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Data on the Odonata fauna of the Natura 2000 site "Lunca Inferioară a Crişului Repede" (ROSCI-0104), Bihor County, NW Romania

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Abstract. This article presents the Odonata species identified in the protected area ROSCI0104 "Lunca inferioară a Crişului Repede" from Crişul Repede River, Bihor County, Romania. During this study we have identified 12 species belonging to 6 families, 10 genres of the 2 suborders of Odonata (Anisoptera and Zygoptera). After the collected data were processed, we can affirm that the investigated site has a rich Odonata fauna comparing to the area surface of the site and according to the richness chart suggested by Devai and Miskolci (1987).

Key words: fauna, Odonata, protected species, Natura 2000, Crişul Repede.

Introduction

Odonata fauna from Romania has for sure 70 species (Manci 2012), and another number of 14 species with non-confirmed stable populations (Manci 2012) from the 120 cited species of Europe (Dijkstra 2006). These represent a small proportion of the 5800 inventoried Odonata species from the word (Schorr et al. 2012). All Odonata species are predators both in larval and adult stage. They have an important role in the living habitats by controlling other insect populations (Fincke et al. 1997, Bulimar 1984).

In Romania the Odonata fauna is not completely known. There are regions of the country where the studies are numerous, for example: Danube Delta (e.g. Kuhlmann 1965, Isvoreanu & Boghian 1980, Griebler 1994), Banat (e.g. Manci 2005a, 2005b, 2006), Carpathian Mountains (e.g. Cârdei 1955, Manci 2005c, Flenker 2011), Romanian Moldavia (e.g. Cârdei 1956a, Nicoară et al. 2000, Patriche & Manci 2008), Transylvania (e.g. Alexinschi 1937, Huber 2004), Oltenia (e.g. Cârdei 1956b, Rogoz 1977). In other part of the country the Odonata studies are scarce (e.g. Maramureş - Cârdei & Borcea 1957, Someş River Basin - Huber 1999, 2000, Romanian Plain - Popescu-Gorj 1989, Tur Valley – Szállassy 2008) or completely lacking. Many of these studies where made several years ago, so in some cases the original habitats can modified during the time. In our study area the researches are few and relatively old, they do not concern exactly the site investigated by us, but the surroundings of Oradea city (Arnold 1988, Paina 1970).

Our observations about the Odonata fauna were made with the aim to have an initial inventory of this insect group in the studied Natura 2000 site and to complete the researches in Bihor County, North-Western Romania.

Material and methods

The observations in field were made using the transect method, on a pathway of approximately 50 km, along the 2000 ROSCI0104 site, divided in 16 sectors. The field observations were performed from June to October 2012, which correspond to the flight period for the most of the species from the region.

The research area is situated along Crişul Repede River (ROSCI0104, N47º3'24'' E21º43'41'' - Fig 1). The area has a surface of 656 ha and an average length of 101 km. It has a proportion of 36% from its surface represented by rivers and lakes 26% crop fields 21% pastures 15% bogs and marshes 2% other agricultural lands. It is situated exclusively in the territory of Bihor county (http://www.mmediu.ro/protectia_naturii/biodiversitate/2011-10-20_protectia_naturii_RO_SCI_SDF_2011.pdf).

