Phycocyanin (PC)-rich APP without PE, mostly unicellular rod-shaped cyanobacteria, were only abundant in some hypertrophic shallow lakes, although in many lakes with highly eutrophic conditions their presence was very low or undetectable.

**Key words:** Autotrophic picoplankton, phycoerythrin (PE)-rich picocyanobacteria (PE-APP), trophic conditions, lake typology, Spain.

## Introduction

Autotrophic picoplankton (APP) are small primary producers (<2 µm) which include several groups of algae, although they are mainly represented by uni-

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