

CONTRIBUTIONS TO THE STUDY OF THE MACROZOOBENTHIC INVERTEBRATE FAUNA FROM TWO TEMPORARY POOLS FROM FOIENI AREA (SATU-MARE COUNTY)

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Abstract. The present paper deals with a study upon the macrozoobenthic invertebrates from two temporary pools placed closet o Foieni village (Satu-Mare County) on the both sides of a road which crosses a forest. The samples were taken during the spring period, in April and May. In the following months the pools dried out. The macrozoobenthic invertebrate fauna in the both pools is scarce in taxonomic groups, because of the temporarily character of these water bodies, which do not let the settling of a stable benthic community. The groups we found are mostly from those which do not have great oxygen needs or are not exclusively benthic and can swim to the surface of the water where the amount of the oxygen is greater. The most frequent groups in the both pools are the Isopoda and Gasteropoda, founded in all samples. The taxonomic diversity is relatively small because a small number of benthic groups are dominant. I the two pools are differences between the benthic macroinvertebrate fauna, because the settling of the benthic community in these habitats which are sitting close one another is mostly the result of the hazard.

Key words: temporary pools, macrozoobenthic invertebrates, benthic community.

Rezumat: Contribuții la studiul nevertebratelor macrozoobentice din două bălți temporare din zona Foieni (Județul Satu-Mare). Lucrarea de față prezintă un studiu asupra faunei de nevertebrate macrozoobentice din 2 bălți temporare situate în apropierea localității Foieni (jud. Satu-Mare) pe cele două margini ale unui drum forestier. Probele au fost prelevate în perioada de primăvară, în lunile aprilie și mai, după care bălțile au secat. S-a constatat că în ambele bălți fauna este relativ săracă în grupe de nevertebrate, tocmai datorită caracterului temporar al apei, fapt ce nu permite instalarea unei comunități bentonice stabile. Grupele prezente fac parte în general dintre cel care nu au pretenții foarte mari în ceea ce privește gradul de oxigenare al apei sau chiar grupe care nu sunt exclusiv bentonice și pot înota spre suprafața apei, unde oxigenarea este mai bună. S-a constatat că cele mai frecvente grupe în ambele bălți sunt Izopodele și Gasteropodele, prezente în toate probele. Diversitatea taxonomică este relativ mică, datorită dominanței unui număr mic de grupe de nevertebrate bentonice. În cele două bălți s-a constatat că există diferențe în ceea ce privește fauna de nevertebrate bentonice, datorită faptului că popularea acestor habitate aflate la distanță mică este în mare parte rezultatul hazardului.

Cuvinte cheie: bălți temporare, nevertebrate macrozoobentice, comunitate bentonică.

INTRODUCTION

In this paper we try to highlight the importance of the temporary pools, which have the tendency to disappear because of the agricultural usage of the lands. The temporary pools are not considered nowadays to have a great importance, although they have a specific fauna (vertebrates and invertebrates as well) with an important role in the ecosystems from which they are part of (BĂNĂRESCU P. M., 1995)

The composition of the benthic fauna of the pools gives us information about the general state of the studied habitat from the pollution point of view and the hydrological regime. Some species act as indicators, especially of the organic pollution and the oxygen content of the water. Their massive development is an indication of the above mentioned conditions. Various species of bacteria, worms, insect larvae are very sensitive to the presence or absence of some organic compounds in water.

The research of the aquatic invertebrate fauna has multilateral importance, for different purposes as fishery, sanitary hygiene, water protection, utilisation of the natural waters for domestic use, etc. A great significance has the water as natural environment for patogen agents which can affect the human health.

The aquatic invertebrates can be found in a great variety of aquatic habitats and they have important roles in the ecosystems from which are part of. The insect larvae are important components of the trophic chains because they process, transform the organic substances and provide food for other invertebrates and vertebrates (fishes, amphibians and birds) (BOUCHARD R. W. JR., 2004).

Regarding to all of these, our main aim of this study is to determine the benthic invertebrate fauna composition from two pool represented by two ditches situated at the both sides of a forest road near the Foieni village (Satu-Mare County). The study was carried out in 2005 in April and May.