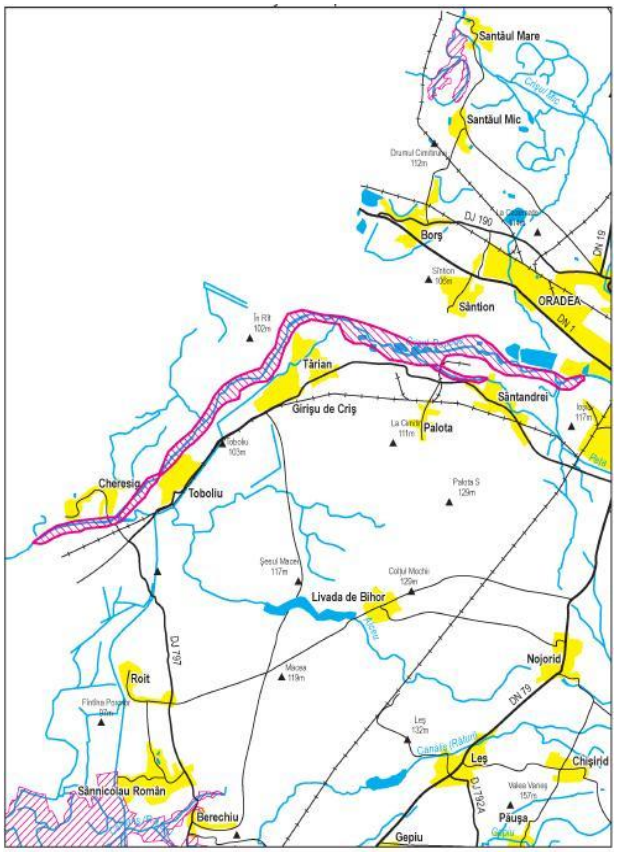

Figure 1. Map of site Nature 2000 ROSCI0104 (after: http://natura2000.mmediu.ro).

The specimens of Odonata where captured with an entomological net and was photographed. We avoided their preservation to prevent the numerical reduction of the rare populations. We determined the species in field or based on the photographs using specific field guides (Djkistra 2006). We have calculated the abundances of suborders, families and genera, the sex's ratio and the species richness of the studied habitat (Devai & Miskolczi 1987).

Table 1. Collected species from the investigated area.

Suborder	Family	Genera	Species
Zygoptera	Platycnemididae	Platycnemis	*Platycnemis pennipes* (Pallas,1771)
	Coenagrionidae	Ischnura	*Ischnura elegans* (Vander Linnden,1820)
		Erythromma	*Erythromma najas* (Hansemann,1823)
	Calopterygidae	Calopteyix	*Calopteyix splendens* (Harris,1782)
Anysoptera	Aeshnidae	Aeschna	*Aeshna isoceles* (Müler ,1767)
		Anax	*Anax imperator* (Leach,1815)
	Gomphidae	Onychogomphus	*Onychogomphus forcipatus* (Linnaeus,1758)
	Libellulidae	Crocothemis	*Crocothemis erythraea* (Brullè,1832)
		Orthetrum	*Orthetrum brunneum* (Fonscolombe,1837)
			Orthetrum cancellatum (Linnaeus,1758
			Orthetrum albistylum (Selys,1848)
		Sympetrum	*Sympetrum sanguineum* (Müler ,1764)

Results

As a result of our researches we found in the investigated area a number of 12 species from two suborders, 6 families and 10 genera (Table 1).

We have calculated the abundance of the suborders and we find out that 27% of the species are from suborder Anisoptera and 73% belongs to Zygoptera (Fig. 2). The percentage abundances of the families (Fig. 3) reveals that the founded dragonflies are in a proportion of 51% Plactynemidae, 21% Libellulidae, 18% Coenagrionidae, 5% Aeshnidae, 3%, Calopterigydae and 2% Gomphidae. From the point of view of the genera percentage abundances (Fig. 4), we can observe the following order: Platycnemis (52%), Orthetrum and Ischnura (14%), Sympetrum (5%), Calopteryx, Erythromma and Aeschna (3%), Crocothemis, Onycogomphus and Anax (2%).

From the point of view of sex ratio we find out that in the case of species *Platycnemis pennipes, Ischnura elegans, Aeshna isosceles, Orthetrum brunneum, Crocothemis erythraea, Anax imperator* we have identified more males than females in field, in the case of *Orthetrum cancellatum, Erythromma najas, Orthetrum albistylum, Calopteryx splendens* the number of captured males and females was the same for each species, and for *Sympetrum sanguineum, Onychogomphus forcipatus* we captured more females than males. The differences between the number of the specimens from the two sexes was small for each species, due to the probability and as a result of this study we can't conclude about the sex ratio of the investigated species, because of the small number of individuals caught in the investigation period (Fig. 5).

