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GENETICAL STRUCTURE OF THE POPULATION OF *BLUMERIA GRAMINIS F. SP. HORDEI* IN LATGALE REGION OF LATVIA IN 2001-2002

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In 2001-2002 samples of Blumeria graminis f.sp. hordei in different phases of the life cycle of the pathogen (sporulation and cleistothecia) were collected in the Latgale region of Latvia, near Daugavpils. Independently from the pathogen stage of the life cycle, virulences Va6, Va7, Va9, Va12, Vk and Vla had high frequencies in the pathogen population. Virulences Va1, Va3 and Va13 had a low or medium level of frequencies with a clear tendency to increasing. Frequencies of virulences, which overcome 'Steffi', 'Goldie' and 'Meltan' resistance genes, were low. Not any isolate virulent to resistance genes of SI1 was found. The pathotype a1 a3 a13 including only virulence genes with low or medium frequencies was detected. It can be defined as a new and dangerous pathogen genotype under Latvian conditions.

Key words: powdery mildew, barley, virulence, resistance, pathotype, complexity

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Introduction

Powdery mildew, caused by the pathogen *Blumeria (Erysiphe) graminis f.sp. hordei*, is one of the most dangerous foliar diseases of barley (Czembor, Blandenopoulos 2001). This disease is a problem in regions with the dry climate, including Latvia. The negative effect of powdery mildew is mainly manifested by the fact that it causes decrease of the number of ears and grains. This also deteriorates the technological quality of grains (Balkema-Boomstra, Masterbroek 1995).

High numbers of isolates are presented in the pathogen population and new ones continuously to be formed as a result of genetic recombination and mutation. *Blumeria graminis f.sp. hordei* is well adapted for aerial dispersal and long distance transport (Limpert et al. 1999; Limpert et al. 2000). In many investigations was proved that spores of *Blumeria graminis f.sp. hordei* are spread by wind over the large distances across Europe with a speed approximately 100 km per year from West to East (Limpert 1987; Limpert et al. 1999).

Varietal resistance is an economically important and ecologically safe plant protection method in regions where barley powdery mildew is a problem (Dreiseitl, Bockelman 1998; Hovmøller et al. 2000). In general, there are "gene-for-gene" interactions between host resistance alleles and avirulence alleles in Blumeria graminis f.sp. hordei. That is why it is very important to know virulence patterns in different populations of the pathogen.

In Latvia the pathogen population are monitored since 1981 (Rashal et al. 1997). In the Latgale region (South-Eastern part of Latvia) the pathogen population was studied regularly since 1995. Data obtained in 1995-2000 presented somewhere early (Rashal et al. 2000a; Rashal et al. 2000b; Kokina, Rashal 2001; Kokina et al. 2002).

The object of this paper is to present data about the genetic structure of the pathogen population in the Latgale region in 2001-2002.

Materials and methods

In 2001-2002 samples of *Blumeria graminis f.sp. hordei* were collected from universally susceptible barley variety 'Otra' in different phases of the life cycle of the pathogen (Table 1). Trap plants were grown in the South-Eastern part of Latvia, near Daugavpils, the largest town of Latgale region, approximately 5-7 km from commercial barley fields. Monopustules were isolated from collected samples both in sporulation and cleistothecia phases.

A set of differentials (Table 2) was used for the detection of monopustules. Differentials were grown in a spore-free room at the temperature 18-20°C. They were inoculated by microinoculation technique (Dreiseitl 1998): spores of monopustule isolates were sucked into the micropipette and blown into settling tower, under which detached leaf segments of differentials on 0.004 % benzimidazole agar in a Petri plate were exposed. Infected leaves segments were incubated at the temperature of 18-20°C and light for at least 8-10 h/day. Infection types of each isolate on the differentials were scored after 8-9 days according Torp et al. (1978) on a 0-4 scale.

Results and discussion

Among studied there were six virulence genes with high frequencies in the Daugavpils population of *Blumeria graminis f.sp. hordei*: Va6, Va7, Va9, Va12, Vk and Vla (Table 3). They frequencies exceeded 80-90 %, independently from the phase of the life cycle of the pathogen and the year of investigation. According data published earlier, high frequencies (more than 70-90 %) of mentioned above virulence genes were detected at least during seven last years in the Daugavpils population of the pathogen like in others parts of Latvia (Rashal et al. 1997; Rashal et al. 2000a; Rashal et al. 2000b; Kokina, Rashal 2001). In the most European countries these virulences has a high level too (Hovmøller et al. 2000). This fact can be explained by extensive and long- term use of the correspondent resistance genes in commercial varieties in several European countries.

Virulence frequencies of genes Va1, Va3 and Va13 had low or medium level with clear tendency to increasing in the Daugavpils population of the pathogen in 2001-2002

(Table 4). These genes were presented in 12-16 % of isolates in 2001 and in significally higher part

Table 1. Samples of *Blumeria graminis* f.sp. *hordei* collected in the Daugavpils population

Year	Date of collecting	Life cycle of the pathogen in the sample	Number of tested isolates
2001	July 5	sporulation	112
	August 6	cleistothecia	125
2002	June 28	sporulation	30
	July 15	cleistothecia	51

Table 2. Differentials used for detection of virulences in the population of *Blumeria graminis* f.sp. *hordei* in Daugavpils in 2001-2002

Differentials	Main resistance genes
P01	*Mla1*
P02	*Mla3*
P03	*Mla6*
P04B	*Mla7*
P08B	*Mla9*
P10	*Mla12*
P11	*Mla13*
P17	*Mlk*
P23	*MlLa*
SI1	*Ml(SI1)*
'Steffi'	*Ml(St1), Ml(St2)*
'Goldie'	*Mla12, MlLa, U*
'Meltan'	*Mla13, Ml(Im9), Ml(Hu4)*

of isolates (20-30 %) in 2002. Virulence genes Va1, Va3 and Va13 were detected under Latvian conditions already in 1996, when the respective isolates of the pathogen were founded in the central part of country in Salaspils (Rashal et al. 1997). About 2-3 years later they are appeared also in the pathogen population in Daugavpils with considerably lower frequencies than in Salaspils (Kokina, Rashal 2001). In some European countries mentioned virulences are average or even high (Hovmøller et al. 2000). Therefore there is a great possibility that the corresponding resistance genes Mla1, Mla3 and Mla13 will completely lose their effectiveness in few years.

V(Me) virulence frequency was also low-medium in Daugavpils in 2001-2002 (Table 4). The virulence, in fact, corresponds to several resistance gene combinations (Mla13, Ml(IM9), Ml(Hu4)). As more genes possess a variety, as long the variety resistance will be effective. To overcome the host resistance the pathogen must accumulate several mutations.

Since 1996 varieties 'Steffi', 'Goldie' and barley line SI1 were added to the set of differentials in Blumeria graminis f.sp. hordei population surveys, performed in several European countries, because they have effective resistance genes (Hovmøller et al. 2000). In 2001, in the Daugavpils population of the pathogen the frequencies of V(St) were low, they not exceeded 2-5 % (Table 4). A tendency towards an increase was detected for V(St) in the phase of cleistothecia in 2001. Such tendency for this virulence gene was detected also in 1999-2000 in the pathogen population in Daugavpils (Kokina, Rashal 2001). In 2002 virulences of V(St) increased to 13 % in phase of sporulation and little decreased in phase of ascospores. Therefore, it is advisable to collect the pathogen samples in various development phases. In 2001, V(Go) frequencies were low (approximately 2 %), considerably increasing to approximately 7 % in phase of sporulation in 2002

Table 3. Highest virulence frequencies (%) in the Daugavpils population of *Blumeria graminis* f.sp. *hordei* in samples collected in different stages of the life cycle of the pathogen 2001-2002

Virulence genes	2001		2002	
	sporulation	cleistothecia	sporulation	cleistothecia
Va6	92.8	93.6	80.0	84.3
Va7	91.9	90.4	86.6	88.2
Va9	88.3	94.4	93.3	86.2
Va12	83.0	90.4	90.0	78.4
Vk	90.1	91.2	90.0	90.2
Vla	97.3	84.0	83.3	90.2

Table 4. Frequencies (%) for virulence genes with low or medium presentation in Daugavpils population of *Blumeria graminis* f.sp. *hordei* in 2001-2002

Virulence genes	2001		2002	
	sporulation	cleistothecia	sporulation	cleistothecia
Va1	14.2	15.2	20.0	25.4
Va3	16.0	13.6	23.3	27.4
Va13	13.3	12.0	30.0	29.4
V(SI1)	0.0	0.0	0.0	0.0
V(St)	1.7	4.8	13.3	7.8
V(Go)	2.6	2.4	6.6	1.9
V(Me)	13.3	7.2	16.6	13.7

(Table 4). SI1 are considered as a new resistance sources in the controlling of powdery mildew (Hovmøller et al. 2000). Not any isolate with correspondent virulence was detected in the pathogen population in Daugavpils in 2001-2002 (Table 4). However, in 1999-2000, some virulent isolates were detected here (Kokina, Rashal 2001). Further observations of this virulence are necessary in Latvia and elsewhere in Europe.

A large number of pathotypes were detected in the Daugavpils population of the pathogen in 2001-2002 (Table 5). The dominant was pathotype a6 a7 a9 a12 k la, which had presented with the frequency 23-41 % in all years of investigation. Other pathotypes were presented with rather low frequencies. Only in 2002, in phase of sporulation the frequency of another pathotype a6 a7 a9 a12 a13 k la reached 10 %. Pathotype a6 a7 a9 a12

Table 5. Some of the most frequent pathotypes in Daugavpils population in 2001-2002

Pathogen sample	Mean complexity	Number of pathotypes	Five the most frequent pathotypes	Pathotype frequencies, %
July 5 2001	6.05±0.10	36	a6 a7 a9 a12 k la	37.5
			a3 a6 a7 a9 a12 k la	5.4
			a6 a7 a9 k la	5.4
			a6 a7 a9 a12 la	3.6
			a1 a6 a7 a9 a12 k la	3.6
August 6 2001	5.99±0.11	39	a6 a7 a9 a12 k la	40.8
			a6 a7 a9 a12 k	6.4
			a3 a6 a7 a9 a12 k la	7.2
			a1 a6 a7 a9 a12 k la	3.2
			a1 a3 a13	1.6
June 28 2002	6.33±0.32	19	a6 a7 a9 a12 k la	23.3
			a6 a7 a9 a12 a13 k la	10.0
			a1 a6 a7 a9 a12 a13 k la	6.7
			a1 a3 a13	3.3
			a1 a3 a6 a7 a9 a12 a13 k la	3.3
July 15 2002	6.24±0.19	26	a6 a7 a9 a12 k la	37.3
			a1 a3 a13	5.9
			a1 a3 a6 a7 a12 a13 k la me	3.9
			a1 a6 a7 a9 a12 a13 k la	3.9
			a1 a3 a6 a7 a9 a12 k la	3.9

k la was wide presented also in previous years (Kokina, Rashal 2004).High frequency of this pathotype is understandable, because it included only all genes with the high frequencies in the population. Surprisely, remarkable frequencies (more than 3.0 %) of the pathotype a1 a3 a13 were detected in 2002 (Table 5). The pathotype includes only three virulence genes with low-medium frequency, not any high virulent gene is presented. It can be an evidence for rather high selection pressure to favourite for these virulences in the pathogen population. This pathotype can be defined as dangerous, it spreading will arise overcoming of resistance genes Mla1, Mla3 and Mla13, like it was in somewhere in Europe (Hovmøller et al. 2000).

In 2001-2002, complexity of detected pathotypes varied from 3 to 9 virulences per isolate. Mean complexity was approximately 6 virulence genes (from 13) per isolate (Table 5) that prove a high level of aggressiveness in the pathogen population in Daugavpils in 2001-2002. Data obtained in the Daugavpils population in 1996-2000 showed that mean complexity was approximately 5 virulence genes per isolate. Higher complexity of pathotypes were presented in the beginning of the growing season and in the cleistothecia stage complexity decreased (Kokina, Rashal 2004). In 2001-2002, such tendency was not detected.

