A study of diving beetles and whirligig beetles in the River Someş (Coleoptera: Dytiscoidea, Gyrinoidea)

Adrian Ruicănescu and István Mathé

Abstract

The authors performed a study of these coleopteran groups in the hydrographic basin of the Someş river. The material has been collected from limnocrenic, ponds, branches with stagnant water and lenthic sections of the Someş river and its affluent (upstream and downstream Ic Ponor, near the river Arinului, from "Trei Iazuri", downstream Salva, downstream Beclean, upstream Rodna Veche, at Someş Odorhei, Pomi and Vetiş). All are situated in Cluj, Bistriţa-Năsăud, Sălaj and Satu-Mare counties. Some data on the habitats were noted, among others their altitude, surface, depth, bottom material, vegetation, transparency and eutrophication, etc.

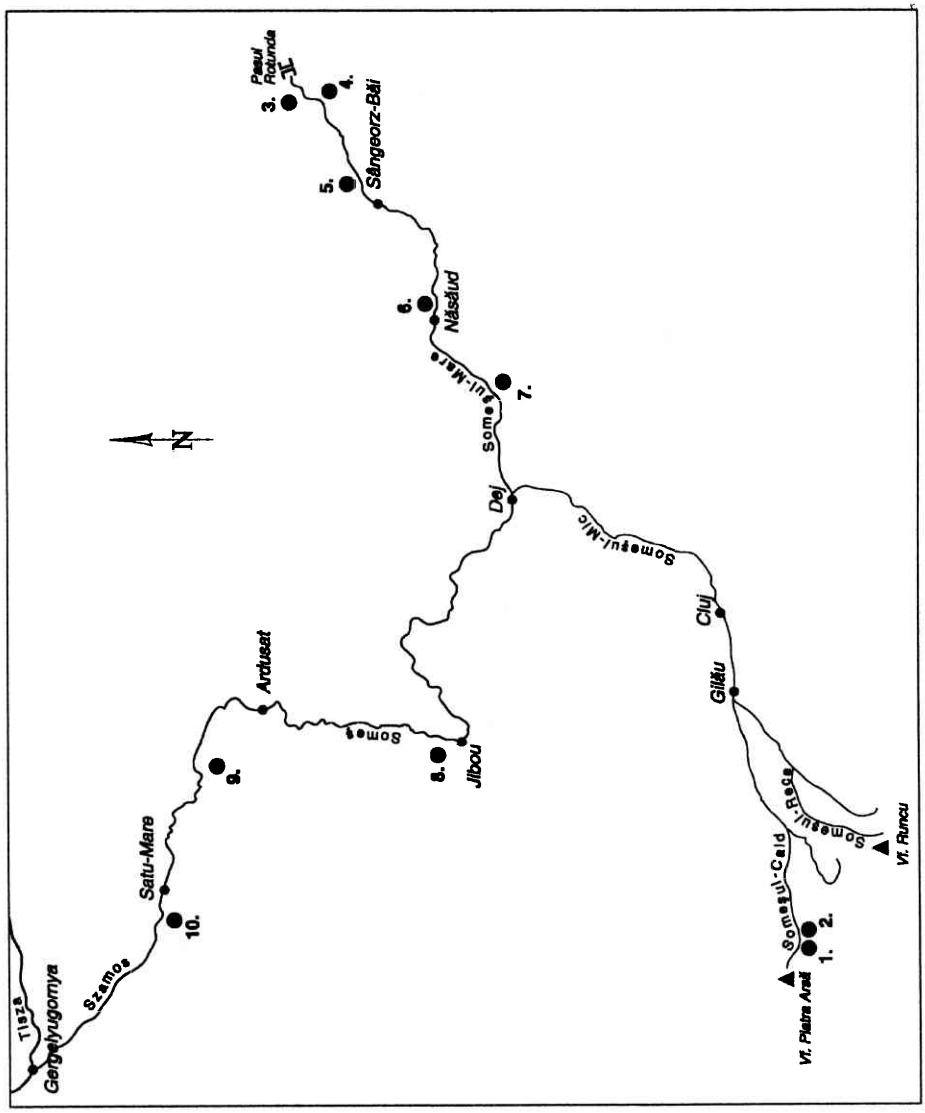
Each species collected and determined during this expedition is presented in this paper, accompanied by some characteristic data, namely their ecological and zoogeographic character, their relative frequency and the number of Dytiscoidea and Gyrinoidea species of different altitude ranges.