Devai and Miskolczi (1987) propose a score for the Odonata fauna depending on the studied habitat (Table 2). For homogenous habitat they propose 2,5 points. Multiplicating the score obtained based on the species frequency (52) with the habitat score we have a total score which shows us the species richness from the studied area (Table 2).

If we classify the species after the criteria of Devai and Miskolczi (1987) (Table 3) we can see four of the species are frequent: *Platycnemis pennipes, Ischnura elegans, Calopteryx splendens, Sympetrum sanguineum*; 7 species are less frequent *Erythromma najas, Aeshna isosceles, Anax imperator, Crocothemis erythraea, Orthetrum brunneum, Orthetrum cancellatum, Orthetrum albistylum* and a very rare species *Onychogomphus forcipatus*.

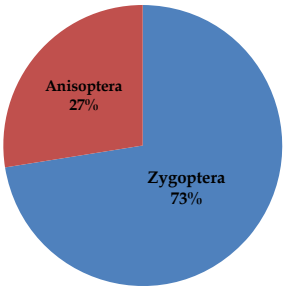

Figure 2. Abundances of species from the two suborders.

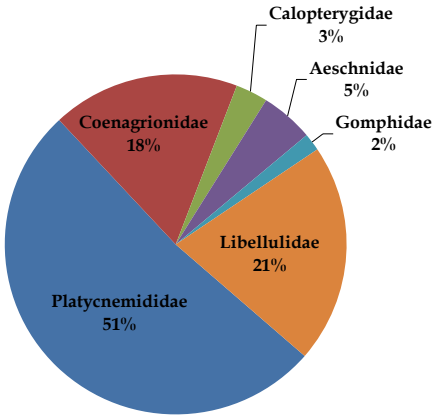

Figure 3. Abundances of species from different families.

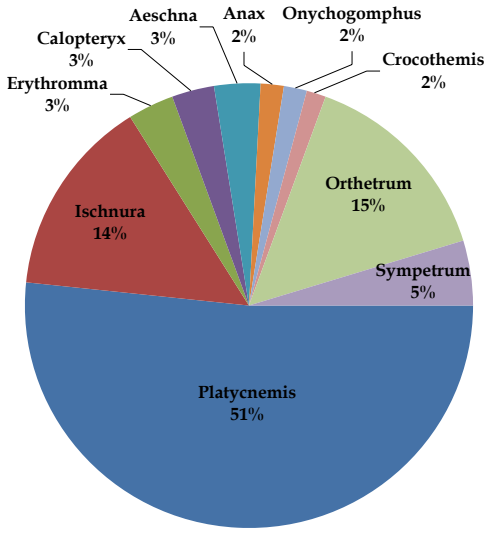

Figure 4. Abundances of species from different genera.