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BEHAVIOUR OF RED FOXES *VULPES VULPES* DURING OF MONTAGU'S HARRIER *CIRCUS PYGARGUS* SOCIAL DEFENCES - CASE STUDY FROM SOUTHEAST POLAND

Ignacy Kitowski

Kitowski I. 2004. Behaviour of Red Foxes *Vulpes vulpes* during of Montagu's Harrier C*ircus pygargus* social defences - case study from southeast Poland**.** *Acta Biol. Univ. Daugavp., 4(2): 71 - 76.*

Behaviour of individuals (n=19) Red Fox *Vulpes vulpes* during of social defence of Montagu's Harrier *Circus pygargus* was studied. During five mobbing foxes counterattacked recruits by performing high jumps. The counterattacked flocks involved more individuals compare to not counterattacked flocks. The counterattacked flocks of Montagu's Harriers involved also more juveniles. The observed behaviour of foxes seems-to result behavioural response on reduced resources of available prey, caused by finishing breeding cycles and dispersal of vertebrates.

K e y w o r d s: Fox, *Vulpes vulpes,* Montagu's Harrier, *Circus pygargus*, mobbing, Poland

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Introduction

Foraging capacity of carnivores may be limited or modified by social mobbing of colonial nesting birds. Published papers analysed spatio-temporal organisation and behaviour of colonial birds during social defences against carnivore mammals (Ven 1977, Clode et al. 2000). Effects of and the impact on the spatial organisation of colonies and breeding effects has also became known (Burness & Morris 1993, van der Kooij 1995, Craik 1997). However, the data on behavioural tactics of carnivorous mammals during avian social mobbing are still found insufficient. Foxes *Vulpes vulpes* are frequent predators of ground nesting birds in different habitats of Europe (Goszczynski 1974, Goszczynski 1985, Blanco 1986, Papageorgiou 1988, Jedrzejewski & Jedrzejewska 1992, Leckie et al. 1998, Fedriani 1999, Tryjanowski et al. 2002). They are also predators of ground nesting raptors-Harriers *Circus* spp. (Schupbach 1996, Dijkstra & Zijlstra 1997, Koks & Visser 2002). Harriers are able to create groups that can perform social defence against terrestrial predators limiting their foraging capacities (Watson 1977, Kitowski 2003, Arroyo et al. 2000). The paper presents an analysis of behaviour of foxes during social defences of Montagu's Harrier. A hypothesis that carnivores are able to control and partially inspire behaviour of recruits is formulated. Their counterattacks are performed under particular, selective circumstances.

Material and methods

The study was carried out on calcareous marshes near Chelm (51°08' N, 23°37'E, south-east Poland). In this area (*ca*. 1300 ha) between 1989 and 1992 5-6 fox dens were known. In the period 1997-1999 the same area covered 9-10 fox dens (Polish Hunting Associacion-unpubl. data, I.Kitowski-unpubl. data). From 1989 to 1992 in the considered area nested up to 32-42 pairs of Montagu's Harriers (Krogulec & Leroux 1994). In the recent years the number of pairs has decreased to about 20 breeding pairs (Kitowski 2002). From late June till late August 12-hour, lasting from 8.00 till 20.00 observational sessions were carried out. Between 1989-92 152 sessions were made, which gave a total of 1824 hours, and in the period 1997-1999 another 86 were added to make the grand total of 1032 hours. Altogether 238 sessions lasting 2856 hours were performed. A 10X20 binocular and a 60 X telescope were during observations from a distance of 250 m. The height of bushes on the marshes whose size was of known, was used to estimate the height of foxes' jumps observed during the study by comparison of both. For the calculation prey mass following (Romanowski 1983) individual Common Vole *Microtus arvalis* mass was estimated as 20 g.

The frequencies were compared by χ^2 test with Yates correction. And the medians were compared with Mann-Whitney U-test. Trends were ascertained Spearman rang correlation. The results are presented as mean ± SD (Fowler & Cohen 1992).

Results

Mobbing groups of Harriers

During the studies (n = 19) social defences of Montagu's Harriers against foxes were observed. In the first period of study (lower number of foxe's dens) (n = 8), defences occurred and (n = 11) mobbing were performed in the second period (higher number of foxe's dens). Social defences involved 3-16 recruits, on average 7.6±4.7 recruits, (n = 19) were involved in mobbing. The total time of mobbing lasted: 504.6±392.6 sec, range: 94-1496 sec., (n = 19). Harriers performed 0-8 dives onto foxes, in average: 3.57±2.7 dives (n=19). There were clear correlation between the number of recruits involved and the duration of mobbing (Spearman r_s = 0.597, n = 19, p< 0.001).

Table 1. Comparison of the composition and behaviour of counterattacked by foxes (*Vulpes vulpes*) and left alone groups of Montagu's Harriers (*Circus pygargus*)

	Groups counterattacked by foxes (n=5)	Groups left alone by foxes (n= 14)	Mann-Whitney U statistics	P
Number of recruits involved in fox mobbing	12.8±2.3 ind. range:10-16 ind.	5.4±3.2 ind. range: 3-14 ind.	U = 3	p < 0.05
Time spend on fox mobbing by recruits	671.5± 466.3 sec. range: 333-1476 sec.	430.5±352 sec. range: 94 -1462 sec.	U = 19	n.s
Number of dives performed by recruits	7.2±1.1 dives range: 6-8 dives	2.3±1.9 dives range: 0-7 dives	U = 34	n.s
Number of juvenile recruits involved	3.4±0. 9 juv. recruits range: 2-4 juv. recruits	0.53±0.9 juv. recruits range: 0-3 juv. recruits	U =1	p< 0.05
Number juvenile as percent of total number of recruits	24.8± 3.2% range: 0.20-0.29%	6.4± 9.0% range:0-0.21	U =3.5	p< 0.05

The behaviour of foxes during the avian mobbing

While mobbing foxes kept jumping high to catch one of the diving Montagu's Harriers. In the first period of studies only one high fox jump targeted on a juvenile Harrier was noted. In the time of the second part of studies four counterattacks were seen. Performed jumps were 1.5-2.5 m high. Overall, foxes tried to catch 3 adults and 2 young diving individuals. The counterattacks on recruits took place when a dive onto a fox was about to be completed. At such moments foxes were close to catching the recruits by touching their back or wing. Mobbing groups of Harriers counterattacked by foxes involved more individuals than groups which were not attacked (Table 1). The foxes also preferred counterattacking if the mobbing groups of Harriers involved more juveniles in number and as percent of all recruits (Table1). However, differences neither in the duration nor the number of performed dives were found between the attacked and not attacked groups of recruits (Table 1). All the observed counterattacks were performed between 7th and 16th of August. In (90%, n = 19) cases the foxes were discovered by birds on the meadows close to the marsh. In (77%, n = 17) cases after the fox was detected by recruits stepped into paths leading to Saw Sedge covered the marsh. Then the foxes would penetrate the area abandoned semicolonies of Montagu's Harriers, or bushes were juveniles of Montagu's Harrier perched frequently. In (23%, n = 17) of cases foxes moved away from abandoned semicolonies after the detection. Differences were found for frequency of straits chosen by foxes that had been previously detected by recruits (χ^2= 4.76, df = 1, p < 0.029). All of the catch trials of recruits by foxes were performed when foxes were closest vicinity of the semicolonies (< 60 m.).

The four sequences of foxes' behaviour lasting 25.0±7.0 sec., range: 17-33 sec. observed on the meadows were really surprising. Foxes would stop suddenly, sat down for a while and then lie down on the one side of the body, in which position they would spent from 4 to 7 sec. Such sequences of behaviour were observed at two different marshes during 3 interactions with flocks of recruits. They took place before three described counterattacks performed by foxes. Therefore, the probability that such kind of behaviour occurs during other mobbing sessions is high. Despite dives that targeted the back or abdomen, no symptoms that could be taken as serious injury were noted in foxes' behaviour; to the contrary, foxes kept penetrating the left colony area and than moving away from the peat-bog. Such behaviour made Harrier's flocks broke up. During defences the foxes never moved as fast as when chasing a prey such as: European Brown Hares *Lepus capensis*, Pheasants *Phasianus colhicus.*

DISCUSSION

At the beginning of 90'. a clear increase in the number of foxes in Poland was observed. Most likely it resulted from program vaccination against rabbies and recession in the fox skin market (Bresinski & Panek 2000a, Bresinski & Panek 2000b). In the studied area an impact of the growing population of foxes on the diminishing number of breeding pairs of Montagu's Harrier was shown (Krogulec & Leroux 1994, Kitowski 2002).

The observed activities of foxes was a behavioural response to reduction of available vertebrate prey exploited during spring and early summer. Such a reduction of availability of the vertebrate prey-has resulted from the end of breeding period and dispersal animal that constitute an important component of the diet. The factors mentioned above particularly affected vertebrates breeding abundantly in the ecotonal zone of the meadows and the marsh, such as Lapwing *Vanelus vanelus,* Black-tailed Godwit *Limosa limosa*, Mallard *Anas plathyrynhos*, Redshank *Tringa totanus*, and finally European Brown Hare (Buczek & Buczek 1996, I. Kitowski - unpubl. data). The foxes in spring and summer hunted also on Common Voles whose importance grew in autumn and winter time (I. Kitowski-unpubl.)data when other prey is scarce, similarly to other Poland and European areas (Goszczynski 1985, Lanszki et al. 1999, Jedrzejewski & Jedrzejewska 1992) The remains of mentioned vertebrates were found in the examined fox dense (I. Kitowski-unpubl. data). The foxes response to decreased availability of prey were attempts to penetrate the closest villages to catch domestic animals, which was also noted in other studies from Central Europe (Goszczynski 1985, Lanszki et al. 1999). However, human activities limited this behaviour and led to the extermination of particular individuals (I. Kitowski - unpubl. data).

Paradoxically, it has been advantageous for foxes to hold still the interesting of Harriers in mobbing since it guaranteed occurrence of recruits in bigger groups what was proved by clear correlation between the number of recruits involved and the duration of social mobbing. It also made the probability of catching one of the recruits higher. The foxes' behaviour showed that they could even invest in being hurt by the recruits, because it allowed foxes to take the optimal decision about attacking such a very attractive prey as adults of Montagu's Harriers (295g -males, 345g-females) (Leroux & Bretagnolle 1996) and their juveniles (315g males, 340g females) (Arroyo et al. 2000). The such prey is the equivalent of 15-17 individuals of Common Vole. Foxes' counterattacked on recruits when they are to completed the diving, seemed to be effective due to well developed jumping skills, which they used also in the contexts of interactions with other animals and their foraging activity (Henry 1986, Sargeant & Allen 1989, Jedrzejewski & Jedrzejewska 1992). In the period of abundant vertebrate prey (from April till early July) events of mobbing were noted (N=14), but none of the foxes tried to counterattack (I.Kitowski - unpubl. data).

It should be noted, however, that the relations between birds and foxes can be non-antagonistic to which the registered playing between foxes and birds (Blumstein & Foggin 1993) can serve as an evidence. In the studied area cases foxes being followed by Montagu's Harriers were observed. Harriers could have been using foxes as the flushing agent of the prey (Kitowski 2003). Very similar non-antagonistic relations between Red Foxes and Hen Harriers *Circus cyaneus* are known (Bandy & Bandy 1978).

