

# TEMPORAL VARIATION OF MACROINVERTEBRATE ASSEMBLAGES IN TEMPORARY PONDS FROM THE DOÑANA NATIONAL PARK (SW SPAIN)

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## Introduction

Water level in temporary ponds fluctuates according to the length of their flooding period (hydroperiod). They are suitable habitats for macroinvertebrates that develop in partial or complete complex life-cycles. The Doñana National Park (SW Spain) (Fig. 1) presents a high diversity of ponds along a wide hydroperiod range. However, few studies have been carried out on the macroinvertebrate assemblages of these ponds. The aim of this study is to point out the high spatio-temporal variation of macroinvertebrates among different ponds and years. Rainfall abundance and distribution were different during the hydrological cycles of 2005-2006 and 2006-2007 (Fig.1). Hydroperiod of temporary ponds also differed between both cycles: it ranged 1-8 months in 2005-2006, and 6-10 months in 2006-2007.

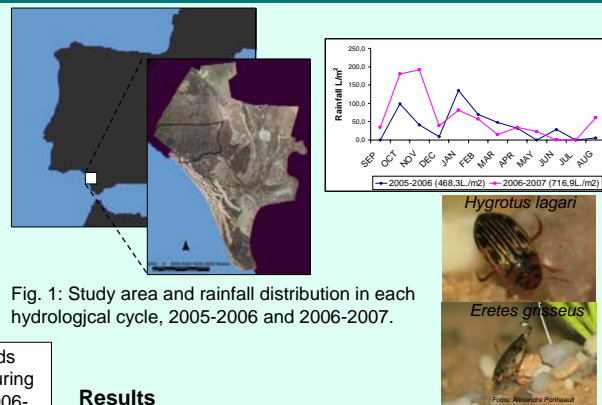


Fig. 1: Study area and rainfall distribution in each hydrological cycle, 2005-2006 and 2006-2007.

## Methods

Macroinvertebrate assemblages of 18 temporary ponds and 1 semipermanent pond were monthly sampled during a dry and a wet hydrological cycle (2005-2006 and 2006-2007, respectively). Several samples were caught with a dipnet of 1mm of mesh size in 1 or 2 transects from the littoral to the open water according to pond size. The relative abundance of each category per pond was calculated in catch-per-unit-effort as the average number of individuals caught in all samples from each pond. Multivariate correlations among similarity matrices of macroinvertebrate assemblages along successive months were carried out with a serial RELATE analysis (Rho is the coefficient of Spearman correlation). The importance of the hydroperiod in the composition of macroinvertebrate assemblages was tested using ANOSIM analyses.

## Results

Table 1: First ten most and least abundant species during the two years of study (\*Adults and larvae were classified in different categories because both occurred in different months, and they usually present different ecological requirements).

10 most abundant species 2005-07	10 least abundant species 2005-07
<i>Corixa affinis</i>	<i>Micronecta schotzi</i>
<i>Anisops sardeus</i>	<i>Hydrophilus pistaceus</i>
<i>Enochrus fuscipennis</i>	<i>Eretes griseus</i>
<i>Anacaena lutescens</i>	<i>Agabus didymus</i>
<i>Plea minutissima</i>	<i>Limnebius furcatus</i>
<i>Ishnura pumilio</i>	<i>Lestes macrostigma</i>
<i>Hydroglyphus geminus</i>	<i>Coenagrion scutulum</i>
<i>Hygrotes lagari</i>	<i>Dytiscus circumflexus</i>
<i>Berosus affinis</i>	<i>Gerris cf. maculatus</i>
<i>Hydrobius fuscipes</i>	<i>Lestes virens</i>

Minimum species richness= 129  
Number of categories\*= 149



Foto: Margarita Florencio

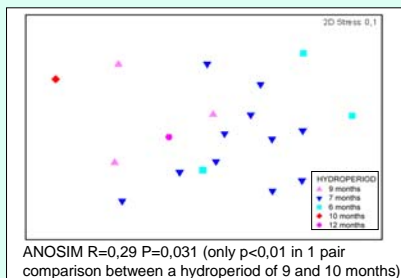


Fig. 2: Ordination (NMDS) of the macroinvertebrate assemblages based upon relative abundance per pond. The different similarity among ponds with different hydroperiod ponds were tested with ANOSIM analysis.