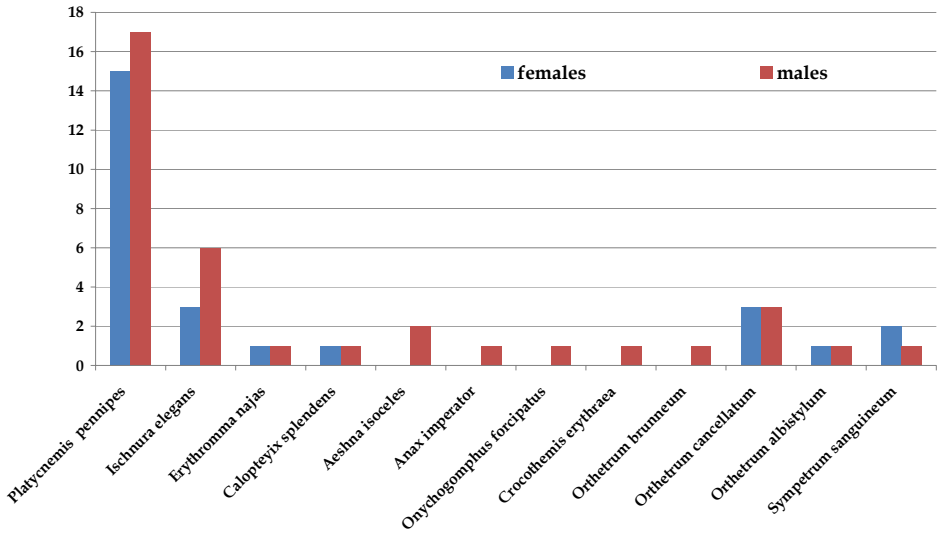

Figure 5. Sex ratio of each species.

Table 2. Clasification proposed by Devai and Miskolczi 1987.

Points	The quality of Odonta fauna
<160	I (very rich fauna)
105-160	II (rich fauna)
61-105	III (medium fauna)
25-60	IV (poor fauna)
25<	V (very poor fauna)

Table 3. Frequency after Devai & Miskolczi 1987 (I-very rare; II-rare; III-less frequent; IV-frequent; V-very frequent); specific habitat type after Cârdei & Bulimar (1965): I=lentic (stagnant water) II=lotic (running water).

No.	Species name	Frequency (Devai & Miskolczi 1987)	Series points (Devai &Miskolczi 1987)	Habitat type (Cărdei & Bulimar 1965)
1.	*Platycnemis pennipes*	IV	2	I
2.	*Ischnura elegans*	IV	2	I
3.	*Erythromma najas*	III	4	I
4.	*Calopteyx splendens*	IV	2	II
5.	*Aeshna isoceles*	III	4	II
6.	*Anax imperator*	III	4	I
7.	*Onychogomphus forcipatus*	I	16	II
8.	*Crocothemis erythraea*	III	4	I
9.	*Orthetrum brunneum*	III	4	II
10.	*Orthetrum cancellatum*	III	4	I
11.	*Orthetrum albistylum*	III	4	II
12.	*Sympetrum sanguineum*	IV	2	I

In Table 3 we classified the species depending on the preferred habitat (lentic or lotic) after the criteria proposed by Cârdei and Bulimar (1969). The number of species characteristic for lentic habitat is 7 and those characteristic for lotic habitat is 5.

Discussion

The characteristic species for stagnant waters are present in a high number comparing of what we expect considering that the habitat is a lotic one. This fact is due to the presence in the proximity of the site of a series of ponds stretching 57 ha, and which have the purpose to compensate the water level in the case of low inflow in the wastewater treatment plant of Oradea and also for the biological phase of the waste water treatment. These ponds become a habitat for different types of aquatic species (plants, fishes, bird) as well as of Odonata larvae.

The studied site is rich in Odonata species, although the observation period was relatively. The species we have identified are new records in the area, because no studies in the Natura 2000 site were made before. Surely most of the species are common in lowland river courses so they were expectable to be find here.

The identification of 12 taxa in a few months reveals a great richness of species comparing the 18 species of Odonata founded in Tur River (Szállassy 2008), where the investigated habitat was bigger, the anthropic factor is less present comparing to ROSCI0104 „Lunca Inferioară a Crişului Repede" where the human impact is very high represented of silt extraction from the river, the fishing ponds nearby and

the highly populated region (upstream is situated city of Oradea and along the river the following villages Sântandrei, Sântion, Tărian, Girişu de Criş, Cheresig, Toboliu).