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SUBMERGED PART OF THE NESTS OF EUROPEAN BITTERN *BOTAURUS STELLARIS* (L.) AS A SUBSTRATE FOR BENTHIC MACRO-INVERTEBRATES

Paweł Buczyński, Ignacy Kitowski, Robert Rozwałka

Buczyński P., Kitowski I., Rozwałka R. 2004. Submerged part of the nests of European bittern *Botaurus stellaris* (L.) as a substrate for benthic macroinvertebrates. *Acta. Biol. Univ. Daugavp., 4 (2): 77 - 80.*

12 taxa of macrozoobenthos were found in the submerged parts of bittern's nests during preliminary studies in the area of pond complex in south-eastern Poland. The dominants were Dytiscidae and Hirudinea. The density of macrozoobenthos was high: 543 ind.·m^{-2} (462 ind.·m^{-3}) on average. Almost the whole community was composed of predators. Habitat conditions of the fauna of nests and the forming of the fauna against other pond habitats are discussed.

Key words: *Botaurus stellaris*, bird nest, macrozoobenthos, microhabitats, substrate

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Introduction

The ecology of macrozoobenthos of inland waters is well known. Insufficiently examined is the problem of inhabiting specific microhabitats by macrozoobenthos, e.g. submerged parts of some birds` nests. It can be presumed that the nests provide invertebrates with good trophic conditions and a refuge from predators. The aim of the authors is to analyse preliminarily this problem on the example of bittern's nests. The obtained results can point out a wilder phenomenon: only in Poland over 20 bird species from 7 families build nests, of which submerged parts can be suitable for inhabiting by macrozoobenthos: Podicipedidae, Ardeidae, Anatidae, Accipitridae, Rallidae, Laridae and Sternidae (Aulak 1989). Many of them are widely distributed (Tomiałojć, Stawarczyk 2003).

Material and methods

The studies were conducted in south-eastern Poland, in intensively used ponds in Samoklęski (51°27' N, 22°26' E). Five bittern's nest – after the leaving of young birds – were collected on the 10th of July 2003; three of them were situated in water. The average area of a nest was 0,07 m^2, volume – 0,113 m^3 (the emergent part: 0,085 m^3).

115 specimens of macrozoobenthos were collected and then preserved in 70% ethanol.

The method of Biological Monitoring Working Party (Chapman & Jackson 1996) was used in assessing water quality.

Results

The average density of macrofauna in the nests was 543 ind.·m-2 (462 ind.·m-3). The fauna was represented by 12 taxa: leeches, dragonflies, bugs, beetles and dipterans. The most numerous were: *Erpobdella octoculata* (Hirudinea), the pupas of Thermonectini (Coleoptera: Dytiscidae) and the larvae and imagines of *Graphoderus cinereus* (Coleoptera: Dytiscidae) (Table 1).

At higher taxa level to the dominants belonged: Coleoptera – 53,0% specimens of which as much as 52,2% were Dytiscidae, and Hirudinea – 41,7%. The share of remaining taxa was not higher than 3%.

Except for one larvae of Chironomini with undefined food preferences, most probably phytophagous one, the whole analysed community was comprised of predators (91,6% qualitative share, 99,1% – quantitative one).

The value of water quality in nests was: BMWP 40 ASPT 5.

Discussion

There are many publications about the inverte-

Table 1. Macrozoobenthos collected in the submerged parts of nests of European Bittern. N – number of specimens, D_1 – average density in Ind.·m^{-2}, D_2 – average density in Ind.·m^{-3} in the relation to the volume of submerged part of a nest, L^2 and L^3 – larval stages.

	Taxa	N	D_1	D_2	Remarks
	Hirudinea				
1.	*Erpobdella octoculata* (Linnaeus, 1758)	48	226	193	
	Odonata				
2.	*Aeshna mixta* Latreille, 1805 larvae	1	5	4	
3.	*Sympetrum vulgatum* (Linnaeus, 1758) larvae	2	9	8	
	Heteroptera				
4.	*Ilyocoris cimicoides* Linnaeus, 1758 larvae	1	5	4	
	Coleoptera: *Dytiscidae*				
5.	*Hydroporini* n.det. larvae	1	5	4	
6.	*Graphoderus cinereus* (Linnaeus, 1758) larvae	4	19	16	L^2: 1, L^3: 13
	- imagines	4	19	16	1 m 3 f
7.	*Graphoderus zonatus* (Hoppe, 1795) larvae	14	66	56	L^3
	- imagines	1	5	4	m
8.	*Thermonectini* n.det. (*Graphoderus* sp.?) pupae	23	109	92	
9.	*Cybister lateralimarginalis* (De Geer, 1774) larvae	8	38	32	L^3
	- pupae	5	24	20	
	Coleoptera: *Hydrophilidae*				
10.	*Berosus* sp. larvae	1	5	4	
	Diptera: *Tabanidae*				
11.	*Heptatoma pellucens* (Fabricius, 1776) larvae	1	5	4	
	Diptera: *Chironomidae*				
12.	*Chironomini* n.det. larvae	1	5	4	
	Σ=	115	543	462	

brate fauna of bird's nests. The most is known about ectoparasites and their interactions with birds (Loyle & Carroll 1995 1998). The occurrence of soil fauna and various synecological groups of spider species was also analysed (Gajdoš & al. 1991, Tajovsky & al. 2001). Almost all studies refer to the nests of terrestrial birds. There has no been any data about macrozoobenthos in the nests of aquatic birds so far. The bittern's nests are made of broken stems and leaves of *Phragmites australis* and *Typha spp*. (in Lublin region *Typha spp.* only), and their bases are submersed in water. Hydrobionts can inhabit the spaces, that are filled with water, between building material. The decomposition of building material by microorganisms and the presence of urine, excrements, food remains and the down of nestlings are crucial for the abundance of food in this microenvironment. The disadvantage for development of fauna can be water quality but in the surveyed nests it was surprisingly good. ASPT value placed this quality in the second category (of four-stage scale) of „doubtful quality" (Mandaville 2002). BMWP score was low but this index depends on the diversity of fauna while a bittern's nest is a small habitatual island in terms of ecology and its fauna is qualitatively poor (MacArthur & Wilson 2001).

The obtained density of invertebrates shows that environmental and food conditions are favourable for them. It outnumbers several times the density noted within e.g. reed rushes. The fauna of nests is qualitatively much poorer, staying at the community level of epiphytic invertebrates (Kornijów & Gulati 1992a, 1992b).

In the surveyed nests the species with wide habitat preferences were found, also frequent in ponds of the studied area (e.g. Buczyński 1997; Buczyński & Piotrowski 2001; Buczyński & Przewoźny 2002). It can be connected with the temporary access of bittern's nests as habitats that are not stable. Macrozoobenthos communities originating in bittern's nests are probably typically pioneering ones. Moreover, this kind of habitat is small and surrounded by a large and compact area of other habitats and as a result the organisms with low environmental selectivity become dominants (Czachorowski & Kornijów 1993).

The trophic structure of analysed community was very interesting – it was almost exclusively comprised of predators. Surprising is the lack of saprophages. Other animal communities are the food base for macrozoobenthos. It can be assumed that for some beetles and younger dragonfly larvae the food base are: planctonic crustaceans and their larvae that avoid fish in open water during a day, also meiobenthic and microbenthic crustaceans. Kehl & Dettner (2003) took notice of a large share of crustaceans in the diet of beetles of pioneering environments, they also found rotifers and filiform algae in the food. With high density of fauna and pioneering conditions cannibalism plays also an important role, especially among dragonflies and beetles (Kehl & Dettner 2003; Van Buskirk 1989).

Bittern's nests can probably also be used by some insects as safe places for a metamorphosis – it could be proved by the high number of pupas, especially beetle ones – and as a daily refuge in the environment with fish in abundance. Those taxa were trophically associated with the habitats outside the nest. Nevertheless, the occurrence of numerous larvae of Dytiscidae species undergoing metamorphosis, not only the last stage, shows that the first hypothesis can be unlikely. The high number of pupas can be explained by collecting the nests in the period of metamorphoses of those species. More detailed analysis o this problem would involve the collecting of material in different periods, also during incubation and brooding of nestlings, consequently it would end in the abandonment of brood by birds that is not acceptable due to scientific, ethical and legal reasons. The more so because a bittern is included in Polish Red Book in „Least Concern" category (Dombrowski 2002).

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SYNCHRONIZED ADULT EMERGENCE OF *CORDULIA AENEA* (LINNAEUS, 1758) (ODONATA: CORDULLIDAE)

Andrzej Zawal

Zawal A. 2004. Synchronized adult emergence of *Cordulia aenea* (Linnaeus, 1758) (Odonata: Cordullidae). *Acta Biol. Univ. Daugavp., 4 (2): 81 - 83.*

On 02 May, 1999 a synchronized adult emergence of Cordulia aenea was observed in the small dystrophic lake near Czermnica (Nowogard district). It went on from 10.00 to 17.00 o'clock. During this time, on the area about 50 m^2, emergence of 48 specimens was observed. This lake is a small, interforest reservoir. Emergences has been in sedges on the sunny bank of lake. On the shady bank no emergence of this dragonfly was observed. The increase of temperature was stimulus for simultaneous emergency. During this time the temperature in the shallow sunny litoral increased from 9°C to 22°C. The day after and the day before, which were cloudy days, any emergence was not observed, what showed the increase of temperature was an impulse for simultaneous emergency. The full emergency lasted five hours on an average.

Key words: Odonata, dragonfly, Anisoptera, *Cordulia aenea*, emergence

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Introduction

The biology of dragonflies is already well known. At this background the emergence in natural environment is still known only for a few species. Synchronized emergence is a typical pattern of so-called spring-species. Description of synchronized adult emergence of *Cordulia aenea* was shown by: Ha et al. (2002) and Wildermuth (1998). These publications refer emergences during several days. Up to now is lacked works about emergences by one day which show connection between temperature and number of emergenced dragonflies. This work describe some observation about emergence of *C. aenea* during one day.

Locality and methods

On 02. 05. 1999 synchronized adult emergence of *Cordulia aenea* was observed. This observation was started from 9.00 and finished at 17.00 o'clock of Central Europa Summer Time. During this time the emergence of 48 specimens of this dragonfly species was noted on 50 m^2 area. It was observed around small, dystrophic reservoir (without name) which was situated in mixed forest near Czermnica (66°N, 15°75' E) on Nizina Szczecińska (Szczecin Lowland).

This area has been permanently penetrated by 9 people. The support on which the larva went out was marked by colour ribbon. The time of emergence was measured from moving the water to starting the maiden flight. Three stages of emergence (1 - wondering from water to the end of support; 2 - abandoning the exuviae; 3 - maiden flight) were distinguished.

The first one was started from moving the larva from the water (some part of larva's body touch to surface of the water) to cease moving, the second one - from cease moving to leaving the exuviae, the third one - from leaving the exuviae to starting the maiden flight (table 1).

Due to presentation of the results the period of observation was devided by 8 intervals: 10.00-10.59; 11.00-11.59; 12.00-12.59; 13.00-13.59; 14.00-14.59; 15.00-15.59; 16.00-16.59; 17.00-18.00 o'clock (fig. 1).

The temperature of water was taken every hour form 9.00 to 18.00 o'clock.

Results

The emergence of 48 specimens of *C. aenea* was observed during 7 hours. The most of larvae (15) leaved water between 13.00 and 14.00 o'clock. The increase in number of emergenced specimens was clearly correlated with increasing of temperature of water (fig. 1).

Emergences was found in insolated *Carex* zone, which was 1,5 – 2 m wide and 20 m long. In the same time in another, not insolated side of reservoir any emergenced specimen was not found.

The larvae left from shallow littoral (about 5 cm) between sedges. It was the only sunny day that week, and only than the emergence of this species was observed. The temperature of water increased from 9°C to 22°C between 9.00 and 14.00 o'clock (fig 1.). In the same time the temperature of water in another, shaded side, oscillated between 9°C and 11°C.