The Foieni village is situated in Satu-Mare County, around the meridian of 22. 5° and between the parallels of 47. 5-48, northern latitude (GREGORIAN E. C. et al., 1992, TUFESCU V. et. al., 1995). The Foieni village is located in the Careiului Plain (Câmpia Careiului) (POSEA G., 1997). Satu-Mare County is in the north-western part of Romania, in the contact area between the Tisa Plain (Câmpia Tisei) with the Oriental Carpathians and the Somes Plateau (Podișul Someșan). It is marked off at east by Maramureș County, at south-east by Sălaj County, at south by Bihor County, at west by the state border with Hungary and at north by the state border with Ukraine. (BOGDAN A. & CĂLINESCU M., 1976) (Fig. 1)



Figure 1. Foieni village from Satu-Mare County
Figura 1. Localitatea Foieni din județul Satu-Mare

MATERIAL AND METHODS

The samples were collected in April and May 2005 from two pools with a 0.1 m² surface benthometer. The samples were preserved in 4% formalin solution. In the lab there were sorted under a 400X magnifying stereomicroscope and transferred in 70% etilic alcohol. The invertebrate groups were determined under a stereomicroscope or under the microscope as whole mounted slides.

RESULTS AND DISCUSSIONS

The main aim of this research was to determine the composition of the benthic fauna from two pools with look like ditches and are situated on both sides of a road which crosses a forest in the Carei Plain (Câmpia Careiului) close to the Foieni village. We also wanted to show the possible differences between the two biotopes which have the same environmental conditions.

The both pools are situated in the forest and are bordered by herbaceous vegetation a tone side and trees at the other side. They have appreciatively the same depth and muddy substrate and well developed submerged vegetation.(Fig. 2a, b)

These pools are forming in the spring as a result of the snow melting and spring rains. Considering the fact that this region has very hot summers, the pools almost every summer dry out.

From the abiotic characteristics and faunistic compound the temporary pools are a distinguish category of continental waters (WILLIAMS D. D., 1997) they play an important role in maintaining the humidity of the area from they belong and represent the breeding habitat for several Amphibian species (*Bufo viridis*, *Pelobates fuscus* etc.), which are important in the control of the harmful insect populations. The most of the temporary pools, especially those which have a typical fauna, are situated in arid areas, where the short rainy period (usually in spring) is followed by a longer drought period, when the pools dry out.



Figure 2. The aspect of the pools: a - in the right side of the road, b- in the left side of the road
Figura 2. Aspectul bălților: a – balta din partea dreaptă a drumului, b - balta din partea stângă a drumului.

Along our researches carried out in the two months of study (April and May 2005) in the two ditches, which are temporary pools we have identified 9 groups of invertebrates. The most of them are benthic or have some species adapted to the benthic life.(Table 1)

Table 1. Invertebrate groups identified during the research period, 2005
Table 1. Grupe de nevertebrate macrozoobentice semnalate în crsul studiului

Nr. crt.	Sampling site	Right pool		Left pool	
	Date (2005)	2.IV.	4.V.	2.IV.	4.V.
1	Oligochaeta	-	+	+	-
2	Gasteropoda	+	+	+	+
3	Crustaceans-Isopoda	+	+	+	+
4	Plecoptera-larvae	-	+	+	
5	Coleoptera-imago	-	+	+	+
6	Coleoptera-larvae	-	+	-	+
7	Trichoptera-larvae	-	-	+	-
8	Diptera-larvae-Nematocera-Culicida	+	-	+	-
9	Diptera-larvae-Nematocera-Chironomida	+	-	+	-
	Total	4	6	8	4

Of the 9 invertebrate groups, some have the whole life cycle in the water (Oligochaeta, Gasteropoda, Crustaceans-Isopoda), and the other have only the larval stage adapted to the water environment and are represented by insect larvae (Plecoptera, Trichoptera, Diptera) (CRANSTON P. S., 1995, PAULIAN R., 1971, RADU GH. V. & RADU V. V., 1967). The higher percent is reached in each habitat by the insect larvae, namely the mosquito larvae. This fact shows that the pools have a temporary hydrological regime. Some of the identified groups can resist even in the absence of the water, because they lay durable eggs which can stand the drought.