Some species were considered to be rare and very rare in the Romanian or Transylvanian fauna, such as Hyphydrus ovatus, Gaurodytes solieri, G. affinis, Hydaticus transversalis, Dytiscus circumflexus and D. dimidiatus.

Keywords: beetles Dyscoidea and Gyrinoidea, River Someş

Materials and methods

The material, consisting of Dytiscoidea and Gyrinoidea specimen collected from aquatic habitats included in the Someş river hydrographic basin, namely from limnocrenes, ponds, branches with stagnant water and lenthic sections of the Someş river and its affluents from the following points: upstream and downstream Ic Ponor, near the river Arinului, from "Trei Iazuri", downstream Salva, downstream Beclean, upstream Rodna Veche, at Someş Odorhei, Pomi and Vetiş. All are situated in Cluj, Bistriţa-Năsăud, Sălaj and Satu-Mare county (see Map).



Results

In the Someş river area 18 species of Dytiscoidea (22.8 %) and 1 species of Gyrinoidea (20 %) has been collected. (see Table)

***Abbreviations of all tables*:** Sp.nr. = number of specimen; Zoogeogr. = zoogeographic character; F. rel. = relative frequency: Ecology: Eh = eremohydatophylous; O-Cn = oreocrenophylous; PoCa = potamocalciphylous; Sh = sciahydatophylous; Ubq = ubiquitous; S-

O-Ca-H-P = silvo-oreo-calci-hydato-potamophylous. Zoogeogr.: Balc-Med = Balkano-Mediterranean; E = European; Hol = Holarctic; I-Med = Irano-Mediterranean; Med = Mediterranean; Mg-E = Maghrebo-European; Mg-Sib-E = Maghrebo-Sibero-European; Pal = Palearctic; Sib-E = Sibero-European. F. rel.: f = frequent > 10 specimen / sample; rf = relative frequent 5-9 specimen / sample; r = 2-5 samples with this species collected till now in Transylvania; fr = very rare 1 single sample with this species collected till now in Transylvania.

The sampling sites were the following ones:

1. Upstream Ic Ponor, on the river Someşul Cald (Cluj county) 1040 m, 02.08.1996

Small water accumulation (limnocrene) situated near Ic Ponor with a length of 2.5 m, width of 2 m and depth of 05 m. Silty and pebbly bottom, without vegetation. The water surface was partially exposed.

Taxa	Sp.nr	Ecology	Zoogeogr.	Altitude (m)	F rel.
Gaurodytes (s. str.) solieri (AUBÉ 1836)	3	O-Cn	E-Mt	600-2000	R
Total: 1 species	3				

2. Downstream Ic Ponor, about. 1200 m (Cluj county) 03.08.1996

Small water accumulation (limnocrene) situated on the river Someşul Cald, with a length of 1 m, width of 0.35 m and depth of 0.03-0.04 m. Silty bottom, without aquatic vegetation, the marsh vegetation consisted of herbaceous plants. The water surface was exposed.

Taxa	Sp.nr	Ecology	Zoogeogr.	Altitude (m)	F rel.
Gaurodytes (s. str.) affinis (PAYKULL 1798)	1	O-Cn	Sib-E	500-1500	R
Total: 1 species	1				

3. Pond near the river Arinului, 900 m (Bistriţa-Năsăud county) 10.08.1996

A pond with a diameter of about 3 m and depth of 0.05-0.1 m, peaty-silty bottom, the swamp being under the way of silting. The aquatic and marsh vegetation consisted of Lemna minor, Alisma plantago-aquatica, Veronica beccabunga, Ferula sadleriana, Callitriche sp.

Taxa	Sp.nr	Ecology	Zoogeogr.	Altitude (m)	F rel.
Hydroporus (s. str.) palustris (LINNÉ 1761)	10	Ubq	Sib-E	0-2000	F
Hydroporus (s. str.) palustris (LINNÉ 1761)	10	Ubq	Sib-E	0-2000	F
Gaurodytes (s. str.) sturmi (GYLLENHAL 1808)	10	S-O-Ca-H-P	E	500-1500	F
Ilybius fuliginosus (FABRICIUS 1792)	5	E-Sh	Hol	200-1000	F
Total: 4 species	35				

4. "Trei Iazuri" (Three Ponds), Confluence of rivers Arinului and Măriei with river Someşul Mare, 900 m (Bistriţa-Năsăud county) 10.08.1996

Three connected ponds with slow flowing water. The surface was about 40×25 m, with a depth of 0.1-0.5 m, and with silty bottom. The aquatic and marsh vegetation was very dense and consisted of Alisma plantago-aquatica, Juncus sp., Typha latifolia, Schoenoplectus sp. The water was relatively transparent.