If we compare our results with the species identified on the Prut River we can find out here the authors (Patriche & Manci 2008) made an inventory of 24 species during two years and also encountered in this inventors formerly collected specimens in 1966, which can be found at the "Galaţi Museum". The number of species found in both studies is 10, in Lunca Prutului are lacking *Erythromma najas* and *Onycogomphus forcipatus*. Some species identified by us (*Platycnemis pennipes, Ischnura elegans, Sympetrum sanguineum*) have a wide distribution and in Romania they are found also in mountainous areas as "Parcul Natural Vânători Neamţ" (see in: Manci 2005c). Another study in a mountainous river (the Cibin River, Curtean-Bănăduc 2006) based on larval samples, inventoried a number of eight Odonata species there, with the same wide spread *Platycnemis pennipes* common with our inventory.

Comparing to the studies carried out in Danube Delta which made an inventory of 23 species during three years of study (1992-1994) (Griebler 1994) from our list seven are founded in both habitats. Comparing to the Someş River (Huber 2000) where the inventory consist from 26 species eight were founded also in our study. The small number of common species in this case is determined by the fact that the study carried out in the Someş River concerned all its length, do a greater diversity of habitats.

Three of the species found by us *Aeschna isosceles, Orthetrum brunneum*, *Onychogomphus forcipatus* are protected in Hungary (Jakab et al. 2002) but not also in Romania. According to existing data concerning these three species they are not very frequent and their populations seems to have small effectives so their protection may be considered in the future. In these circumstances the investigated site is valuable for Odonata species conservation.

The faunistical classification according to Devai and Miskolczi (1987) put the observed species in the following categories: 4 species frequent, 7 species less frequent 1 species very rare. We consider that if the studies will be carried out in the future they will lead to the identification of more species, which will make this area more valuable for Odonata species conservation.

The distribution maps from the field guide of Djkistra (2006) shows that two species *Aeschna isosceles*, *Onychogomphus forcipatus* are present on the territory of our country only by isolated populations and species *Erythromma najas* is an uncommon presence in the area.

The species of Anisoptera suborder where almost one third in percentage abundance comparing to the species from Zygoptera order. This fact maybe is a result of the fact that Zygoptera are easier to catch and the most abundant species with almost half of the all caught specimens was *Platycnemis pennipes*. Analyzing the families from which are part the identified species we observed that Platycnemididae made up 51% of total individuals due especially to the high abundance of *Platycnemis pennipes*. Families Aeshnidae (5%), Calopterigydae (3%) and Gomphidae (2%) are represented by rare species or some which are not considered rare (Djkistra 2006) as *Calopteryx splendens* but which was caught in small number of individuals.

From the point of view of genera Platycnemis has 52% of abundance and the less abundant genera are Anax, Crocothemis and Onycogomphus each with 2%. From these *Onycogomphus forcipatus* is a rare species so we do not expect a high abundance of this species. Species *Anax imperator* and *Crocothemis erythraea* are not rare in their habitat (Djkistra 2006), but due probably to their mobility and the sampling period we captured a small number of individuals.

We noticed the great influence of the ponds from nearby which are the property of the city's waste water treatment plant, also the presence of a fishery pond and which determine a great number of lentic species comparing to lotic ones, as we expect along a river.

Odonata are sensitive indicators of biotic and abiotic disorders and they are very valuable to evaluate the quality of aquatic ecosystems (Devai & Miskolczi 1987). We can consider from the point of view of Odonata, that the investigated site is rich in fauna, the environmental protection has positive effects and they slower the anthropogenic impact. Although the close vicinity of the urban (city of Oradea) and rural habitats (villages Sântion, Sântandrei, Tărian, Girişu de Criş, Cheresig, Toboliu) within an area of 2 km, can create an anthropogenic impact by their waste water effluents which increase the organic charge of the river, or by agriculture which have a proven negative effect on Odonata fauna (Md Rawi et al. 2012, Hernandez et al. 2006).

The industrial activities and the industrial development potential of the area, the vicinity of the silt extracting area and a thermal power station which use fossil fuel especially coal are potential threatening factors for this area.