In the right pool we have found 4 groups in April and 6 in May. Of these we found in both months only Gastropods and Isopods. The total number of individuals was 322, of which 275 we found in April and 47 in May. The drastic diminution of the individuals in May is due of the lack of the mosquito larvae, which in April represented 210 individuals.(Table 2)

In April the Diptera-Culicida larvae form 76.36% of the whole benthic fauna of this pool. These larvae have a high adaptability to the special conditions of some biotopes (CHIRIAC & UDRESCU, 1965). They are followed by Isopods (specimens of the genus *Asellus* – prefers food of many aquatic animal species), whose abundance reach 22.91%. The other two groups: Gasteropoda and Chironomida have very low abundances. (Table 2, Fig. 3)

Table 2. The abundance of the macrozoobenthic invertebrate groups from the two pools
Tabel 2. Abundența grupelor de nevertebrate macrozoobentice din cele două bălți

Sample sites	Right pool				Left pool			
	2.IV.		4.V.		2.IV.		4.V.	
	Nr.ind.	A (%)	Nr.ind.	A (%)	Nr.ind.	A (%)	Nr.ind.	A (%)
Oligochaeta	0	0	1	2.128	1	0.44	0	0
Gasteropoda	1	0.364	10	21.28	5	2.20	17	62.96
Crustacean-Isopoda	63	22.91	15	31.91	18	7.93	5	18.52
Plecoptera-larva	0	0	1	2.128	1	0.44	0	0
Coleoptera-imago	0	0	1	2.128	1	0.44	2	7.40
Coleoptera-larva	0	0	19	40.43	0	0	3	11.11
Trichoptera-larva	0	0	0	0	2	0.88	0	0
Diptera-larva-Nematocera-Culicida	210	76.36	0	0	195	85.90	0	0
Diptera-larva-Nematocera-Chironomida	1	0.364	0	0	4	1.76	0	0
Total	275	100	47	100	227	100	27	100

In May the benthic fauna composition diversifies, but the mosquito larvae disappear, because they become adults in few weeks. In this study period the highest abundance is reached by the Coleoptera larvae 40.43%, followed by Crustaceans-Isopoda with 31.91%. In this month the abundance of Gastropoda grows significantly to 21.28%.(Table 2, Fig. 3)

The presence of the coleopteran larvae which are zoophagous in such high abundance shows that the conditions are optimum for their settlement in the community, namely they have enough trophic resources for living. (Table 2).

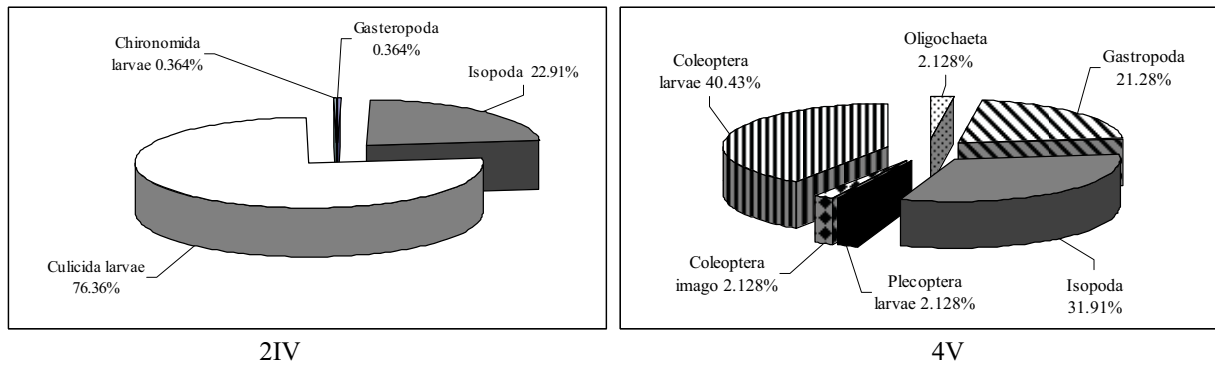


Figure 3. The abundance of the macrozoobenthic invertebrate groups in the right side pool, in the two month of study
Figura 3. Abundența grupelor de nevertebrate macrozoobentice în balta din partea dreaptă, în cele două luni de studiu