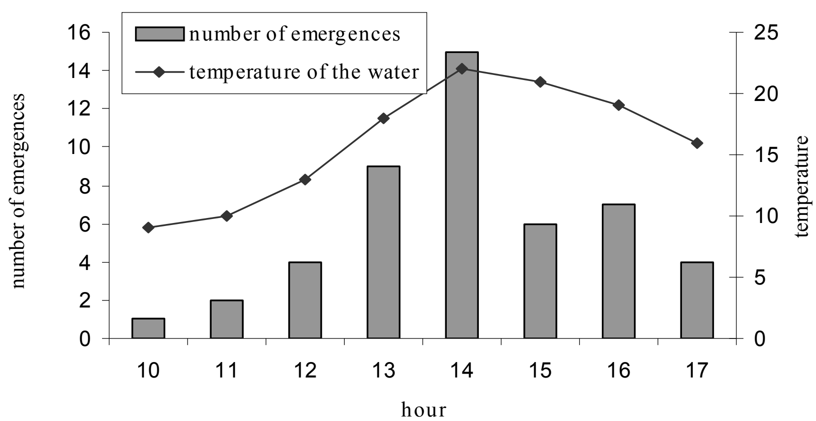

Fig. 1: Dependance of emergence (the larvae which leaved the water) of *Cordulia aenea* for time of a day and for the temperature of the water.

Table 1. Duration of particular stages, in minutes (average).

Stages of emergence	Migration from the water	Abandoning of exuvium	Flying
Duration of particular stages	12 - 21 (15,9)	30 - 66 (44,7)	90 - 270 (190,8)
Sample size	48	48	44
Standard deviation	2,2	9,1	40,6

The time of remaining particular transformation stage was given in table 1. After leaving the water the larvae climbed on sedgens around 40 cm high. The whole emergence lasted about 132 – 357 minutes; n = 44; mean = 251,6; s.d. = 51,1. Dragonflies which started the mergence after 17.00 o'clock did not flight this day. They spend all night in the same place. None of transformated dragonflies attained final colours before maiden flight.

Discussion

Cordulia aenea is so-called spring-species (Corbet 1954) which have synchronized patern of emergence, emergance curve EM_{50} = 2-9 days (Wildermuth 1998; Ha et al. 2002). Emergence of this species usually occurs on the second and third decade of may (Wildermuth 1980, 1998, 2000). Ealier emergence is very rare and depends on warm and early spring (Ha et al. 2002; Sterberg & Schmidt 2000). It indicated the temperature as a main factor depends on emergance. On the other hands the emergence of C. Aenea occurs in low temperature and cloady sky as well (Ha et al. 2002). This apparent contradiction arises of fact that speed of different physiological processes including most probably emergence depends on height of temperature as well as the time of its influences. Therephore at the beginning of emergence period the rapid increase of temperature is a tigger for urgent and mass emergences. Several days after the beginning of emergence period infuence of temperature is not such visible and emergences occur in bad conditions weather as well (Ha et al. 2002).

This work observations regard at the beginning of emergence period and confirm the emergence is limited by cold weather only at the beginning of its period. It follow by emergences occured only on insolated part of reservoir and only in one day then was a sunny weather. Next days were cool and cloady therephore next emergences were observed aroud a week later then temperature increased to around 15^{o}C. Emergences of *C. aenea* occured in narrow Carex-zone above the water (in publication by Ha et al. 2002 – mainly above the land) because of blanket bog without any supports for emergence which was situated between Carex-zone and land.

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FAUNISTIC RECORDS OF THE BEETLES (HEXAPODA: COLEOPTERA) IN LATVIA. 1.

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Barsevskis A., Valainis U., Bicevskis M., Savenkovs N., Cibulskis R., Kalnins M., Strode N. 2004. Faunistic records of the beetles (Hexapoda: Coleoptera) in Latvia. 1. *Acta Biol. Univ. Daugavp., 4 (2): 93 – 106.*

The article containsinformation about 252 new records of the beetles (Hexapoda: Coleoptera) species, collected in Latvia mainly in 2003. 3 species are indicated for the first time in Latvian fauna.

Key words: Coleoptera, fauna, distribution, Latvia, protected species.

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Introduction

The article contains information on 252 beetle species, from which 3 species are indicated for the first time in the Latvian fauna: *Pselaphorhynchites pauxillus* (Germar, 1824) (Attellabidae); *Apion armatum* Gerstaecker, 1854, *Apion flavimanum* Gyllenhal, 1833 (Apionidae); ... species are protected in Latvia but ... species are protected in European Union.

Beetles collected as in the way of separate expeditions with entomological net, as conducting beetle fauna monitoring in the Moricsala Nature reserve, in Silene Nature park (Ilgas), in Lejasciems and Jaungulbene forestry forest burnings, where for researches was used windows traps (Fig. 1), pitfall traps and malayse traps (Fig. 2).

In the species list after species name is indicated place where it was found, collecting date, in the brackets is indicated the number of collected specimens, short information about biotope and collector' s name abbreviation: A.B. – Arvīds Barševskis, N.Sa – Nikolajs Savenkovs, N.St. – Natālija Strode, R.C. - Raimonds Cibuļskis, U.V. – Uldis Valainis, M.B. – Mārtiņš Bičevskis, K.V. – Kristaps Vilks, V.P. – Viktors Ponamarjovs, E.K. - Edīte Krukovska, S.N. - Sanita Novožilova.

Fig. 1. Malayse traps in Moricsala Nature reserve. Photo: A.Barševskis

Fig. 2. Windows traps in Moricsala Nature reserve. Photo: A.Barševskis

The material is stored in the collection Daugavpils University (DAUC) (Daugavpils, Latvia) and in the collections of authors or other collectors.

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The records published in the article will complete the information about beetle species distribution in Latvia.

List of species

Gyrinidae Latreille, 1810

1. *Gyrinus pullatus* Zaitzev, 1907 – Grāveri, Protected Nature territory "Čertoka ezers", 20.07.2003. (5, A.B.).

2. *Gyrinus paykulli* Ochs, 1927 – Grāveri, 20.07.2003. (5, Jazinkas lake, A.B.).

3. *Gyrinus minutus* (Fabricius, 1798) – Ilgas, Silene Nature park, 05. – 07. 2003. (2, Bedušu lake (Fig.1.), A.B.).

Dytiscidae Leach, 1815

4. *Agabus sturmi* (Gyllenhal, 1808) – Mazirbe, 26.07.2003. (1, A.B.); Jaunaglona, 09.2003. (1, Rušona lake, A.B.).

5. *Agabus affinis* (Paykull, 1798) – Grāveri, 20.07.2003. (1, Jazinkas lake, A.B.).

6. *Agabus paludosus* (Fabricius, 1801) – Grāveri, 20.07.2003. (1, Jazinkas lake, A.B.); Šķeltova 08.2003 (2, Aksenovas lake, A.B.); Elerne, Nature park "Daugavas loki", 09.2003. (3, Daugava river, A.B.); Jaunaglona, 09.2003. (7, Rušona lake, A.B.).

7. *Agabus bipustulatus* (Linnaeus, 1767) – Grāveri, 20.07.2003. (4, Jazinkas lake, A.B.).

8. *Ilybius aenescens* Thomson, 1870 – Mazirbe, 26.07.2003. (2, A.B.); Grāveri, 20.07.2003. (1,

Jazinkas lake, A.B.).

9. *Ilybius guttiger* Thomson, 1870 – Mikeļtornis, 27.07.2003. (1, Baltic sea coast, A.B.), Slītere, Zilie kalni, Slītere National park, 26.07.2003. (1, A.B.); Elerne, Nature park "Daugavas loki", 09.2003. (1, Daugava river, A.B.).

10. *Ilybius similis* Thomson, 1856 – Gulbītis, 05. 06. 2003. (1, Ušūrs lake, A.B.); Ilgas, Silene Nature park, 30.06.2003. (1, Sitas lake, A.B.); Pāvilosta, 28.07.2003. (1 (dry specimen), dry meadows near Baltic Sea coast, A.B.).

11. *Rhantus exsoletus* (Forster, 1771) – Ilgas, Silene Nature park, 30.06.2003. (3, Smilģīnas lake, A.B.); Grāveri, 20.07.2003. (1, Jazinkas lake, A.B.), Protected Nature territory "Čertoka ezers", 20.07.2003. (5, A.B.); Moricsala Nature reserve, 07. 2003. (1, Usmas lake, A.B.); Šķeltova 08.2003 (2, Aksenovas lake, A.B.); Gulbītis, 09. 2003. (2, Ušūrs lake, A.B.); Elerne, Nature park "Daugavas loki", 09.2003. (1, Daugava river, A.B.); Jaunaglona, 09.2003. (2, Rušona lake, A.B.).

12. *Rhantus frontalis* (Marsham, 1802) – Šķeltova 08.2003 (1, Aksenovas lake, A.B.).

13. *Hydaticus transversalis* (Pontoppidan, 1763) – Slītere, Zilie kalni, Slītere National park, 26.07.2003. (1, A.B.).

14. *Dytiscus latissimus* Linnaeus, 1758 – Ilgas, Silene Nature park, 05. – 07. 2003. (7, Bedušu, Sitas, Sila, Smilgīnas, Valnanišķu lakes, A.B.). Protected species in Latvia and European Union.

15. *Dytiscus dimidiatus* Bergtstrasser, 1778 – Moricsala Nature reserve, 30.05.2003. (2, ligth traps, N.Sa.).

16. *Dytiscus circumcinctus* Ahrens, 1881 – Moricsala Nature reserve, 30.05.2003. (1, ligth trap, N.Sa.).

Haliplidae Brulle, 1835

17. *Haliplus wehnckei* Gerhardt, 1877 – Mazirbe, 26.07.2003. (1, A.B.).

18. *Haliplus fulvus* (Fabricius, 1801) – Gulbītis, 05. 06. 2003. (1, Ušūrs lake, A.B.).

Carabidae Latreille, 1802

Distribution of ground beetles (Carabidae) species of Latvia's fauna see in A.Barševskis (2003).

19. *Nebria brevicollis* (Fabricius, 1792) – Svente, 24.05. 2003. (1, N.St.); Naujene 05.2003. (2, Jezufova dendrological park, A.B.); Moricsala Nature reserve, 26.09.2003. (~20, U.V.), Valmiera, 07.2003. (1, S.N.).

20. *Leistus terminatus* (Hellwig, 1793) – Naujene, 05.2003. (1, Jezufova dendrological park, A.B.); Moricsala Nature reserve, 26.09.2003. (6, U.V.).

21. *Notiophilus aestuans* Dejean, 1826 – Pāvilosta, 28.07.2003. (1, dry dunes, A.B.).

22. *Notiophilus aquaticus* (Linnaeus, 1758) – Cesvaine, 06.2003. (1, A.B.); Slītere, Pēterezers, 26.07.2003. (6, dry pine forests, A.B.); Mazirbe, 26.07.2003. (4, dunes, A.B.); Lielirbe 26.07.2003. (1, dunes, A.B.); Moricsala Nature reserve, 07.2003. (4, A.B.); Grāveri, 20.07.2003. (1, Protected Nature territory "Čertoka ezers", A.B.).

23. *Notiophilus germinyi* Fauvel, 1863 – Mikeļtornis, 27.07.2003. (1, dunes, A.B.), Slītere, Pēterezers, 26.07.2003. (4, dry pine forests, A.B.); Mazirbe, 26.07.2003. (2, dunes, A.B.); Ovīši, 26.07.2003 (4, dry pine forests, A.B.); Lielirbe 26.07.2003. (1, dunes, A.B.); Robežnieki, 07.2003. (2, V.P.).

24. *Notiophilus palustris* (Duftschmid, 1812) – Lejasciems, 05. – 10. 2003. (3, forest burning, A.B.); Slītere, Zilie kalni, Slītere National park, 26.07.2003. (1, A.B.); Moricsala Nature reserve, 07.2003. (7, A.B.); Kalsnava 08.2003. (1, A.B.).

25. *Notiophilus biguttatus* (Fabricius, 1779) – Moricsala Nature Reserve, 05.- 09.2003. (>20, A.B., U.V. & R.C.), Lejasciems, 05. – 10. 2003. (>10, forest burning, A.B.); Gulbitis, 05. – 10. 2003. (7, forest burning near Ušūrs lake, A.B.); Grāveri, 20.07.2003. (3, Protected Nature territory "Čertoka

ezers", A.B.); Lielirbe 26.07.2003. (1, pine forest, A.B.).

