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Water beetles (*Insecta, Coleoptera*) from the springs of Belarus

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Introduction

Studies of the faunistic complexes inhabiting spring ecosystems have attracted a lot of special attention recently (Thorup and Llindegaard 1977, Biesiadka 1979, Cowie and Winterbourn 1979, Kownacki 1985, Braun 1986, Glazier and Gooch 1987, Czachorowski 1990, Biesiadka *et al.* 1990, Roughley and Larson 1991, Kordylas 1994, Khmeleva *et al.* 1994). Such interest is connected with several ecological factors associated with these cold springs. One of the most important features differentiating spring ecosystems from other continental waterbodies is the relatively stable low temperature water regime. As a rule, the water temperature in the springs is between the range 2.0-10.0 °C all year round. This peculiarity governs the cold spring faunistic composition which is a often unique one. Low temperatures in springs allow hydrobionts to exist in atypical landscape-climatic conditions. In such cases, springs appears to be refugia, being, e.g. in Europe, the connecting links between north European water invertebrate fauna and central and south European mountain fauna. Taking into consideration this information, one can imagine that studies of species composition of spring communities will yield valuable zoogeographic information allowing better understanding of the migratio of different water animal species and the peculiarities of European fauna formation.

Lack of the data on spring ecosystem fauna in Belarus defined the aim of the present paper - a study of water beetle species composition.

Material and methods

Material for this publication was obtained from water beetle collections made in cold springs of Belarus in 1987-1992, 1994. Beetles were collected in Grodno, Minsk and Vitebsk Regions in western, central and northern Belarus (Fig. 1). The study area is situated in the western part of the East European Plain, in the Dniepr, Western Dvina and Neman Rivers basins. The landform of the study area was

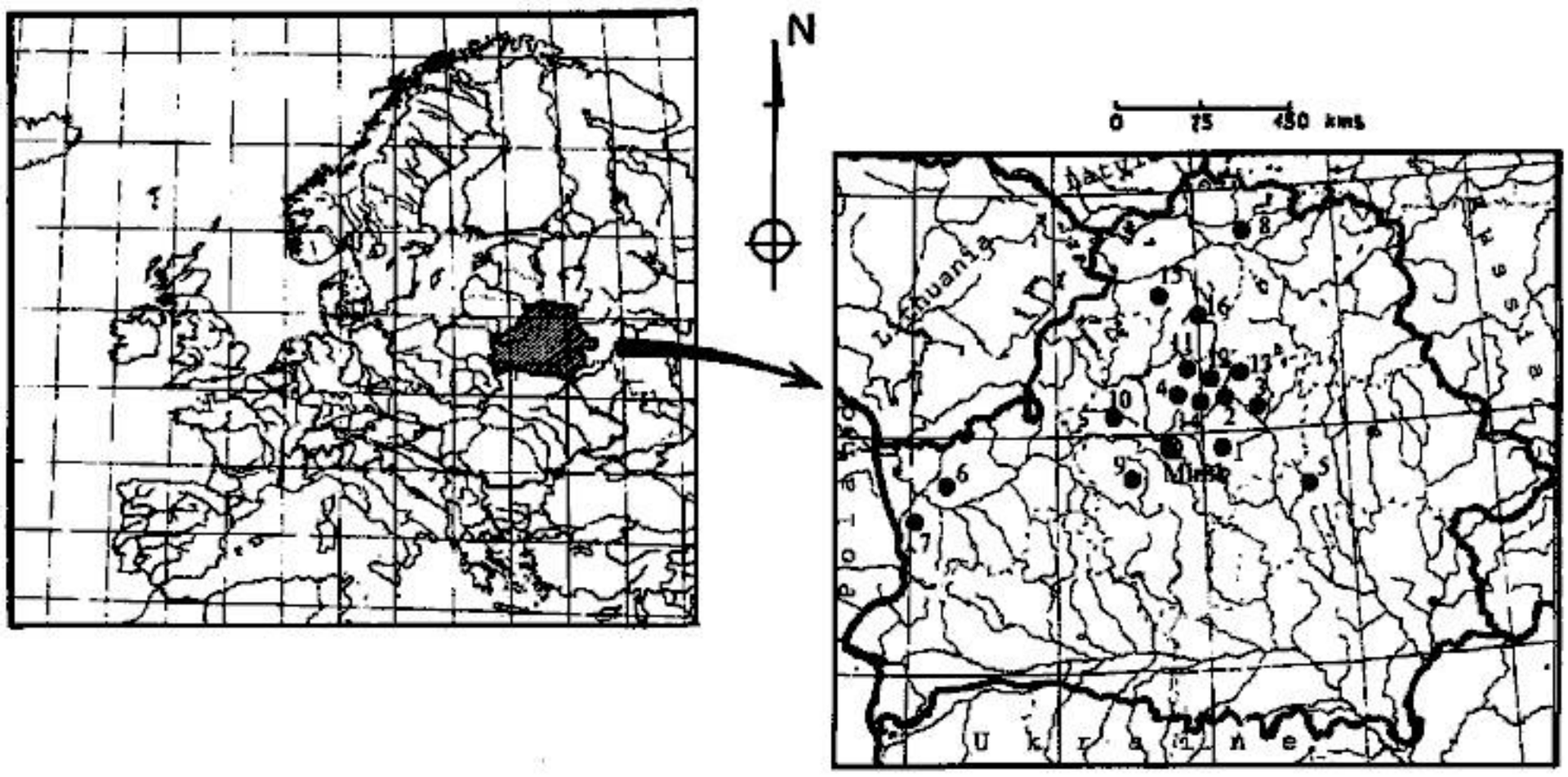

Fig. 1. Location of sampling stations in Belarus. 1 - 16 = numbers of springs.

largely shaped by glaciations and meltunter streams. The relief of Belarus is represented by gently rolling plain divided by river valleys. There are about 21,000 rivers and brooks with total length of 91,000 km and more than 10,000 lakes in the country. The mean elevation of the area is 159 m above sea level, it varies between 80 m in the Neman River valley and 346 m in Minsk Height. The position of Belarus in the temperate latitudes and free access of the Atlantic ocean air produce a transition from temperate Oceanic to continental climate (Dementiev 1977).