Taxa	Sp.nr	Ecology	Zoogeogr.	Altitude (m)	F rel.
Platambus maculatus (LINNÉ 1758)	7	PoCa	E	200-1000	F
Ilybius fuliginosus (FABRICIUS 1792)	7	E-Sh	Hol	200-1000	F
Total: 2 species	14				

5. Upstream Rodna Veche, on the river Someşul Mare (Bistriţa-Năsăud county) 900-1000 m, 12.08.1996

Small water accumulation (limnocrene), situated on the river Someşul Mare, 10 km upstream Rodna Veche, near the river Măriei. Its length was 3 m, width was 0.5 m and depth was 0.05-0.1 m, with silty and pebbly bottom. The aquatic vegetation missed. The marsh vegetation consisted of herbaceous plants, which partially invaded in the water. The surface was exposed.

Taxa	Sp.nr	Ecology	Zoogeogr.	Altitude (m)	F rel.
Gaurodytes (s. str.) guttatus (PAYKULL 1798)	4	O-Cn	Pal	600-2000	F
Ilybius fuliginosus (FABRICIUS 1792)	20	E-Sh	Hol	200-1000	F
Gyrinus (s. str.) distinctus AUBÉ 1836	2	Ep	Balc-Med	200-1000	F
Total: 3 species	26				

6. Downstream Salva, 800-900 m (Bistriţa-Năsăud county) 12.08.1996

The stagnant water branch was situated at about 4 km downstream of Salva. The researched segment was 40 m in length, 5 m in width, and 0.1-0.8 m in depth. The bottom was oozy and the silt layer was deep, which shows a great bacterial activity. The water was very eutrophicated. The aquatic and marsh vegetation consisted of Potamogeton pectinatus, Lysimachia vulgaris and Typha latifolia. The surface of the researched segment was exposed.

Taxa	Sp.nr	Ecology	Zoogeogr.	Altitude (m)	F rel.
Laccophilus hyalinus (DE GEER 1774)	2	Eh-Sp	I-Med	0-1500	F
Hyphydrus ovatus (LINNÉ 1761)	4	E-Sh	Mg-Sib-E	0-1000	R
Total: 2 species	6				

7. Downstream Beclean, 800-900 m (Bistriţa-Năsăud county) 12.08.1996

It was a slow flowing section of a stream with a length of 50 m, width of 5 m and depth of 0.05-0.5 m. The bottom was oozy (silty) with stones scattered sparsely. The vegetation consisted of Myriophyllum spicatum, Potamogeton crispus, P. pectinatus, Typha latifolia and Schoenoplectus sp. The studied surface was exposed.

Taxa	Sp.nr	Ecology	Zoogeogr.	Altitude (m)	F rel.
Platambus maculatus (LINNÉ 1758)	15	PoCa	E	200-1000	F
Gaurodytes (s. str.) sturmi (GYLLENHAL 1808)	3	S-O-Ca-H-P	E	500-1500	F
Total: 2 species	18				

8. Someş Odorhei (Sălaj county), 200 m, 14.08.1996

Two branches of the river Someş were studied about 3 km upstream Satu Mare. One of them presents a faster water flow. The studied length was 30 m, the width was 3 m and the depth was 10-25 m. The bottom was pebbly. The marsh herbaceous vegetation was typical. The water surface was exposed to the sun rays.

Taxa	Sp.nr	Ecology	Zoogeogr.	Altitude (m)	F rel.
Guignotus pusillus (FABRICIUS 1781)	3	Eh	Med	0-600	F
Rhantus pulverosus STEPHENS 1828	2	Eh	Med	0-1000	F
Dytiscus (Macrodytes) circumflexus FABRICIUS 1801	1	Eh	Mg-E	0-500	FR
Total: 3 species	6				

9. Pomi (Satu-Mare county) 200 m, 15.08.1996

It was a stagnant water channel, with a length of 20 m, width of 1.25 m and depth of 35 cm. The bottom was silty with marsh vegetation consisting of Typha angustifolia, Carex sp., etc. The water was eutrophic with reduced transparency. The water surface was exposed to sun.