26. *Cicindela maritima maritima* Dejean, 1822 – Mazirbe, 26.07.2003. (1, Baltic sea coast, A.B.).

27. *Carabus convexus convexus* Fabricius, 1775 – Moricsala Nature Reserve, 30.05.2003. (1, U.V.), 06.2003 (2, pitfall traps, U.V.), Svente 31.08.2003. (2, N.St.), 07.09.2003. (1, N.St.), 11.09.2003. (1, N.St.), Cesvaine, 06.2003. (1, A.B.).

28. *Carabus menetriesi menetriesi* Hummel, 1827 – Ilgas, Silene Nature park, 06.2003. (1, near Bedušu lake, A.B.). Protected species in Latvia.

29. *Carabus coriaceus coriaceus* Linnaeus, 1758 – Robežnieki, 07.2003. (1, V.P.).

30. *Calosoma inquisitor inquisitor* (Linnaeus, 1758) – Moricsala Nature reserve, 30.05.2003. (1, pitfall traps, U.V.), 06.2003 (2, pitfall traps, U.V.). Protected species in Latvia.

31. *Blethisa multipunctata* (Linnaeus, 1758) – Moricsala Nature reserve, 05.08.2002. (1, ligth traps, N.Sa.), 30.05.2003. (1, pitfall traps, U.V.).

32. *Elaphrus aureus aureus* Mueller, 1821 – Dunava, 24.07.2004. (3, Daugava river, A.B.).

33. *Omophron limbatum* (Fabricius, 1776) – Elerne, Nature park "Daugavas loki", 06.2003. (1, Daugava river, A.B.).

34. *Dyschirius intermedius* Putzeys, 1846 – Dunava, 24.07.2004. (1, Daugava river, A.B.).

35. *Dyschirius obscurus* (Gyllenhal, 1827) – Dunava, 24.07.2004. (4, Daugava river, A.B.).

36. *Miscodera arctica* (Paykull, 1798) – Mazirbe, 26.07.2003. (2, dry dunes, A.B.).

37. *Patrobus assimilis* Chaudoir, 1844 – Svente, Sasalu mežs forest, 12.09.2003. (1, N.St.).

38. *Trechoblemus micros* (Herbst, 1784) – Moricsala Nature reserve, 05.08.2002. (1, ligth traps, N.Sa.).

39. *Trechus rubens* (Fabricius, 1792) – Jersika, 07.2003. (1, near 'Kurpnieki", A.B.).

40. *Asaphidion pallipes* (Duftschmid, 1812) – Pāvilosta, 28.07.2003. (2, Baltic Sea coast, A.B.); Jaunaglona, 09.2003. (1, near Rušona lake, A.B.).

41. *Bembidion pallidipenne* (Illiger, 1802) – Jūrkalne, 28.07.2003. (1, Baltic Sea coast, A.B.). In Latvia this species is known by some records from Baltic sea coast in Western part. Very rare.

42. *Bembidion argenteolum* Ahrens, 1812 – Jersika, 07.2003. (1, Daugava river, A.B.).

43. *Bembidion velox* (Linnaeus, 1761) – Jersika, 07.2003. (1, Daugava river, A.B.), Aiviekste, 09.07.2003. (1, Aiviekste river, A.B.).

44. *Bembidion azurescens azurescens* Dalla Torre, 1877 – Jūrkalne, 28.07.2003. (1, Baltic Sea coast, A.B.).

45. *Bembidion gilvipes* (Sturm, 1825) – Moricsala Nature reserve, 05.08.2002. (1, ligth traps, N.Sa.).

46. *Bembidion illigeri* Netolitzky, 1914 – Slītere, Zilie kalni, Slītere National park, 26.07.2003. (1, A.B.).

47. *Bembidion cruciatum polonicum* Mueller, 1930 – Aiviekste, 09.07.2003. (2, Aiviekste river, A.B.); Jersika, 07.2003. (1, Daugava river, A.B.).

48. *Sericoda quadripun-ctata* (De Geer, 1774) – Lejasciems, 05. – 10. 2003. (nummerous, forest burning (Fig. 3), A.B.); Gulbītis, 05. – 10. 2003. (nummerous, forest burning near Ušūrs lake, A.B.).

49. *Platynus krynickii* (Sperk, 1835) – Moricsala Nature reserve, 07. 2003. (1, pitfall traps, U.V.).

50. *Paranchus albipes* (Fabricius, 1796) – Ogre, 20.05.2003. (>10, Ogre river, A.B.).

51. *Agonum impressum* (Panzer, 1796) – Elerne, Nature park "Daugavas loki", 06.2003. (1, Daugava

river, A.B.), Valmiera, 07.2003. (1, Gauja river walley, S.N.).

52. *Agonum marginatum* (Linnaeus, 1758) – Aiviekste, 09.07.2003. (5, Aiviekste river, A.B.).

53. *Olisthopus rotundatus* (Paykull, 1790) – Svente 20.06.2003. (1. N.St.), 10.08.2003. (1, N.St.).

54. *Poecilus punctulatus* (Schaller, 1784) – Dignāja, 07. 2003. (1, E.K.). Insufficiently known species, in last 100 years recorded from a few localities in South-east part of Latvia. In Latvia - very rare species in dry, open habitats.

55. *Pterostichus quadrifoveolatus* Letzner, 1852 – Lejasciems, 05. – 10. 2003. (nummerous, forest burning (Fig 3), A.B.); Gulbītis, 05. – 10. 2003. (nummerous, forest burning near Ušūrs lake, A.B.).

56. *Pterostichus macer macer* (Marsham, 1802) – Dignāja, 07. 2003. (1, E.K.). In Latvia - very rare species.

57. *Pterostichus aethiops* (Panzer, 1796) – Slītere, Zilie kalni, Slītere National park, 26.07.2003. (2, A.B.)

58. *Pterostichus rhaeticus* Heer, 1837 – Slītere, Zilie kalni, Slītere National park, 26.07.2003. (1, A.B.); Jūrkalne, 28.07.2003. (1, Baltic Sea coast, A.B.).

59. *Synuchus vivalis vivalis* (Illiger, 1798) – Moricsala Nature reserve, 05.08.2002. (1, N.Sa.); Jūrkalne, 28.07.2003. (1, Baltic Sea coast, A.B.).

60. *Amara convexior* Stephens, 1823 Moricsala Nature reserve, 05.08.2002. (1, A.B.); Pāvilosta, 28.07.2003. (1, Baltic Sea coast, A.B.); Jaunaglona, 09.2003. (1, near Rušona lake, A.B.).

61. *Amara pulpani* Kult, 1949 – Jūrkalne, 28.07.2003. (1, Baltic Sea coast, A.B.). In Latvia this species is insufficiently known.

62. *Amara lunicollis* Schioedte, 1837 – Dignāja, 07. 2003. (2, E.K.).

63. *Amara ovata* (Fabricius, 1792) – Daugavpils, 04.04.2004. (1, A.B.).

Fig. 3. Forest burning in Lejasciems - a habitat of *Sericoda quadripunctata* (De G.), *Pterostichus quadrifoveolatus* Letzn., *Melanophila acuminata* (De G.) & *Danosoma fasciata* (L.) , Photo: A.Barševskis

64. *Amara majuscula* Chaudoir, 1850 – Dignāja, 07. - 09.2003. (>10, E.K.).

65. *Amara praetermissa* (Sahlberg, 1827) – Lejasciems, 09. 2003. (1, A.B.)

66. *Amara gebleri* Dejean, 1831 – Jūrkalne, 28.07.2003. (1, meadows near Baltic Sea coast, A.B.).

67. *Harpalus pumilus* Sturm, 1818 – Ilgas, Silene Nature park, 07.06.2003. (1, dry meadows in Jakubova, A.B.).

68. *Harpalus anxius* (Duftschmid, 1812) – Ilgas, Silene Nature park,

30.06.2003. (1, dry meadows near Ilgas, A.B.), 01.07. 2003. (1, dry meadows in Jakubova, A.B.).

69. *Harpalus autumnalis* (Duftschmid, 1812) – Ilgas, Silene Nature park, 30.06.2003. (4, dry meadows in Jakubova , A.B.), 01.07. 2003. (1, dry meadows in Jakubova, A.B.).

70. *Masoreus wetterhallii wetterhallii* (Gyllenhal, 1813) – Jūrkalne, 28.07.2003. (1, Baltic Sea coast, A.B.).

71. *Chlaenius nitidulus* (Schrank, 1781) – Jūrkalne, 28.07.2003. (1, Baltic Sea coast, A.B.); Jersika, 07.2003. (1, near Daugava river, A.B.), Aiviekste, 09.07.2003. (2,near Aiviekste river, A.B.).

72. *Badister unipustulatus* Bonelli, 1813 – Moricsala Nature reserve, 05.2003. (1, U.V.).

73. *Badister bullatus* (Schrank, 1798) – Moricsala Nature reserve, 10.2003. (1, U.V.).

74. *Badister lacertosus* Sturm, 1815 – Moricsala Nature reserve, 04.2003. (1, A.B.); Aiviekste, 09.07.2003. (2,near Aiviekste river, A.B.).

75. *Badister collaris* Motschulsky, 1845 – Moricsala Nature reserve, 05.08.2002. (1, ligth traps, N.Sa.).

76. *Lebia cruxminor* (Linnaeus, 1758) – Moricsala Nature reserve, 10.2003. (1, A.B.).

77. *Paradromius linearis* (Olivier, 1795) – Slītere, Zilie kalni (!), Slītere National park, 26.07.2003. (6, A.B.); Jūrkalne 28.07.2003. (2, dry meadows near Baltic Sea coast, A.B.).

78. *Dromius quadrima-culatus* (Linnaeus, 1758) – Jaunaglona, 09.2003. (1, A.B.).

79. *Dromius agilis* (Fabricius, 1787) – Lejasciems, 26. 10. 2003. (nummerous, pine forest, A.B.); Grāveri, Protected Nature territory "Čertoka ezers", 20.07.2003. (2, A.B.).

80. *Dronius schneideri* Crotch, 1871 – Jaunaglona, 09.2003. (1, A.B.).

Hydrophilidae Latreille, 1802

81. *Hydrophilus aterrimus* Eschscholtz, 1822 – Moricsala Nature reserve, 05.2003. (2, ligth traps, N.Sa.); Ilgas 06.06.2003. (3, A.B.).

82. *Cymbiodyta marginella* (Fabricius, 1792) – Daugavpils, Gubišče Lake, 09.09.2003. (4, A.B.).

83. *Cercyon laminatus* Sharp, 1873 – Moricsala Nature reserve, 10.2003. (1, U.V.).

Silphidae Latreille, 1807

84. *Nicrophorus sepultor* Charpentier, 1825 – Svente, 2003. (2, N.St.), Gulbitis, 07.2003. (1, pitfall trap, A.B.).

85. *Silpha obscura* Linnaeus, 1758 – Škeltova 12.04.2003. (1, A.B.).

86. *Silpha tristis* Illiger, 1798 – Moricsala Nature reserve, 08.2002. (2, U.V.), 10.2003. (1, U.V.).

Staphylinidae Latreille, 1802

87. *Emus hirtus* (Linnaeus, 1758) – Svente 27.05. 2003. (1, N.St.), 16.07.2003. (1, N.St.), 08.2003. (1, N.St.).

88. *Dinothenarus pubescens* (De Geer, 1774) – Kandava, 05.2003. (1,A.B.).

89. *Ocypus ophthalmicus ophthalmicus* (Scopoli, 1763) – Elerne, Nature park "Daugavas loki", 06.2003. (1, A.B.); Moricsala Nature reserve, 06. - 07.2003. (10, U.V.)..