More than 40 beetle samples were collected during the study period, generating 276 specimens. Standard netting with circular 20 cm net and/or a 0.025 m^2 Ekman-Berge bottom sampler were used for collecting water beetles.

All three main types of springs and their combinations (limnocren, reocren and helocren) were sampled. The investigated limnocrens generally took the form of a small basin with sandy bottom. Reocren springs form usually at the hill base, and have, as a rule, slow water flow, their bottom covered with sand and pebbles. Helocren springs are characterised by numerous outcrops of subterranean waters on a relatively flat surface creating muddy substrates with fine-grained black detritus, a small brook usually crosses or borders the spring. Characteristics of the sampled springs are given in Table 1. All studied springs in Belarus have minimal winter temperature not lower then 2.0 °C and maximal summer temperatures not higher 8-10 °C. Oxygen concentration was fairly high in the examined springs, i.e. 8.5-13.6 ml dm^{-3}.

N	Location	Type of spring	Vegetation
1	Minsk region	helocren	C-L
2	----"----	reohelocren	L
3	----"----	reocren	C-L
4	----"----	helocren	C-L
5	----"----	limnohelocren	L
6	Grodno region	helocren	L
7	----"----	limnocren	O
8	Witebsk region	limnocren	L-O
9	Minsk region	limnocren	O
10	Minsk region	limnocren	O
11	Minsk region	helocren	C-L
12	----"----	limnohelocren	L
13	----"----	limnocren	L-O
14	----"----	reolimnocren	L-O
15	----"----	limnocren	L-O
16	----"----	limnocren	O

Table 1. Characteristics of investigated springs. O - open sites (free of arboreous vegetation); C - coniferous forest; L - brodleaf forest; L-O - a few decidious trees near the spring; C-L - mixed forest (coniferous + decidious).

Results and discussion

We recorded 33 water beetle species in course of the study (Table 2). The collection of two species, *Oreodytes sanmarkii* and *Agabus guttatus*, seems to us to be the most interesting. Both these species are considered as boreomontane, inhabiting stagnant waterbodies in Karelia (Gerd 1965) and streams in central and south European mountains (Galewski, Tranda 1978, Biesiadka 1979, Mateleshko 1977, 1988), and they were not found outside springs in Belarus. Two additional species listed in Table 2, *Hydroporus nigrita* and *H. incognitus*, are rare and local in Belarus. According to their distribution in Europe (Zaitzev 1953, Wroblewski 1980) it seems that both of them approach their southern range in Belarus. It was quite surprising to find single female of Mediterranean *Helophorus alternans* in the spring. This species was recorded for the first time in Belarus and spring seems to be a chance habitat for it. The most common and numerous species among collected beetles were *Hydroporus erythrocephalus*, *H. striola* and *Helodes pseudominuta* (larvae). *H. erythrocephalus* and *H. striola* are among the commonest water beetles in Belarus preferring small stagnant wa-terbodies (mainly in wetlands). Larvae of *H. pseudominuta* were recorded only in fast-flowing rivers and brooks

Species	Site number (see Table 1)
HALIPLIDAE	
Haliplus lineatocollis (Marsham)	2
DYTISCIDAE	
Guignotus pusillus (Fabricius)	8
Hydroporus nigrita (Fabricius)	1
H. fuscipennis Schaum	16
H. erythrocephalus (Linnaeus)	1, 3, 4, 10
H. tristis (Paykull)	16
H. incognitus Sharp	2, 15
H. striola Gyllenhal	1,3,5,7,10
H. palustris (Linnaeus)	16
Hydroporus sp.	9
Graptodytes granularis (Linnaeus)	16
Oreodytes sanmarkii (Sahlberg)	3
Agabus guttatus (Paykull)	1
A. paludosus (Fabricius)	1
A. bipustulatus (Linnaeus)	7
Hydaticus sp.	4
HYDROPHILIDAE	
Helophorus aequalis Thomson	14
H. granularis (Linnaeus)	3, 14
H. grandis Illiger	14
H. minutus Fabricius	2, 14
H. griseus Herbst	2, 14
H. flavipes Fabricius	2
H. alternans Gene	2
Anacaena lutescens (Stephens)	14, 15,16
Laccobius bipunctatus (Fabricius)	2
HYDRAENIDAE	
Ochthebius minimus (Fabricius)	2
Hydraena palustris Erichson	16
H. nigrita Germar	16
H. gracilis Germar	3
Limnebius crinifer Rey	16
L. truncatulus Thomson	16
Limnebius sp.	2, 14
HELODIDAE	
Helodes pseudominuta Klausnitzer	1-7, 11, 12, 13

Table 2. Water beetles of the Belorussian springs.

outside reocren spring.

Finally, summarizing collected data, a preliminary conclusion about the presence of both widely distributed and characteristic water beetle species in spring fauna of Belarus may be drawn. Our data have added to information on the possible ways of water beetle distribution in Europe.

Analysis of the species composition of water beetle fauna recorded in Belarus (Moroz 1983, 1993, 1995, Zakharenko and Moroz 1988) and in the springs of neighbouring countries (Kordylas 1994, Meteleshko 1977, 1988) allows us to conject that around 2o-25 species are still not recorded in the springs of Belarus and remain to be discovered.

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