

Protected Aquatic Insects of Latvia – *Graphoderus bilineatus* (DEGEER, 1774) (Coleoptera: Dytiscidae)

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Abstract: The water beetle *Graphoderus bilineatus* (DEGEER, 1774) is one of the insect species protected by the Regulations of Cabinet of Ministry in Latvia. The species is distributed over the main part of the European Plain. Published data, existing collections, data collected during the project „Analysis of the Specially Protected Nature Territories in Latvia and Establishing of EMERALD/Natura 2000 Network” and material collected by Latvian entomologists have all been used in the analysis of the distribution of this species. The distribution of *G. bilineatus* was mapped using a basic grid of 5x5 km squares in the Baltic grid system. So far, the assessment of populations of *G. bilineatus* suggests that there are 13-20 areas where this species occurs. In total, *G. bilineatus* is recorded from 43 squares in Latvia. Most known localities are concentrated in central and NW Latvia. Based on recent observations, the estimated number of areas where it occurs could be at least 90-100. The majority of Latvian populations of *G. bilineatus* have been recorded in the natural eutrophic lakes with *Magnopotamin-* or *Hydrocharition*-type vegetation (13 records) and ox-bows (17 records). Other *G. bilineatus* habitats are hard oligo-mesotrophic lakes with benthic vegetation of *Chara* spp. (3 records), and also natural dystrophic lakes and ponds, in active raised bogs or transition mires (7 records). Only a few specimens have been found in rivers, ponds and temporary pools (2 records). In the majority of cases *G. bilineatus* was recorded from June to August, occasionally also in May, September and October. In the most cases 1-2 beetle specimens were caught and in only a few cases were more than 5 specimens caught at one site. *G. bilineatus* was found together with other *Graphoderus* species in two ox-bows in Ziemeļgauja PPNT.

Key words: Coleoptera, Dytiscidae, *Graphoderus bilineatus*, protected species, habitats, distribution, Latvia.

Introduction

The water beetle *Graphoderus bilineatus* (DEGEER, 1774) is one of the insect species protected by the Regulations of Cabinet of Ministry of Latvia (Regulations... 2000). *G. bilineatus* can be found in most European countries – Austria, Belarus, Belgium, Bosnia and Herzegovina, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Great Britain, Hungary, Italy, Latvia, Lithuania, The Netherlands, Norway, Poland, Slovakia, Slovenia, Sweden, Switzerland, The Ukraine, former Yugoslavia and Russia (Central, Southern and Northern part of Europe), as well as in the Asian part of Russia – Western Siberia (Nilsson 2005). This species is also included on the IUCN Red List of Threatened Animals (Foster 1996). The species is now protected in the majority of European countries following the Bern-Convention (The Bern Convention...

1979, Council... 1992).

In Latvia, the species has been first mentioned by G. Seidlitz (1872-1875) as a considerably rare species in Līvzeme (former Livland: northern-eastern part of Latvia and southern part of Estonia) and Kurzeme (Kurland). Later he has described the species as „not common” (Seidlitz 1887-1891) in the whole Baltic region. Later, the species was found in Lake Rāznas in the eastern part of Latvia (Качалова 1960) and Lake Engure in the western Latvia (Spuris 1960). In 1995, M. Holmen (1995) published records of the species in a small lake near Siksala of the Teiči Nature Reserve. Some remarks about confirmed localities and distribution have been made in the recent papers (Barševskis et al. 2005, Telnov et al. 2005).

Methods

Published data, the collections of the Department of Zoology and Animal Ecology of the Faculty of Biology of the University of Latvia, collections of the Institute of Biology of the University of Latvia, the data collected during the project „Analysis of the Specially Protected Nature Territories in Latvia and Establishing of EMERALD/Natura 2000 Network” in 2001-2002 and material collected by Latvian entomologists until 2006 have been used in the analysis of the distribution of this species. The collection deposited in the Institute of Biology includes 16 specimens of *G. bilineatus*, all collected between 1959 and 1971. Beetles were collected by using a water net or by visual searching and capturing by hands. The recent material was collected from 1997 to 2006. All data are included in the author's database (totally 48 records).

