

## Effects of water intermittency on diatom (Bacillariophyta) and invertebrate (aquatic and terrestrial) communities in streams of southern Portugal

Novais MH<sup>1</sup>, Penha MA<sup>1</sup>, Morales EA<sup>1</sup>, Oliveira A<sup>2</sup>, Bouchez A<sup>3</sup>, Barthès A<sup>4</sup>, Usseglio-Polatera P<sup>5</sup>, Várberó G<sup>6</sup>, Morais MM<sup>1</sup>

<sup>1</sup>Instituto de Ciências da Terra, Universidade de Évora, Évora, Portugal

<sup>2</sup>Departamento de Biologia, Universidade de Évora, Évora, Portugal

<sup>3</sup>INRA - UMR CARTELE, Thonon, France

<sup>4</sup>EUROFINS Expertises Environnementales, Vergeze, France

<sup>5</sup>University of Lorraine, CNRS, LIEC, Metz, France

<sup>6</sup>Department of Tisza Research, Danube Research Institute, Hungarian Academy of Sciences, Hungary

hnovais@uevora.pt

Macroinvertebrate and diatom communities were sampled in intermittent streams (i.e. no superficial flow for more than 3 months) of southern Portugal, in spring and end summer 2017 (when carabids were also sampled). The ecological classification of the 18 sampling sites ranged from Moderate to High in spring (flow conditions), according to the Water Framework Directive. During summer, high hydrologic variability was observed and the sites have been classified in three intermittency classes: “low flow” (2 sites), “scattered pools” (11 sites) and “dry” (5 sites). In “low flow” sites, macroinvertebrate and diatoms were collected following standard protocols; in “scattered pools” sites, macroinvertebrates were sampled from pools and two benthic diatom samples were collected from hard substrates in pools and dry riverbed; and in “dry” sites, only dry biofilm on hard substrate was collected. Carabids were sampled using pitfalls placed in the margins and channels in “scattered pools” and “dry” sites, and only along margins in “low flow” sites. First results show changes in diatom communities according to intermittency, with small differences between spring and summer samples collected from “low flow” sites; whilst spring differed from summer (independently of being collected from pools or as dry biofilm). Sites classified as Good or High in spring were more affected by intermittency, with significant reduction in macroinvertebrate species richness, diversity and evenness, whilst these differences were not so evident in Moderate sites. In “scattered pools” situation, a decrease in relative abundance of Trichoptera, Plecoptera and Ephemeroptera was detected, whilst Diptera, Heteroptera and Oligochaeta (more adapted to lentic conditions) increased in relative abundance. During the dry period, 14 carabid species were identified, both in the channel and margins. Among them, few species are typical from riverine systems and the majority occurs in agricultural areas, cork-oak forests and shrublands. This study increases our knowledge about the distribution and habitats of *Pheropsophus hispanicus*, a carabid species poorly known in Portugal. Our preliminary findings have also highlighted the importance of improving the assessment of intermittent streams considering the whole hydrological cycle (including the period with no flow), and integrating complementary biological indicators of their ecological status, as carabids and dry biofilm.

## Nitrogen stable isotopes ( $\delta^{15}\text{N}$ ) in halophytes as a proxy for anthropogenic nitrogen pollution in intermittent Mediterranean wetlands

Paredes I<sup>1</sup>, Ramírez F<sup>1</sup>, Forero MG<sup>2</sup>, Green AJ<sup>1</sup>

<sup>1</sup>Department of Wetland Ecology, Doñana Biological Station (EBD-CSIC), Seville, Spain

<sup>2</sup>Department of Conservation Biology, Doñana Biological Station (EBD-CSIC), Seville, Spain

irene.paredeslosada@gmail.com

Nitrogen (N) loading from anthropogenic activities is concerning major human impact contributing to the eutrophication and degradation of wetlands worldwide. This is the case in the iconic Doñana wetlands in southwestern Spain, which have been exposed to increasing N inputs from intensive agriculture and urban wastewaters over recent decades. The uneven distribution of human impacts across the watershed and the inherent hydrodynamic complexity of the system require monitoring tools that go beyond conventional water-quality parameters to facilitate adequate, effective management measures to control and reduce N pollution. Natural abundance of N stable isotopes ( $\delta^{15}\text{N}$ ) in aquatic plants allows tracing and monitoring of the spatial distribution of different nitrogen (N) sources. The variable nature of N sources is reflected in distinct isotopic ratios ( $^{15}\text{N}/^{14}\text{N}$ ). Human wastewaters and animal waste N are enriched in  $\delta^{15}\text{N}$  (10–20‰) while synthetic inorganic fertilizers have lower values (–3 to 3‰) because they are derived from industrial atmospheric nitrogen fixation ( $\delta^{15}\text{N}$  -values close to zero). We investigated the spatial variability of different N inputs across the Doñana marsh and entry streams using the  $\delta^{15}\text{N}$  values measured in two representative halophytes species (*Bolboschoenus maritimus* and *Typha domingensis*). We hypothesized that those areas most impacted by isotopically enriched wastewaters and/or organic fertilizers will result in enhanced N concentration and enriched  $\delta^{15}\text{N}$  values. We collected fresh plant leaves in spring and surface water samples during the rainy period (Oct.–May) over two consecutive years (2015/16) from a network of points across the Doñana marsh and two tributary streams (La Rocina and El Partido). We found higher average values of  $\delta^{15}\text{N}$  in the plant tissues collected in the streams than in the marsh. The stream most affected by urban wastewaters (El Partido) showed the highest isotopic values and N concentrations. Linear regression models revealed that isotopic values in plants were in general positively related to the N concentrations in surface waters. Our results provide the first information about the variability of  $\delta^{15}\text{N}$  across the Doñana watershed-marsh system.