We can observe that the main invertebrate groups which enlighten the community in this biotope are the Culicidae larvae and the Isopoda. the Gastropoda and the Coleoptera larvae are also important. These are less exacting groups regarding the water quality. The scarce presence or even the absence of some oxyfilous groups shows an oxygen deficiency in the water.

The left pool is less rich in species than the other. Here we found also Trichoptera larvae, but in a very small proportion, only 2 specimens. In April we have found 9 invertebrate groups and in May only 4. The total number of individuals varies in the two periods of sampling alike in the right pool. Because of the high number of Culicidae larvae, in April the total number of individuals is 227 and in May this number drops to 27, as the result of the disappearance of the Culicida larvae.(Table 2)

The abundance of the Culicida larvae is very high in the first period reaching 85.90%. Their presence in such high number provides an important source of food for the frogs found in this habitat. (COGĂLNICEANU D. & VENCZEL M., 1993)(Table 2, Fig. 4)

An relative high abundance is reached also by the Isopoda with 7.93 % and Gastropoda with 2.20%. Also in this pool we found two Trichoptera larvae. Their presence in such small number shows the oxygen deficiency in the water.

In May the highest abundance is reached by the Gastropoda (62.96%). This fact is due to the great abundance of the submerged vegetation in the pool, and the most of the snails are fitophagous. Other abundant groups in this month are Isopoda (18.52%), the larvae (11.11%) and the adults of Coleoptera (7.40%).(Table 2, Fig. 4)

The mosquito larvae are absent from the sample taken in May, probably because they already turned in adults.

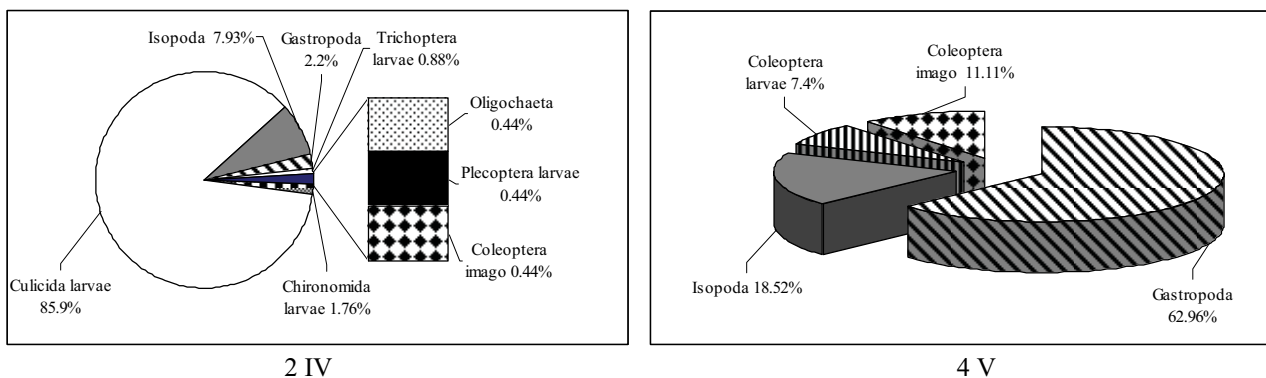


Figure 4. The abundance of the macrozoobenthic invertebrate groups in the left pool, in the two month of study.
Figura 4. Abundența grupelor de nevertebrate macrozoobentice în balta din partea stângă, în cele două luni de studiu.

We can see that, as in the other sample site, the most abundant groups are the Culicida larvae, the Isopoda and Gastropoda. The rest of the invertebrate groups have a small abundance.