Taxa	Sp.nr	Ecology	Zoogeogr.	Altitude (m)	F rel.
Noterus clavicornis DE GEER 1774	5	Eh	Med	0-600	F
Laccophilus hyalinus (DE GEER 1774)	7	Eh-Sp	I-Med	0-1500	F
Ilybius obscurus (MARSHALL 1802)	2	Eh	Hol	0-700	rF
Rhantus pulverosus STEPHENS 1828	3	Eh	Med	0-1000	F
Colymbetes fuscus (LINNÉ 1758)	10	Ubq	I-Med	0-1000	F
Hydaticus transversalis (PONTOPPIDIAN 1763)	2	Eh	Sib-E	0-700	R
Acilius sulcatus (LINNÉ 1758)	3	S-Oh	Sib-E	200-1000	rF
Dytiscus (Macrodytes) dimidiatus BERGSTRÄSSER 1778	4	Eh	Mg-E	0-500	R
Total: 8 species	36				

10. Vetiş, downstream Satu Mare on the joint Someş river, 200 m (Satu Mare county) 17.08.1996

(1)Temporary pool, with a length of 10 m, width of 5 m and maximal depth of 0,5 m. The bottom was silty and pebbly, without vegetation. The surface was exposed.

(2) Temporary pool, with a surface of 5×3 m and depth of 0,5-m. The bottom was black silty (intensive anaerobic activity) with some dispersed pebbles and without specific vegetation. The surface was exposed.

Taxa	Sp.nr	Ecology	Zoogeogr.	Altitude (m)	F rel.
Laccophilus hyalinus (DE GEER 1774)	5	Eh-Sp	I-Med	0-1500	F
Guignotus pusillus (FABRICIUS 1781)	5	Eh	Med	0-600	F
Coelambus impressopunctatus (SCHALLER 1783)	3	Ubq	Hol	0-1000	F
Rhantus pulverosus STEPHENS 1828	4	Eh	Med	0-1000	F
Total: 4 species	17				

We present a brief description of each habitat containing the essential ecological conditions observed and the species list of Dytiscoidea and Gyrinoidea with information on the number of individuals, on their ecological and zoogeographic character, on the number of Dytiscoidea and Gyrinoidea species of different altitude ranges and on the relative frequency of each studied species. The habitats are sorted according to descending altitude.

For defining of the ecological elements, we have introduced the following terms:

1. eremohydatophilous element = species inhabiting usually stagnant waters situated in an open terrain on low altitudes (0-600 m). The surface of ponds is totally or partially exposed to the sun radiation.
2. sciahydatophilous element = species inhabiting usually stagnant waters situated in forests on low altitudes. The surface of ponds is totally or partially shaded by trees.
3. sciapotamophilous element = species inhabiting usually the lenthic (slow running) sections of streams or rivers situated in forests on low altitudes.
4. hydato- or potamocalciphilous element = species inhabiting usually stagnant or slow running waters situated on limestone.
5. oreocrenophilous element = species inhabiting lakes and lymnocrenes on high altitudes (over 800 m)
6. Some species can live in more than one from these habitat types, such as Gaurodytes sturmi that we define like a silvo-oreo-calci-hydato-potamophilous element.
7. ubiquist element = species which can inhabit all of these habitat types.

The greatest number of species was collected at Pomi (8 species). That pond consists of a mosaic of biotopes. It is followed by Vetiş and the river Arinului, (4 species); upstream Rodna Veche and Someş Odorhei (3 species) and "3 Iazuri", downstream Salva and downstream Beclean (2 species) (Figure 1.).

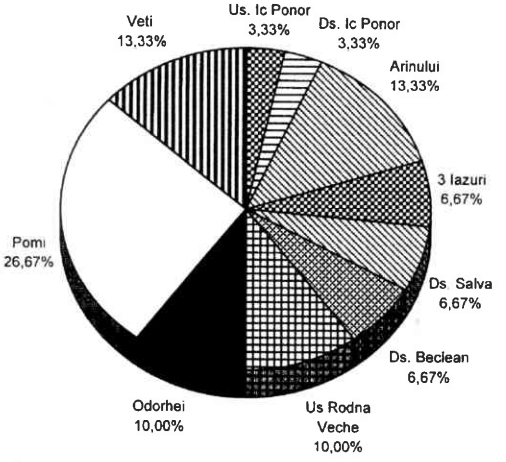


Figure 1. Biodiversity diagram of diving beetles collected on the River Someş

The most common species were Platambus maculatus and Ilybius fuliginosus, both with 22 specimen. The rarest species were Gaurodytes affinis and Dytiscus circumflexus, both with 1 specimen.