90. *Ocypus fuscatus* (Gravenhorst, 1802) – Moricsala Nature reserve, 05. - 07.2003. (8, U.V.); Kandava, Abava river walley, 07.2003. (1, A.B.).

91. *Ocypus similis* (Fabricius, 1792) – Moricsala Nature reserve, 30.05.2003. (1, U.V.).

92. *Platydracus fulvipes* (Scopoli, 1763) – Moricsala Nature reserve, 05.2002. (2, U.V.), 08.2003. (1, U.V.).

93. *Platydracus latebricola* (Gravenhorst, 1806) – Moricsala Nature reserve, 06.2003. (4, U.V.).

94. *Quedius brevis* Erichson, 1840 – Moricsala Nature reserve, 30.05.2003. (1, U.V.).

95. *Quedius curtipennis* Bernhauer, 1908 – Kandava, Abava river walley, 07.2003. (1, A.B.).

96. *Quedius scitus* (Gravenhorst, 1806) – Moricsala Nature reserve, 09.2003. (1, U.V.).

97. *Rugilus erichsoni* (Fauvel, 1876) – Moricsala Nature reserve, 05.2003. (4, U.V.); Ilgas, Silene Nature park, 06.2003. (7, A.B.).

98. *Rugilus rufipes* Germar, 1836 – Moricsala Nature reserve, 06.2003. (1, U.V.); Lejasciems, 05.-10.2003. (3, A.B.).

Eucinetidae Lacordaire, 1857

99. *Eucinetus haemorrhoidalis* (Germar, 1818) – Lejasciems, 07.2003. (1, windows traps, A.B.), Mikeltornis, 27.07.2003. (1, A.B.); Moricsala Nature reserve, 09.2002. (1, U.V.).

Scirtidae Fleming, 1821

100. *Cyphon kongsbergensis* Munster, 1924 – Moricsala Nature reserve, 01.05.2003. (1, A.B.), 12.05.2003. (1, U.V.), 30.05.2003. (1, U.V.).

101. *Cyphon laevipennis* Tournier, 1868 (= *C.phragmiteticola* Nyholm, 1955) – Graveri, Nature reserve "Certoka ezers", (1, A.B.).

102. *Cyphon palustris* Thomson, 1855 – Moricsala Nature reserve, 05.08.2002. (2, ligth traps, N.Sa.), 05.08.2003. (1, ligth traps, N.Sa.).

103. *Cyphon hilaris* Nyholm, 1944 – Slitere National park, 26.07.2003. (2, A.B.).

Dascillidae Lacordaire, 1857

104. *Dascillus cervinus* (Linnaeus, 1758) – Moricsala Nature reserve, 07. 2003. (2, windows traps, U.V.).

Trogidae McLeay, 1819

105. *Trox scaber* (Linnaeus, 1767) – Morcsala Nature reserve, 26.09.2003. (1, U.V.).

Scarabaeidae Latreille, 1802

106. *Oryctes nasicornis* (Linnaeus, 1758) – Svente 03.06.2003. (1, Rubaniški, N.St.), 05.06.2003. (1, Rubaniški, N.St.), 13.07.2003. (1, Rubaniški, N.St.); Robežnieki 07.2003. (1, V.P.).

107. *Liocola marmorata* (Fabricius, 1792) – Svente, 16.07.2003. (1, N.St.), Svente, 12.08.2003. (1, Egļukalns, N.St.).

108. *Osmoderma eremita* (Scopoli, 1763) – Moricsala Nature reserve, 06.08.2003. (11 imago, > 20 larvae, in hollow of oak (Fig. 4), A.B. & R.C.).

109. *Hoplia graminicola* (Fabricius, 1792) – Ilgas, Silene Nature park, 29.06.2003. (>10, dry meadows , A.B.), 01.07. 2003. (>15, dry meadows , A.B.); Dignāja, 07. 2003. (1, E.K.); Jūrkalne, 28.07.2003. (1 dry specimen, Baltic Sea coast, A.B.).

110. *Hoplia parvula* Krynicki, 1832 – Mazirbe, 26.07.2003. (6, dry dunes, A.B.).

111. *Aphodius nemoralis* Erichson,1848 – Moricsala Nature reserve, 09.2002. (1, U.V.).

112. *Aphodius haemorrhoidalis* (Linnaeus, 1758) – Ilgas, Silene Nature park, 06.2003. (2, A.B.).

113. *Aphodius luridus* (Fabricius, 1775) - Šķeltova, "Barševski" 06.2003. (~7, A.B.).

Geotrupidae Latreille, 1806

114. *Geotrupes spiniger* (Marsham, 1802) – Mazirbe, 09.2003. (2, dry dunes, A.B.).

115. *Trypocopris vernalis vernalis* (Linnaeus, 1758) – Mikeļtornis, Slītere National Park, 27.07.2003. (1, dry pine forest, A.B.).

Lucanidae Latreille, 1806

116. *Platycerus caraboides var. rufipes* Herbst – Moricsala Nature reserve, 06.2003. (2, U.V.), 07. 2003. (1, U.V.).

117. *Dorcus parallelopipedus* (Linnaeus, 1758) – Svente, 10.07.2003. (1, N.St.), 12.08.2003. (1, Egļukalns, N.St.).

118. *Ceruchus chrysomelinus* (Hochenwarth, 1785) – Moricsala Nature reserve, 04.- 10.2003. (>30, A.B. & U.V.).

Lycidae Laporte de Castelnau, 1840

119. *Dictyoptera aurora* (Herbst, 1784) – Moricsala Nature reserve, 05.08.2002. (1, ligth traps, N.Sa.).

Elateridae Leach, 1815

120. *Danosoma fasciata* (Linnaeus, 1758) – Lejasciems 08.2003. (2, A.B.). In Latvia - very rare & protected species.

121. *Hemicrepidius hirtus* (Herbst, 1784) – Morcsala Nature reserve, 26.09.2003. (1, U.V.); Grāveri, near Jazinkas lake 26.06.2003. (1, A.B.).

122. *Stenagostus rufus* (De Geer, 1774) – Kolka, 26.07.2003. (1, dunes, A.B.). In Latvia - very rare & protected species.

123. *Diacanthous undulatus* (De Geer, 1774) - Kalsnava, 27.05.2002. (1, windows traps, M.B.).

124. *Denticollis rubens* Piller & Mitterpacher, 1783 – Moricsala Nature reserve, 06.2002. (3, windows traps, U.V.). Protected species in Latvia.

125. *Hypnoidus riparius* (Fabricius, 1792) – Jersika, 04.2003. (1, A.B.).

126. *Selatosomus cruciatus* (Linnaeus, 1758) – Morcsala Nature reserve, 05.2002. (1, U.V.); Lejasciems, 05..2003. (1, mixed forest, A.B.); Kolka 26.07.2003. (1, A.B.); Ķemeri, Ķemeri National park, 06.2003. (1, A.B. & N.Sa.).

127. *Procraeus tibialis* (Lacordaire, 1835) - Moricsala Nature reserve, 30.05.2003. (2, windows traps, U.V.). In Latvia species is known only from Moricsala Nature reserve.

128. *Ampedus erythrogonus* (Mueller, 1821) – Moricsala Nature reserve, 04.-07.2002. (5, windows traps, U.V.), 06.2003. (1, windows traps, U.V.), Lejasciems, 05.-10.2003. (>10, pine forest clearing (Fig. 10), A.B.).

129. *Ampedus nigroflavus* (Goeze, 1777) – Moricsala Nature reserve, 06.2003. (1, windows traps, U.V.).

130. *Ampedus nigrinus* (Herbst, 1784) – Kalsnava, 06.06.2002. (1, windows traps, M.B.), Lejasciems, 05.-10.2003. (>30, pine forest clearing (Fig. 10), A.B.).

131. *Ampedus tristis* (Linnaeus, 1758) – Lejasciems, 07.2003. (1, windows traps, A.B.), Kalsnava, 27.05.2002. (1,

Fig. 4. Habitat of *Osmoderma eremita* (Scop.) and *Ampedus praeustus* (F.) in Moricsala Nature reserve. Photo: A.Barševskis

windows traps, M.B.), 07.06.2002. (1, windows traps, M.B.).

132. *Ampedus praeustus* (Fabricius, 1792) – Moricsala Nature reserve, 08.2003. (1, A.B.) (Fig. 4).

133. *Ectimus aterrimus* (Linnaeus, 1761) – Moricsala Nature reserve, 05. 2002. (1, windows traps, U.V.), 05.2003. (1, windows traps, U.V.).

134. *Synaptus filiformis* (Fabricius, 1781) - Jersika, Daugava river walley, 06.2003. (1, A.B.).

Eucnemidae Eschscholtz, 1829

135. *Microrhagus lepidus* Rosenhauer, 1847 - Ķemeri, Ķemeri National park, 06.2003. (1, A.B. & N.Sa.).

136. *Xylobius corticalis* (Paykull, 1800) – Moricsala Nature reserve, 05. 2003. (1, A.B.)

Buprestidae Leach, 1815

137. *Chalcophora mariana mariana* (Linnaeus, 1758) – Daugavpils, Križi env., 19.05.2003. (1, A.B.). Protected species in Latvia.

138. *Poecilonota variolosa variolosa* (Paykull, 1799) – Naujene, Daugava river walley, 05.2003. (4,A.B.); Tadenava, 13. 07. 2003. (5, on Populus tremulae, A.B.).

139. *Buprestis haemorrhoidalis haemorrhoidalis* Herbst, 1780 – Kalsnava 07.-08.2002. (4, windows traps, M.B.); Tukums, 08.2003. (1, A.B.); Lejasciems, 08.2003. (2, pine forest, A.B.); Robežnieki 07.2003. (1, V.P.).

140. *Buprestis rustica rustica* Linnaeus, 1758 – Kalsnava 08.2002. (1, windows traps, M.B.); Lejasciems, 08.2003. (1, pine forest, A.B.).

141. *Chrysobothris affinis affinis* (Fabricius, 1794) – Robežnieki 07.2003. (1, V.P.);

142. *Chrysobothris chrysostigma chrysostigma* (Linnaeus, 1758) – Kalsnava 19.08.2002. (1, windows traps, M.B.), Lejasciems, 08.2003. (1, pine forest, A.B.).

143. *Anthaxia godeti* Gory & Laporte de Castelnau, 1839 – Lejasciems, 07.2003. (1, dry pine forest, A.B.), Kolka 26.07.2003. (1, dunes, A.B.); Pāvilosta, 28.07.2003. (3, dunes, A.B.); Mazirbe, 09.2003. (1, dunes, A.B.).

144. *Melanophila acuminata* (De Geer, 1774) – Lejasciems, 07.2003. (1, pine forest burning (Fig. 3), A.B.)

145. *Agrilus ater ater* (Linnaeus, 1767) – Tadenava, 13. 07. 2003. (14, on Populus tremulae, A.B.). In Latvia - very rare.

146. *Agrilus subauratus* (Gebler, 1833) – Ilgas, Silene Nature park, 07.06.2003. (1, A.B.).

147. *Agrilus angustatus* (Illiger, 1803) – Ilgas, Silene Nature park, 30.06.2003. (1, on oak, A.B.).

148. *Agrilus laticornis* (Illiger, 1803) – Moricsala Nature reserve, 06.2002. (2, A.B.).

149. *Agrilus populneus* Schaeffer, 1946 – Tadenava, 13.07.2003. (3, on Populus tremulae, A.B.).

150. *Trachys troglodytes* Gyllenhal, 1817 – Ilgas, Silene Nature park, 07.06.2003. (2, dry meadows near Ilgas, A.B.), 10.06.2003. (3, dry meadows near Jakubova, A.B.).

Byrrhidae Latreille, 1806

151. *Byrrhus arietinus arietinus* Steffahny, 1842 – Gulbitis, near Lake Ušūrs, 05.06.2003 (1, A.B.).

