

**LICHEN FUNCTIONAL GROUPS AS INDICATORS OF MICROCLIMATE CHANGES  
ASSOCIATED TO URBANIZATION**

Silvana MUNZI<sup>1</sup>, Otilia CORREIA<sup>1</sup>, Patricia SILVA<sup>2</sup>, Nuno LOPES<sup>2</sup>, Catarina FREITAS<sup>2</sup>,  
Cristina BRANQUINHO<sup>1</sup>, Pedro PINHO<sup>1,3</sup>

*<sup>1</sup>Centro de Biologia Ambiental, Universidade de Lisboa, Lisbon, Portugal; <sup>2</sup>Câmara Municipal de Almada, Almada, Portugal; <sup>3</sup>Centre for Natural Resources and the Environment, Universidade Técnica de Lisboa, Lisbon, Portugal*

Environmental changes caused by urbanization and human daily activities are among the major threats to natural environment and biodiversity in urban and peri-urban areas. Due to the complexity of urban ecosystems, reliable ecological indicators are required to evaluate the consequences of urbanization on the environment. In this work, we tested lichen functional groups as potential biological indicators of the effects of urbanization in a case study carried out in forest remnants in a Mediterranean urban area (Almada, Portugal). A GIS was used to design a stratified random sampling taking into account location and size of the forest fragments. A total of 48 patches were selected. At each sampling site, lichens were sampled on *Pinus pinaster* and *P. pinea*, the most common tree species in the area, and lichen functional diversity was assessed. Lichen diversity resulted mostly correlated with microclimatic conditions, confirming its suitability as indicator of microclimatic changes induced by urbanization (Urban Heat Island). Lichens not only provided an integrated response to microclimatic modifications occurring in urban environments, but also allowed the identification of critical areas and forest fragments with high potentiality for conservation. This can help effectively decision-makers to develop strategies for a sustainable urbanization.