In ecological point of view, the eremohidatophilous elements were the most frequent (8 species), followed by oreocrenophilous (3 species), ubiquist and eremo-sciahidatophilous (both with 2 species) (Figure 2.).

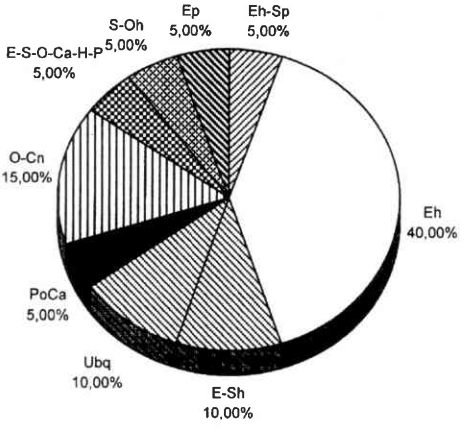


Figure 2. Biological structure of Dyscoidea and Gyrinoidea collected River Someş

In Dytiscoidea and Gyrinoidea collected from the Someş river area a wide range of latitudinal structure exist. The greatest number of species (11) occur in an altitude range of 0-1000 m, followed by an altitude range of 200-1000 m and 500-2000 m (both with 4 species), 0-1500 m and 0-2000 m (both with 3 species) and 0-600 m and 0-700 m (both with 2 species) (Figure 3.).

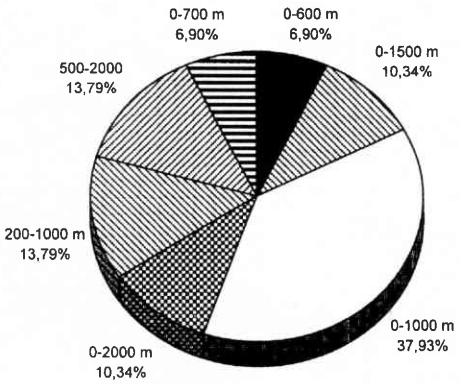


Figure 3. Latitudinal range diagram for Dyscoidea and Gyrinoidea collected from River Someş area

The zoogeographical composition of the Dytiscoidea and Gyrinoidea community was dominated by the Sibero-European elements (4 species), followed by the Mediterranean and Holarctic (both with 3 species), Irano-Mediterranean, European and Maghrebo-European (each with 2 species), Maghrebo-Sibero-European, Palaearctic, Euro-Mountainous and Balkano-Mediterranean (each with 1 species) (Figure 4.).

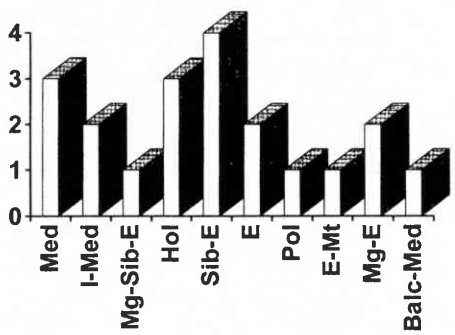


Figure 4. Zoograghical structure of Dyscoidea and Gyrinoidea collected from River Someş area

Discussions

Till now in Transylvania about 79 Dytiscoidea and 5 Gyrinoidea species are known. In the Someş river area 18 species of Dytiscoidea (22.8 %) and 1 species of Gyrinoidea (20 %) has been collected.

The greatest number of species is collected at Pomi and Vetiş, in ponds with diverse habitats.

The most frequent species inhabits waters with a small diversity of species, for example Platambus maculatus inhabits running waters.

The ecological structure of the communities in the Someş river is dominated by the eremohydatophilous elements, like in Dytiscoidea and Gyrinoidea living in Transylvania and Romania.

The zoogeographical structure is dominated by the Sibero-European elements.