Dermestidae Latreille, 1807

152. *Dermestes murinus murinus* Linnaeus, 1758 – Gulbitis, near Lake Ušūrs, 08.2003 (1, A.B.).

153. *Attagenus smirnovi* Zhantijev, 1973 – Daugavpils, 23.03.2004. (~15, A.B.), Jelgava 04.02.2004. (3, A.B.).

154. *Trogoderma angustum* (Solier, 1849) - Daugavpils, 03.03.-04.04.2004. (~10, A.B.).

155. *Megatoma undata* (Linnaeus, 1761) – Kemeri National park, 06.2003. (1, A.B.), Kandava, Abava river walley, 07.2003. (1, A.B.).

156. *Anthrenus pimpinellae pimpinellae* Fabricius, 1775 – Talsi, 06.2004. (1, A.B.); Moricsala Nature reserve, 07.2003. (1, Malayse traps (Fig. 11), A.B.)

Anobiidae Kirby, 1837

157. *Dorcatoma robusta* Strand, 1938 – Moricsala Nature reserve, 30.05.2003. (1, windows trap (Fig. 12), U.V.).

158. *Dorcatoma chrysomelina* Sturm, 1837 – Ilgas, Silene Nature park, 06.-07.2004. (5, windows traps, A.B.).

159. *Dorcatoma dresdensis* Herbst, 1792 - Ilgas, Silene Nature park, 06.2004. (3, windows traps, A.B.).

160. *Xestobium rufovillosum* (De Geer, 1774) – Moricsala Nature reserve, 06-07.2002. (4, A.B.).

Trogossitidae Latreille, 1802

161. *Grynocharis oblonga* (Linnaeus, 1758) – Moricsala Nature reserve, 01.05.2003. (1, A.B.).

162. *Thymalus limbatus* (Fabricius, 1787)– Moricsala Nature reserve, 06.2003. (1, A.B.). Very rare. Habitat (Fig. 5).

Melyridae Leach, 1815

163. *Anthocomus rufus* (Herbst, 1784) – Robežnieki, 07.2003. (2, V.P.).

Nitidulidae Latreille, 1802

164. *Cyllodes ater* (Herbst, 1792) – Moricsala Nature reserve, 07.2003. (2, windows traps, U.V.), 10. 2003. (1, A.B.).

165. *Epuraea boreella* (Zetterstedt, 1812) – Moricsala Nature reserve, 06.2002. (1, U.V.).

166. *Epuraea longula* Erichson, 1845 – Moricsala Nature reserve, 09.2002. (1, U.V.).

167. *Thalychra fervida* (Olivier, 1790) – Moricsala Nature reserve, 06.2002. (1, U.V.).

Rhizophagidae Redtenbacher, 1845

168. *Rhizophagus picipes* (Olivier, 1790) – Moricsala Nature reserve, 05.08.2002. (2, ligth traps, N.Sa.).

169. *Rhizophagus ferrugineus* (Paykull, 1800) – Moricsala Nature reserve, 04.2002. (5, U.V.), 06.2003. (1, windows traps, U.V.), 10.2003. (2, windows traps, U.V.).

Cryptophagidae Kirby, 1837

170. *Cryptophagus angustus* Ganglbauer, 1899 – Moricsala Nature reserve, 06.2002. (1, U.V.).

171. *Cryptophagus badius* Sturm, 1845 – Moricsala Nature reserve, 05.2002. (1, U.V.).

172. *Atomaria atra* (Herbst, 1793) - – Moricsala Nature reserve, 07.2002. (1, U.V.).

Endomichidae Leach, 1815

173. *Leiestes seminigra* (Gyllenhal, 1808) – Moricsala Nature reserve, 30.05.2003. (1, windows trap, U.V.).

Erotylidae Latreille, 1802

174. *Triplax scutellaris* Charpentier, 1825 – Moricsala Nature Reserve, 04.-06.2002. (1, windows traps, U.V.), 27.09.2003 (1, U.V.).

Aspidiphoridae Kiesenwetter 1877 (1859)

175. *Aspidiphorus orbiculatus* (Gyllenhal, 1808) – Moricsala Nature reserve, 30.05.2003. (1, U.V.).

Coccinellidae Latreille, 1807

176. *Coccinella magnifica* Redtenbacher, 1843 – Ilgas 23.06.2003 (1, A.B.), 01.07.2003. (1, A.B.); Kaltene 26.07.2003. (1, A.B.); Svente 19.08.2003. (1, N.ST.).

177. S*cymnus ferrugatus* (Moll, 1785) – Moricsala Nature reserve, 07.2003. (1, U.V.).

178. *Scymnus suturalis* Thunberg, 1795 – Moricsala Nature reserve, 10.2003. (1, windows traps, U.V.).

Oedemeridae Latreille, 1810

179. *Calopus serraticornis* (Linnaeus, 1758) – Moricsala Nature reserve, 01.05.2003. (1, A.B.), Robežnieki 05.2003. (2, V.P.).

Salpingidae Leach, 1815

180. *Salpingus ruficollis* (Linnaeus, 1761) – Kalsnava, 27.05.2002. (1, windows traps, M.B.).

Aderidae Winkler, 1927

181. *Anidorus nigrinus* (Germar, 1831) – Moricsala Nature reserve, 05.08.2002. (1, N.Sa), Lejasciems, 07.2003. (1, dry pine forest, A.B.), Kolka 26.07.2003. (1, dunes, A.B.).

182. *Phytobaenus amabilis* Sahlberg, 1834 – Moricsala Nature reserve, 01.05.2003. (1, A.B.).

Anthicidae Latreille, 1825

183. *Omonadus formicarius* (Goeze, 1777) – Ilgas, Silene Nature park, 06. 2003. (1, A.B.), Jūrkalne, 28.07.2003 (1, dry meadows near Baltic Sea coast, A.B.).

184. *Anthicus antherrinus* (Linnaeus, 1761) – Mazirbe 26.07.2003. (1, dunes, A.B.); Pāvilosta, 28.07.2003. (1, dry meadows, A.B.).

185. *Anthicus ater ater* (Panzer, 1796) – Ventspils, 27.07.2003. (2, A.B.); Jūrkalne, 27.07.2003. (1, dry meadows near Baltic Sea coast, A.B.); Pāvilosta, 28.06.2003 (1, dry meadows, A.B.), Cesvaine, 06.2003. (1, A.B.).

186. *Anthicus flavipes flavipes* (Panzer, 1797) – Mazirbe, 26.07.2003 (3, dunes, A.B.).

Meloidae Gyllenhal, 1810

187. *Meloe brevicollis* Panzer, 1793 – Ilgas, Silene Nature park, 16.06.2003. (1, A.B.); Robežnieki 07.2003. (1, V.P.), Svente 05.06.2003. (1, N.ST.), 14.05.2003. (1, N.ST.), 12.05.2003. (1, N.ST.).

Tenebrionidae Latreille, 1802

188. *Oplocephala haemorrhoidalis* (Fabricius, 1787) – Moricsala Nature reserve, 07.2003. (3, windows traps, U.V.); Slītere, Slītere National park, 26.07.2003. (1, near Zilie kalni , A.B.)..

189. *Uloma culinaris* (Linnaeus, 1758) – Gulbītis, Near Lake Ušūrs, 05.06.2003. (1, windows traps, A.B.).

Fig. 5.Habitat of *Thymalus limbatus* (F.) in Moricsala Nature reserve. Photo: A.Barševskis

190. *Prionychus ater* (Fabricius, 1775) – Moricsala Nature reserve, 05.08.2002. (1, ligth traps, N.Sa.),

191. *Omophlus rufitarsis* (Leske, 1785) – Daugavpils, Me˛ciems, 06.-07.2003. (5, inland dunes, A.B.).

192. *Pseudocistela ceramboides* (Linnaeus, 1758) – Lejasciems, 06.2003. (3, windows traps, A.B.), Tadenava 11.07.2003. (1, forest clearing, A.B.).

Melandryidae Leach, 1815

193. *Xylita laevigata* (Hellenius, 1786) – Lejasciems, 05. – 06. 2003. (>40, windows traps, A.B.).

194. *Serropalpus barbatus* (Schaller, 1783) – Kalsnava, 22.06.2002. (1, windows traps, M.B.), Moricsala Nature reserve, 05.08. 2002. (6, ligth traps, N.Sa.).

195. *Melandrya dubia* (Schaller, 1783) – Naujene, 22.05.2003. (5, old forest near Daugava river, A.B.).

Mordellidae Latreille, 1802

196. *Tomoxia bucephala* Costa, 1854 – Tadenava, 11.07.2003. (9, forest clearing, A.B.), Slītere, Slītere National park, 26.07.2003. (1, near Zilie kalni, A.B.).

197. *Hoshihanomia perlata* (Sulzer, 1776) – Slītere, Slītere National park, 26.07.2003. (1, near Zilie kalni, A.B.).

198. *Mordellochroa abdominalis* (Fabricius, 1775) – Naujene 22.05.2003. (1, A.B.), Ilgas, Silene Nature park, 06.06.2003. (1, A.B.), Slītere, Slītere National Park, Zilei kalni (Fig. 15), 26.07.2003. (2, A.B.).

199. *Curtimorda maculosa* (Naezen, 1794) – Ovīši 27.07.2003. (3, A.B.), Mazirbe, Slītere National park, 26.07.2003. (2, A.B.), Slītere, Zilie kalni, Slītere National park, 26.07.2003. (4, A.B.).

Cerambycidae Latreille, 1802

200. *Prionus coriarius* (Linnaeus, 1767) – Ilgas, Silene Nature park, 17.08.2003. (1, pine forest, A.B.); Svente, 08.08.2003. (1, Svistopole, N.St.), 12.08.2003. (1, Egļu kalns & 1, near Sventes lake, N.St.), 13.08.2003. (1, Svistopole, N.St.), 24.08.2003. (1, N.St.).

201. *Oxymirus cursor* (Linnaeus, 1758) – Moricsala Nature reserve, 30.05.2003. (1, pitfall traps, U.V.), Lejasciems, 06.2003. (2, pitfall traps, A.B.).

202. *Pachyta qudrimaculata* (Linnaeus, 1758) – Svente, 22.07.2003. (1, N.ST.); Lejasciems 26.07.2003. (4, pine forest, windows traps, A.B.); Gulbitis, (2, Ušūrs lake, A.B.).

203. *Pachyta lamed* (Linnaeus, 1758) – Lejasciems, 06. – 07. 2003. (3, pine forest clearing, windows traps, A.B.)

204. *Cortodera femorata* (Fabricius, 1787) – Svente, 29.06.2003. (1, N.ST.), Pededzes ozolu audze, protected nature territory, 16.06.2002 (1, oak forest, K.V.).

205. *Grammoptera ruficornis* (Fabricius, 1781) – Rudbārži, 15.06.2001 (3, mixed forest, K.V.).

206. *Anoplodera sexguttata* (Fabricius, 1775) – Moricsala Nature reserve, 07.2003 (3, Malayse traps, windows traps, U.V.).

207. *Lepturobosca virens* (Linnaeus, 1758) – Lejasciems – Lejasciems 05. – 10. 2003. (>10, windows traps, A.B.); Gulbītis 05. – 10. 2003. (6, windows traps, A.B.).

208. *Stenurella nigra* Linnaeus, 1758 - Ovīši, 27.07.2003. (1, A.B.); Slītere, Slītere National park, 26.07.2003. (2, A.B.), 27.07.2003. (1, A.B.).

209. *Etorufus pubescens* Fabricius, 1787 – Madliena, 28.07.2001. (1, pine forest, K.V.), Ovīši 27.07.2003. (nummerous, A.B.); Mikeļtornis 27.07.2003 (3, A.B.); Ventspils, 27.07.2003. (5, A.B.).

210. *Rutpela maculata* Poda, 1761 – Slītere, Slītere National park, 26.07.2003. (1, A.B.).

211. *Stictoleptura scutellata* (Fabricius, 1781) – Slītere, Slītere National park, 26.07.2003. (1, A.B.).