For maintaining the actual state of the protected area it is important to monitoring all the pollutant factors in the region as well as the biodiversity to be able to stop the degradation of the environment as soon as it is observed.

References

Alexinschi, A. (1937): Noi Odonate citate pentru Transilvania. Revista Ştiinţifică "V. Adamachi" 23(1): 45.

Arnold, A. (1988): Zur Libellen fauna (Odonata) un zwei Thermalbädern bei Oradea, Romänien. Entomologische Nachrichten und Berichte (Dresden) 32: 91-92.

Bulimar, F. (1984): Libelulele (Odonta: Insecta), ca factori limitativi ai populaţiilor insectelor dăunătoare din unele agroecosisteme învecinate cu zonele umede. pp.279-282. In: Muzeul de Istorie Naturală Iaşi. Iaşi, Romania.

Cârdei, F. (1955): Contribuţii la fauna Odonatelor din Cheile Bicazului. Studii şi Cercetări Ştiinţifice, Academia R.P.R., fil. Iaşi 6(3-4): 227-234.

Cârdei, F. (1956a): Contribuţii la cunoaşterea răspândirii subordinului Anisoptera în Moldova. Analele Ştiinţifice ale Universităţii "Al.I. Cuza" Iaşi 2(2): 203-210.

Cârdei, F. (1956b): Contribuţii la fauna Odonatelor din Oltenia. Analele Ştiinţifice ale Universităţii "Al.I. Cuza" Iaşi 2(2): 185-193.

Cârdei, F., Borcea, P. (1957): Contribuţii la studiul Odonatelor din Maramureş. Analele Ştiinţifice ale Universităţii "Al.I. Cuza" Iaşi 2(3): 271-278.

Cârdei, F., Bulimar, F. (1969): Contribuţii la studiul faunei Odonatelor (Ord. Odonata) de pe teritoriul viitorului lac de acumulare "Porţile de Fier". Analele Ştiinţifice ale Universităţii "Al.I. Cuza" Iaşi 15: 329-334.

Curtean-Bănăduc, A. (2006): Contributions to the study of Cibin river Odonata larvae communities. Brukenthal, Acta Musei 1(3): 117-124.

Dévai, G., Miskolczi, M. (1987): Javaslat egy új környezetminősítő értékelési eljárásra a szitakötők hálótérkép szerinti előfordulási adatai alapján. Acta Biologica Debrecina 20 : 33–54.

Dijkstra, K.D.B. (2006): Field Guide to the Dragonflies of Britain and Europe. British Wildlife Publishing, Dorset.

Fincke, O.M., Yanoviak, S.P., Hanschu, R.D., (1997): Predation by odonates depresses mosquito abundance in water-filled tree holes in Panama. Oecologia 112: 244-253.

Flenker, U. (2011): Odonata of Romanian Carpathians with notes on *Somatochlora alpestris* and on the first Romanian record of *Aeschna subarctica* (Odonata: Curduliidae, Aeshnidae). Libellula 30(3/4): 183-202.

Griebler, C. (1994): Investigations on the fauna of dragonflies in the Danube Delta. Analele Ştiinţifice ale Institutului Delta Dunării 3(1): 113-120.

Hernandez, K.M., Reece, B.A., McIntyre, N.E. (2006): Effects of anthropogenic land use on Odonata in playas of the southern high plains. Western North American Naturalist 66(3): 273-278.

Huber, A. (1999): Odonatological survey on the River Somes/Szamos in Romania. pp. 207-213. In: Sarkany, K.A., Hamar, J. (eds), The Someş/Szamos River Valley - A study of the geography, hydrobiology and ecology of the river system and its environment. Tiscia Monograph Series, Szolnok/Szeged/Târgu Mureş, Hungary/Romania.

Huber, A. (2000): On the Odonate fauna of the Szamos (Somes) River and its surroundings in Romania. Notule Odonatologicae 5(6): 80-82.