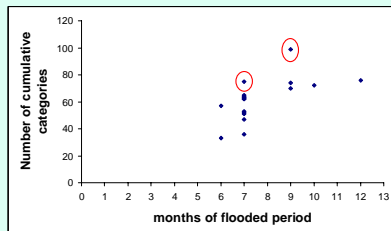


Fig. 3: Cumulative number of categories in ponds with different hydroperiod. Open circles mark ponds with the highest number of categories.

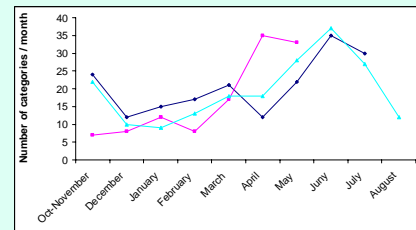


Fig. 4: Number of categories per month in three ponds with different hydroperiod.

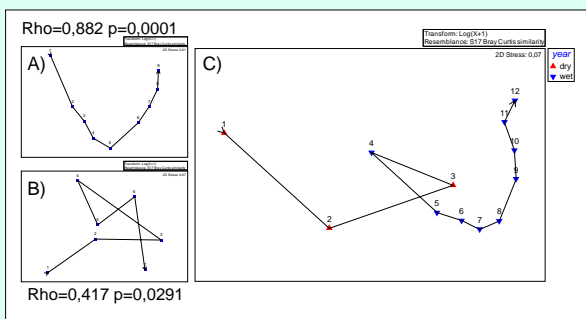


Fig. 5: Monthly variation of the macroinvertebrate assemblage based upon relative abundance data. The months of hydroperiod are successively numbered. A) and B) show different ponds during the wet year. C) show the same pond as in A) but compares assemblages between the dry and the wet year. Rho is the coefficient of Spearman serial correlation in the RELATE analysis.

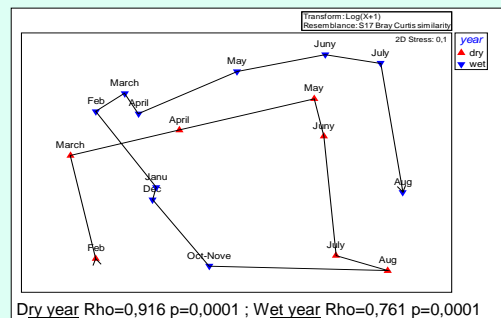


Fig. 7: Monthly variation (NMDS) of macroinvertebrate assemblage composition of all studied ponds in the Doñana National Park during the wet and dry years. Rho is the coefficient of Spearman serial correlation in the RELATE analysis for every year.

Adults of Coleoptera and Heteroptera showed the highest abundance both at the end and at the beginning of the hydroperiod, except ponds with longer hydroperiod that reached the highest abundance of adults of Heteroptera in summer (Fig. 6a). Larvae of Coleoptera (mainly Dytiscidae) occurred in the middle of the flooding period. However, the highest abundance of Coleoptera was reached by adults of Hydrophilidae at the end of the hydroperiod (Fig. 6b). Among Odonata, Libellulidae was found throughout the flooding period while Coenagrionidae (mainly *Ishnura pumilio*) was very abundant at the end of it (Fig.6c).

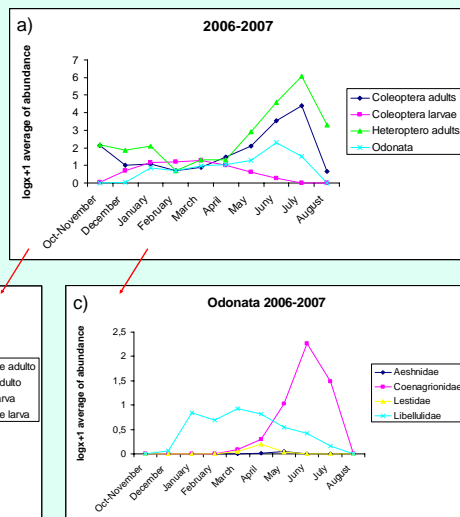


Fig. 6: Monthly variation of the abundance of some groups of macroinvertebrates.

## Conclusions

- The composition of macroinvertebrate assemblages (based on relative abundance data) was different in ponds with different hydroperiod.
- The highest number of categories was recorded approximately one or two months before to the desiccation of temporary ponds.
- Different ponds presented different temporal variation of their macroinvertebrate assemblages throughout the flooding period, and among different hydrological cycles. This might be explained by the different requirements of each categories.
- However, the monthly variation of macroinvertebrate assemblage composition was similar for the whole study area in the Doñana National Park in the dry and wet years. This suggest that, globally, life-cycle pattern are repeated regardless of hydrological conditions.