

Macroinvertebrates of astatic ponds in Central Italy: a functional analysis

Marcello Bazzanti, Valentina Della Bella, Francesco Grezzi

Department of Animal and Human Biology, "Sapienza" University of Rome, viale dell'Università 32, 00185 Rome, Italy



AIM:

To discover the relationships between environmental parameters and functional aspects (feeding guilds, habits and resistance to drought according Wiggins et al., 1980) of the macroinvertebrate communities of 21 astatic ponds in Central Italy.

RESULTS:

The functional characteristics did not differ significantly between temporary and permanent ponds (Figs 1 and 2). In contrast, as regards the mesohabitats, some differences were evident (Figs. 3 and 4): collector-gatherers, burrowers and Group 1 of Wiggins et al. (1980) were more abundant in the sediments, whereas scrapers, shredders, sprawlers+climbers and swimmers+divers, and Group 4 of Wiggins et al. (1980) occurred more abundantly in the macrophyte beds. Moreover we found a significant correlation ($r = 0.85, p < 0.0001$) between taxonomic and functional diversities.

STUDY AREA AND METHODS:

Invertebrate macrofauna of 13 temporary and 8 permanent ponds located in four protected areas in Central Italy was studied in March, May and June 2002. Macroinvertebrates were collected by a pond net (mesh opening: 0.280 mm) in three contrasting mesohabitats (macrophytes, littoral sediments, central sediments, the latter two unvegetated). We adopted the Man Whitney U test for comparisons between the two pond typologies (data of all ponds were used at each date) and ANOVA and Tukey test between mesohabitat types (only data from 10 ponds in May 2002 were used because they contained all the three mesohabitats simultaneously).



Environmental characteristics	Pond type	
(mean values from ponds of the same typology. Water turbidity is expressed as median value).	P	T
Water permanence (days)	365	220.8
Macrophyte cover (% of pond area)	61.9	40
Number of macrophyte species	6.2	3.3
Phosphorus in the sediments (g/kg)	0.521	0.402
Nitrogen in the sediments (%)	0.154	0.181
Phosphorus in the water (mg/l)	0.207	0.316
Nitrogen in the water (mg/l)	1.53	3.66
Maximum depth (cm)	77.6	24
Surface area (m ²)	3550.3	143.6
Dissolved oxygen (mg/l)	10.9	5.6
Organic carbon in the sediment (%)	1.16	1.53
Organic matter (%)	10.9	10.5
Conductivity (µS/cm)	884	704
pH	8.6	7.4
Water turbidity (class: 1 = clear, 2 = intermediate, 3 = turbid)	1	3
Coarse sand (%)	3.1	2.7
Medium sand (%)	14.2	15.3
Fine sand (%)	11.4	15.0
Silt (%)	44.4	35.0
Clay (%)	27.4	31.8
Tree cover (% of pond area)	8.7	12.5

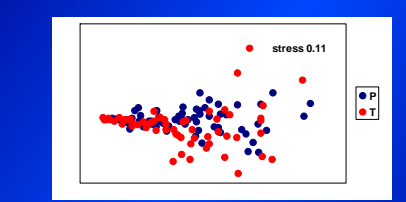
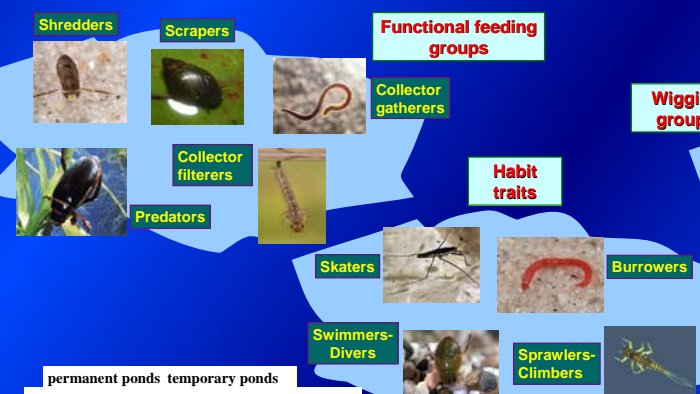


Figure 1. Plot of Non Metric Multidimensional Scaling (NMDS) performed on the abundances of functional groups (functional feeding groups, habits and Wiggins Groups) during the three study months. P = permanent ponds, T = temporary ponds.

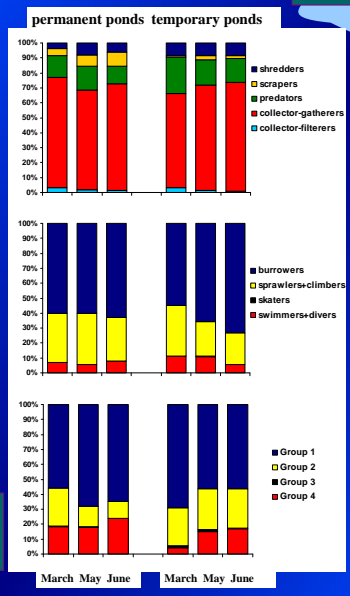


Figure 2. Mean percentage composition of functional groups (functional feeding groups, habits and Wiggins Groups) in the ponds during the three study months.

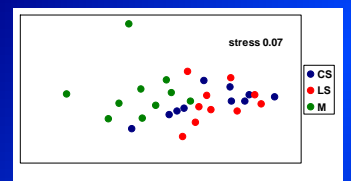


Figure 3. Plot of Non Metric Multidimensional Scaling (NMDS) performed on the abundances of functional groups (functional feeding groups, habits and Wiggins Groups) of 10 selected ponds in May 2002. CS = central sediments, LS = littoral sediments and M = macrophyte beds.

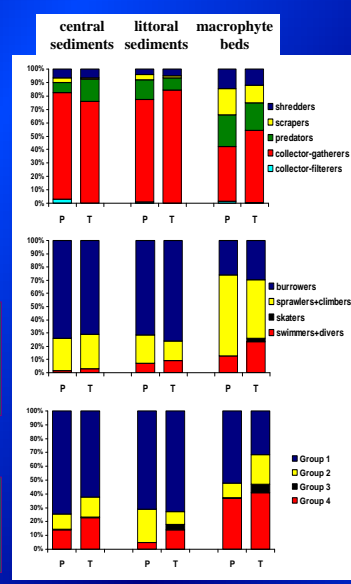


Figure 4. Mean percentage composition of functional groups (functional feeding groups, habits and Wiggins Groups) in the different mesohabitats of 10 selected ponds in May 2002. P = permanent ponds, T = temporary ponds.

DISCUSSION AND CONCLUSIONS:

In spite of the hydroperiod seemed to be the driving factor affecting taxonomic composition and abundances of the macroinvertebrates as appeared in a previous study on the same ponds (Della Bella et al. 2005), these results suggest that it is an unimportant factor in governing community functional aspects, which appeared more influenced by substrate types. Moreover, the direct relationships between the taxonomic diversity and the three functional diversities correspond to a good partitioning of the ecological resources among taxa to maintain the ecological complexity in ponds. Our results suggest that all pond and mesohabitat types should be sampled to obtain a better knowledge of pond ecology functioning.