Huber, A. (2004): Contribution to the knowledge of the odonate fuana of Transsylvania, Romania. Notule Odonatologicae 6(3): 25-27.

Isvoreanu, V., Boghian, V. (1980): Noi specii de odonate pentru Delta Dunării. Studii şi Cercetări de Biologie, seria Biologie Animală (Bucureşti) 32(2): 147-150.

Jakab, T., Müller, Z., Dévai, G., Tóthmérész, B. (2002): Dragonfly assemblages of a shallow lake type reservoir (Tisza-Tó, Hungary) and its surroundings, Acta Zoologica Hungarica 48: 161-171.

Kühlmann, D. (1965): Contribuţii la cunoaşterea faunei de Odonate din Delta Dunării. Hidrobiologia (Bucharest) 6: 195-206.

Manci, C.O. (2005a): Studiu preliminar asupra distribuţiei libelulelor (Insecta: Odonata) în Pădurea Verde (Timişoara) şi zona imediat apropiată. Buletinul de Informare Entomologică 16 : 83-88.

Manci, C.O. (2005b): Dragonfly fauna (Insecta: Odonata) from Satchinez Ornithological Reserve. pp.77-81. In: Stănescu, D. (ed.), Mlaştinile de la Satchinez - Flora şi fauna ariei protejate. Editura Artpress, Timişoara, Romania.

Manci, C.O. (2005c): Preliminary study on the dragonfly (Insecta: Odonata) fauna from the Vânători Neamţ Natural Park. In: Deju, R., Cătănoiu, S. (eds.). Studies and Research in Vânători Neamţ Natural Park 1: 28-35.

Manci, C.O. (2006): Investigations on the dragonflies (Insecta: Odonata) occurring in Mures Floodplain Natural Park. Scientific Annals of The Danube Delta Institute, Tulcea, Romania 12: 69-74.

Manci, C.O. (2012): Fauna de libelule (insecta Odonata din România). PhD Thesis, Babeş-Bolyai University, Cluj-Napoca, Romania.

Md Rawi, C.S., Al-Shami, S.A., Md Shah, A.S.R., Ahmad, A.H., Man, A. (2012): Effects of herbicides on Odonata communities in a rice agroecosystem. Toxicological & Environmental Chemistry 94(6): 1188-1198.

Nicoară, M., Cojocaru, I., Vasiloiu, A. (2000): Dynamics of the entomological fauna living in aquatic ecosystems in Iaşi area. Analele Ştiinţifice ale Universităţii "Al.I. Cuza" Iaşi 46 : 45-54.

Paina, I. (1970): Note asupra faunei de odonate din Bihor. Muzeul Ţării Crişurilor Oradea, Caiet de Comunicări Ştinţele Naturii 1970: 53-56.

Patriche, G., Manci, C.O. (2008): Preliminary data records of Dragonflies (Insecta: Odonata) from Lower Prut Floodplain Natural Park. Brukenthal Acta Musei 3(3): 95-101.

Popescu-Gorj, A. (1989): *Sympetrum pedemontanum* (Allioni) (Odonata, Anisoptera) présent dans les zones de plaine de sud de la Roumanie. Travaux du Muséum National d'Histoire Naturelle "Grigore Antipa" 30: 67-70.

Rogoz, I. (1977): Cercetări asupra structurii calitative a zoocenozelor bentonice din râul Olteţ, în zona podişului Getic. Hidrobiologia (Bucharest) 15: 253-260.

Schorr, M., Lindeboom, M., Paulson, D. (2012): World Odonata List. <ttp://www.pugetsound.edu/academics/academic%E2%80%93resources/slater%E2%80%93museum/biodiversityresources/dragonflies/world%E2%80%93odonata%E2%80%93list/> accessed at November 2012.

Szállassy, N. (2008): Date preliminare privind fauna de odonate (Insecta: Odonata) de pe braţele moarte ale râului Tur. Biharean Biologist 2(Suppl.1): 51- 54.