Habitat.

212. J*udolia sexmaculata* (Linnaeus, 1758) – Rudbārži, 24.06.2002 (2, mixed forest, K.V.), Lejasciems, 06.-07.2003. (>10, pine forest clearing, A.B.).

213. *Necydalis major* Linnaeus, 1758 – Moricsala Nature reserve, 07. 2003. (1, windows traps, U.V.)

214. *Obrium cantharinum* (Linnaeus, 1767) – Svente, 16.07.2003. (1, N.ST.).

215. *Aromia moshata moshata* (Linnaeus, 1758) – Pededzes ozolu audze, Protected nature territory, 03.08.2001. (1, mixed forest, K.V.), Bērzpils, 26.06.2002. (3, mixed forest, K.V.), Svente 10.07.2003. (1, N.St.), Cesvaine, 06.2003. (1, A.B.).

216. *Lamia textor* (Linnaeus, 1758) – Svente, 06.07.2003., (1, N.ST.), 07.2003. (1, N.ST.); Robežnieki 07.2003. (1, V.P.).

217. *Pogonocherus fasciculatus fasciculatus* (De Geer, 1775) – Lejasciems, 07.2003. (1, windows traps, A.B.), Robežnieki, 07.2003. (2, V.P.).

218. *Acanthocinus griseus griseus* (Fabricius, 1792) – Lejasciems, 07.2003. (1, windows traps, A.B.), Robežnieki, 07.2003. (1, V.P.), Svente 07.07.2003. (1, N.St.).

219. *Saperda scalaris scalaris* (Linnaeus, 1758) – Svente, 05.06.2003. (1, near Svente lake, N.St.); Robežnieki 07.2003. (2, V.P.).

220. *Saperda perforata* (Pallas, 1773) – Robežnieki, 07.2003. (1, V.P.), Moricsala Nature reserve, 08.2003. (2, windows traps, A.B.).

221. *Phytoecia virgula* (Charpentier, 1825) – Ilgas, Silene Nature park, 08.06.2003. (1, dry meadows in Jakubova), 01.07.2003. (1, dry meadows near Ilgas, A.B.); Svente, 29.06.2003. (1, dry meadows, N.St.).

222. *Tetrops praeusta* (Linnaeus, 1758) – Moricsala Nature reserve, 07.2003. (1, windows traps, U.V.).

Chrysomelidae Latreille, 1802

223. *Bruchidius marginalis* (Fabricius, 1792) – Ilgas, Silene Nature park, 01.07.2003. (1, on *Astragalus glycyphyllus*, A.B.).

224. *Donacia crassipes* Fabricius, 1775 – Grāveri, Jazinkas lake 26.06.2003. (1, A.B.).

225. *Donacia antiqua* Kunze, 1818 - Grāveri, Jazinkas lake 26.06.2003. (1, A.B.).

226. *Donaciella clavipes* (Fabricius, 1793) – Moricsala Nature reserve, 07.2003. (>50, Usmas lake, A.B.).

227. *Cryptocephalus pallifrons* Gyllenhal, 1813 – Ilgas, Silene Nature park, 06.06.2003. (1, A.B.)

228. *Cryptocephalus ocellatus* Drapiez, 1819 – Ilgas, Silene Nature park, 06.2003. (1, A.B.).

229. *Chrysomela cuprea* Fabricius, 1775 – Robežnieki, 07.2003. (2, V.P.).

230. *Chrysomela saliceti* (Weise, 1884) – Dunava, 12.07.2003. (19, on Salix near Daugava river, A.B.), Cesvaine, 06.2003. (6, on Salix, A.B.).

231. *Chrysolina gypsophilae* (Kuester, 1845) – Robežnieki, 07.2003. (1, V.P.).

232. *Chrysolina hyperici* (Forster, 1771) – Moricsala Nature reserve, 07.2003. (9, A.B.), 26.09.2003. (1, U.V.).

233. *Cassida panzeri* Weise, 1907 - Slitere, Slitere National park, 26.07.2003. (1, A.B.).

234. *Cassida margaritacea* Schaller, 1783 – Elerne, Nature park "Daugavas loki", 06.2003. (1, A.B.).

235. *Cassida sanguinosa* Suffrian, 1844 – Elerne, Nature park "Daugavas loki", 06.2003. (1, A.B.).

236. *Cassida murrea* Linnaeus, 1767 – Ilgas, Silene Nature park, 06.06.2003. (4, A.B.), Dunava 14.06.2003. (5, Daugava river walley, A.B.), Kandava 07.2003. (8, A.B.), Ķemeri, Ķemeri Na-

tional park, 07. 2003. (14, A.B.).

Anthribidae Billberg, 1820

237. *Platystomus albinus* (Linnaeus, 1758) – Kalsnava, 07.06.2002. (1, windows traps, M.B.), Robežnieki, 07.2003. (2, V.P.), Moricsala Nature reserve, 26.09.2003. (1, U.V.).

238. *Platyrhinus resinosus* (Scopoli, 1763) – Gulbītis, near Lake Ušūrs, 05.06.2003. (1, windows traps, A.B.).

Attelabidae Billberg, 1820

239. *Pselaphorhynchites pauxillus* (Germar, 1824) – Pavilosta, 28.07.2003. (1, A.B.). New species for fauna of Latvia. In North Europe this species is known from Sweden, Denmark & Lithuania (Silfverberg 2004).

240. *Deporaus mannerheimi* (Hummel, 1823) – Lejasciems, 06.2003. (2, A.B.), Cesvaine, 06.2003. (1, A.B.).

241. *Apoderus erythropterus* (Gmelin, 1790) - Cesvaine, 06.2003. (1, A.B.).

Apionidae Schoenherr, 1823

242. *Ceratapion armatum* Gerstaecker, 1854 - Elerne, Nature park "Daugavas loki", 06.2003. (1, on *Centaurea*, A.B.). New species for fauna of Latvia. In North Europe this species is known from Sweden, Denmark & Estonia (Silfverberg 2004)

243. *Squamapion flavimanum* Gyllenhal, 1833 – Rīteri, 06.2003. (1, on *Origanum vurgare*, A.B.). New species for fauna of Latvia. In North Europe this species is known from Sweden, Denmark & Estonia (Silfverberg 2004)

Curculionidae Latreille, 1802

244. *Sitona griseus* (Fabricius, 1775) – Pāvilosta, 28.07.2003. (1, dry meadows near Baltic Sea coast, A.B.).

245. *Lixus bardanae* (Fabricius, 1787) – Cesvaine, 06.2003. (1, A.B.).

246. *Chromoderus affinis* (Schrank, 1781) – Mikeļtornis, 27.07.2003. (1, A.B.).

247. *Anthonomus brunnipennis* Curtis, 1840 – Slitere, Slitere National park, 26.07.2003. (1, A.B.).

248. *Hypera zoilus* (Scopoli, 1763) – Moricsala Nature reserve, 26.09.2003. (1, U.V.).

249. *Cionus hortulanus* (Geoffroy, 1785) - Riteri, 06.2003. (3, A.B.), Mikeltornis, 27.07.2003. (5, A.B.).

250. *Cionus tuberculosus* (Scopoli, 1763) - Cesvaine, 06.2003. (1, A.B.), Pāvilosta, 28.07.2003. (1, A.B.).

251. *Rhynchaenus alni* (Linnaeus, 1758) – Dunava, 10.07.2003. (1, A.B.), Grāveri, 26.06.2003. (1, A.B.).

252. *Mononychus punctumalbum* (Herbst, 1787) – Dunava, 10.07.2003 (Eglūna river walley, on *Iris sibirica,* A.B.).

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OCHTHEBIUS AMRISHI SP. NOV. FROM CENTRAL JAVA (COLEOPTERA: HYDRAENIDAE)

Dewanand Makhan

Makhan D. 2004. *Ochthebius amrishi sp. nov.* from Central Java (Coleoptera: Hydraenidae). *Acta Biol. Univ. Daugavp., 3 (2): 111 - 112.*

Ochthebius amrishi sp. nov. is described. The genus Ochthebius Leach is recorded from Java for the first time.

Key words: *Ochthebius amrishi,* new species, Hydraenidae, Java.

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Introduction

Ochthebius amrishi sp. nov. is the second species for Indonesia. The first species, Ochthebius sumatrensis JÄCH (2001) was described from Sumatra.

My brother Roepnarain Makhan collected the new species in a rice field, in Central Java. The holotype is deposited in the Zoologische Museum, Amsterdam, The Netherlands.

Ochthebius amrishi Makhan, *sp. nov.*

(Figs 1 - 1b)

Holotype: Male. Indonesia, Central Java, 15.11.1984, R. Makhan.

Paratypes : 1 male and 1 female, same data as holotype.

Description (holotype male): Habitus (Fig. 1b) , convex, 1.2 mm in length, 0.4 mm in width, shining.

Colour of head, pronotum and elytra black, legs and palpi brown.

Head: With setae, anterior margin of labrum with finely punctures, clypeus with finely punctures, frons with fine punctures on disk, smooth and shining between the punctures.

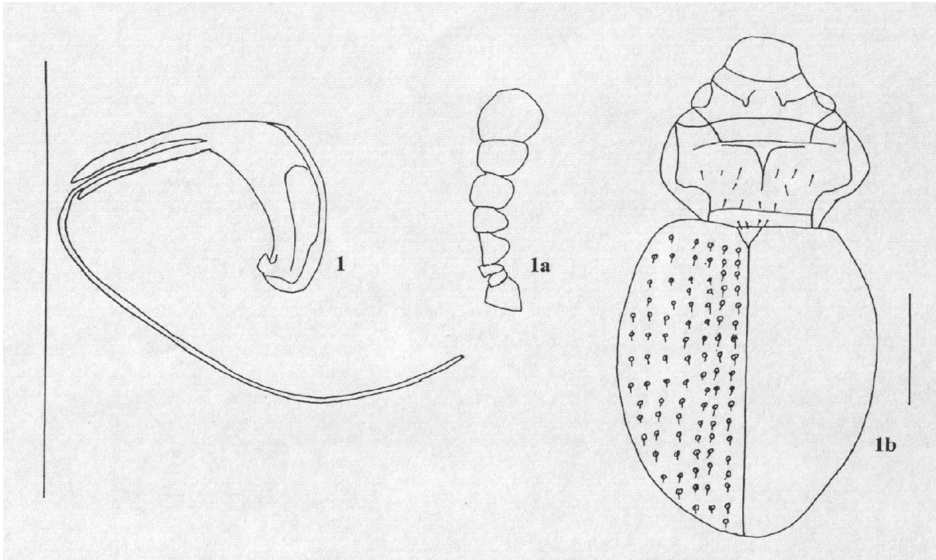
Antennae: (Fig. 1a) Last segment large and rounded.

Pronotum wider than long, with two large foveae in form of a straight line, one on the anterior and one on the posterior side, depressions absent, with finely punctures and setae.

Elytra length 0.7 mm, widest at the middle, interstriae flat and is wider that striae punctures, each punctures with a long seta. Elytra apices rounded.

Legs: All legs moderately long and slender.

Male aedeagus (Fig.1), median lobe is very long and is longer than the basal piece with the parameres, setae absent on the parameres.



Figs 1-1b. *Ochthebius amrishi* Makhan, sp. nov., 1 = aedeagus, 1a = antennae, 1b = habitus (scale = 0.25 mm)

Remarks: The median lobe is very long in *Ochthebius* amrishi sp. nov. (Fig. 1), median lobe short in *Ochthebius sumatrensis* JÄCH (2001). Parameres with setae in *Ochthebius sumatrensis*, setae absent in *Ochthebius* amrishi sp. nov.

Etymology: This species is named after my son Amrish Makhan.

Acknowlegement

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Reference

Jach M.A. 2001: Ochthebius s.str. Leach in Indonesia and Australia (Coleoptera: Hydraenidae). – Koleopterologische Rundschau 71: 101-104.

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