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Adrian Ruicănescu
Institute of Biological Research
48 Republicii St.
3400 Cluj
Romania

István Mathé
University Babeş-Bolyai
Department of Ecology and Genetics
5-7 Clinicilor St.
3400 Cluj
Romania

Taxa	Locality, date	Sp.nr	Ecology	Zoogeogr.	Altitude (m)
Dytiscoidea					
Noterus clavicornis DE GEER 1774	Pomi, 200 m, 15.08.1996	**5***	Eh	Med	0-600
Laccophilus hyalinus (DE GEER 1774)	Pomi, 200 m, 15.08.1996; Salva, 800-900 m12.08.1996; Vetiş (2) 200 m, 17.08.1996	7 2 5 **14**	Eh-Sp	I-Med	0-1500
Hyphydrus ovatus (LINNÉ 1761)	Salva, 800-900 m, 12.08.1996	**4**	E-Sh	Mg-Sib-E	0-1000
Guignotus pusillus (FABRICIUS 1781)	Vetiş (1, 2) 200 m, 17.08.1996; Odorhei (2), 200 m, 14.08.1996	5 3 **8**	Eh	Med	0-600
Coelambus impressopunctatus (SCHALLER 1783)	Vetiş (1) 200 m, 17.08.1996	**3**	Ubq	Hol	0-1000
Hydroporus (s. str.) palustris (LINNÉ 1761)	Arinului river 900 m, 10.08.1996	**10**	Ubq	Sib-E	0-2000
Platambus maculatus (LINNÉ 1758)	downstream "Beclean pe Someş", 800-900 m, 12.08.1996; "Trei Iazuri", 900 m, 10.08.1996	15 7 **22**	PoCa	E	200-1000
Gaurodytes (s. str.) guttatus (PAYKULL 1798)	Rodna Veche, 900-1000 m, 12.08.1996	**4**	O-Cn	Pal	600-2000
Gaurodytes (s. str.) solieri (AUBÉ 1836)	Ic Ponor, 1200 m, 3.08.1996	**3**	O-Cn	E-Mt	600-2000

* The total number of specimen was marked with **bold**.

Table: Checklist of Dyscoidea and Gyrinoidea collected from river Someş area (10-17 August, 1996)

Taxa	Locality, date	Sp.nr	Ecology	Zoogeogr.	Altitude (m)
Gaurodytes (s. str.) affinis (PAYKULL 1798)	Ic Ponor, 1200 m, 3.08.1996	**1**	O-Cn	Sib-E	500-1500
Gaurodytes (s. str.) sturmi (GYLLENHAL 1808)	Downstream Beclean pe Someş, 800-900 m, 12.08.1996 Arinului river, 900 m, 10.08.1996	3 10 **13**	E-S-O-Ca-H-P	E	500-1500
Ilybius fuliginosus (FABRICIUS 1792)	Rodna Veche, 900-1000 m, 12.08.1996; Trei Iazuri, 900 m, 10.08.1996; Arinului river, 10.08.1996	20 7 5 **22**	E-Sh	Hol	200-1000
Ilybius obscurus (MARSHALL 1802)	Pomi, 200 m, 15.08.1996	**2**	Eh	Hol	0-700
Rhantus pulverosus STEPHENS 1828	Pomi, 200 m, 15.08.1996; Vetiş (2) 200 m, 17.08.1996; Odorhei (2), 200 m, 14.08.1996	3 4 2 **9**	Eh	Med	0-1000
Colymbetes fuscus (LINNÉ 1758)	Pomi, 200 m, 15.08.1996 (leg. MATHÉ)	**10**	Eh	I-Med	0-1000
Hydaticus transversalis (PONTOPPIDIAN 1763)	Pomi, 200 m, 15.08.1996	**2**	Eh	Sib-E	0-700
Acilius sulcatus (LINNÉ 1758)	Pomi, 200 m, 15.08.1996	**3**	S-Oh	Sib-E	200-1000
Dytiscus (Macrodytes) dimidiatus BERGSTRÄSSER 1778	Pomi, 200 m, 15.08.1996	**4**	Eh	Mg-E	0-500
Dytiscus (Macrodytes) circumflexus FABRICIUS 1801	Odorhei (1), 200 m, 14.08.1996	**1**	Eh	Mg-E	0-500
Gyrinoidea					
Gyrinus (s. str.) distinctus AUBÉ 1836	Rodna Veche (2), 900-1000 m, 12.08.1996	**2**	Ep	Balc-Med	200-1000

Table: Checklist of Dyscoidea and Gyrinoidea collected from river Someş area (10-17 August, 1996)