From the frequency point of view there are two groups with maximum frequency 100%: Gastropoda and Isopoda. Although the highest abundance was reached by the Culicida larvae, their frequency is only 50%, because they are absent in May. Higher frequency is reached also by the Coleoptera-imago, which although appear in small quantities, were identified in 3 from the 4 sampling periods.(Table 3)

Together with the mosquito larvae, the most of the invertebrate groups have a frequency of 50% (Oligochaeta, Plecoptera larvae, Coleoptera larvae and Chironomida larvae). The smallest frequency is reached by Trichoptera larvae (25%) found only in one sample. (Table 3)

Table 3. The frequency of the macrozoobenthic invertebrate groups during the study
Tabel 3. Frecvența grupelor de nevertebrate macrozoobentice în perioada de studiu

Sample site Date (year 2005)	Right pool		Left pool		F(%)
	2.IV.	4.V.	2.IV.	4.V.	
Oligochaeta	0	1	1	0	50
Gastropoda	1	10	5	17	100
Isopoda	63	15	18	5	100
Plecoptera-larvae	0	1	1	0	50
Coleoptera-imago	0	1	1	2	75
Coleoptera-larvae	0	19	0	3	50
Trichoptera-larvae	0	0	2	0	25
Diptera-larvae-Nematocera-Culicida	210	0	195	0	50
Diptera-larvae-eNematocera-Chironomida	1	0	4	0	50

The diversity indexes represent a measure of the distribution of the individuals from different species in a sample (MAGURRAN A. E., 1998, SÎRBU I. & BENEDEK A. M., 2004). A community of invertebrates formed from species relatively equal distributed is considered more natural than a community with a simple structure owed by the dominance of a small number of taxa. Although we must consider also that a simple community can be also a result of natural conditions (WINGET R. N. & MANGUM F. A., 1979).

The diversity of the benthic fauna of the studied pools is reduced because of the dominance of a small number of invertebrates. (Table 4)

Table 4. The values of the diversity during the study period
Tabel 4. Valorile diversității în perioada de studiu

	Right pool			Left pool		
	2.IV.	4.V.	T	2.IV.	4.V.	T
Diversity	0.58	1.30	0.94	0.72	1.04	0.88

Comparing the diversity of the samples from April and May, we can see that in both pools, the samples collected in May have a greater value. In this month the Culicida larvae are absent. Their high abundance in April causes a smaller diversity in this month. (Table 4)

For the two different pools the values of the diversity are alike, just a little higher in the pool from the right side of the road.

CONCLUSIONS

The number of invertebrate groups found in the studied pools is 9, the majority have exclusively benthic representatives of species adapted to this environment. Some of them are living permanently in the water (Oligochaeta, Gastropoda, and Isopoda). The others have only the larval stage adapted to the water environment (Plecoptera, Trichoptera, Diptera larvae). The abundance of the individuals in the samples is for the two biotopes higher in the case of insect larvae especially the mosquito larvae.

In both pools in the samples collected in April, the mosquito larvae are dominant, followed by the Isopoda. In the month of May, the mosquito larvae are absent because they have transformed into adults.

So in May in the benthic fauna in the right side pool prevail the Coleoptera larvae together with the Isopoda and Gastropoda, and in the left side pool the Gastropoda followed by the Isopoda and Coleoptera larvae and adults.

From the point of view of the frequency the Gastropoda and Isopoda reaches the highest frequency of 100%. Although the highest abundance was reached by the Culicida larvae, their frequency is only 50%, because they lack in May. High frequency is reached also by the Coleoptera, but these are not characteristic for the benthic fauna.

The diversity of the benthic fauna is not too high, because of the dominance of a small invertebrate group. The diversity is higher in the case of the samples collected in May and very close for the two different habitats.

The composition of species from the two studied pools is characteristic for stagnant water types with a benthic fauna dominated by the Diptera larvae adapted to the oxygen deficiency in the environment. Also here the species with increased oxygen needs are very less abundant or absent. (Plecoptera, Trichoptera larvae).

The relatively small number of invertebrate groups identified during the study is due to the fact that is a temporary pool in which cannot be set a stable community with a rich and highly structure. In these pools the presence of some invertebrate groups is often the result of the hazard (KENK R., 1949, CUPȘA et al., 2002).

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