A part of material was collected using bottle-type (volume 5 l) traps, shown in Figure 1. Traps were set in three ox-bows (namely Starkas, Pirtsličis, Marsi) in Ziemeļgauja PPNT (01-06.08.2006). Raw liver was used as bait. Traps were placed in the littoral zone among

macrophytes, at depth between 0.1-0.3 m. Dominate macrophyte species were as follows:

- 1) ox-bow Starku – *Stratiotes aloides*, *Hydrocharis morsus-ranae*;
- 2) ox-bow Pirtsliča – *Lemna minor*, *Lemna trisulcata*, *Elodea canadensis*;
- 3) ox-bow Marsu – *Elodea canadensis*, *Nuphar lutea*, *Ceratophyllum demersum*.

Distribution of *G. bilineatus* was mapped using a basic grid of 5x5 km squares of the Baltic grid system on a Transverse Mercator projection (TM-1993) of Latvia. For preparing the *G. bilineatus* distribution map the data from the author's database were used. The typological classification of water bodies and description of other parameters was based on publications (Kabucis 2000, Cimdiņš 2001).

Explanations: d. – district; env. – environment; NP – National Park; NR – nature reserve; PPNT – particularly protected nature territory; vill. – village. The number of specimens is given in brackets after the date of collection.

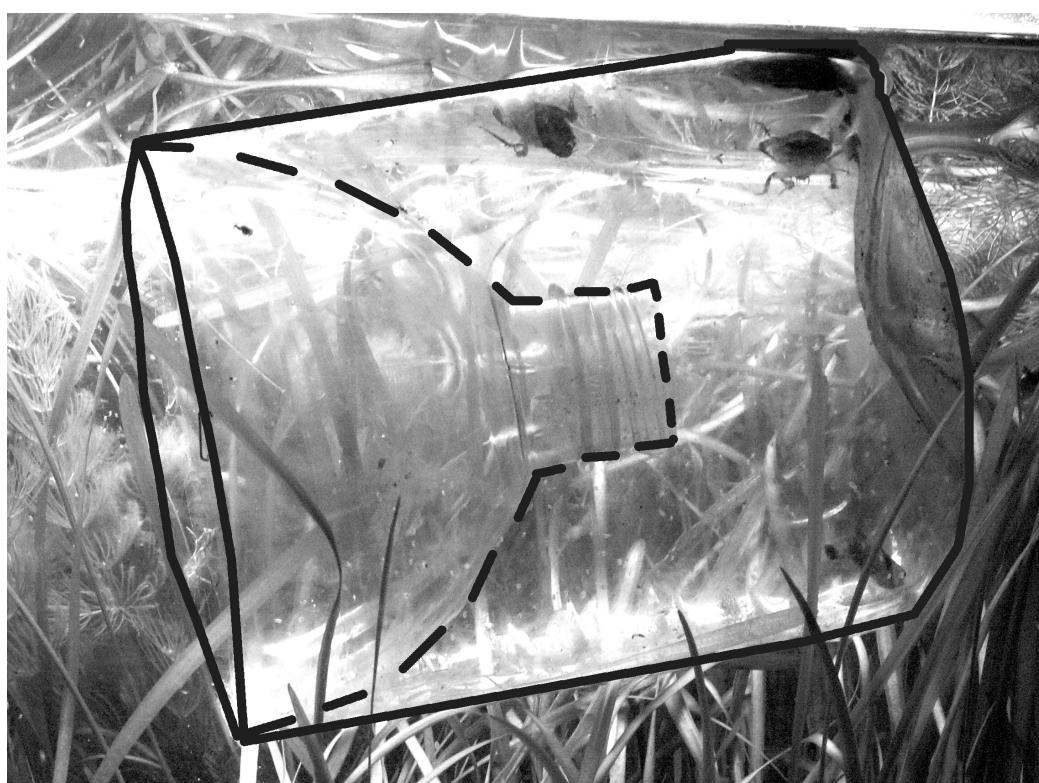


Figure 1. Bottle-type trap (volume 5 l) commonly used for caching adephagan water beetles.

Results

A list of localities sorted by administrative districts:

Cēsis d., Gauja NP, Lake Sāls, 09.08.1999 (1), leg. M.Kalniņš; Cēsis env., Gauja NP, ox-bow Kvēpenes, 11.08.1999 (1), leg. M.Kalniņš; Lake Rijas, 03.07.2002 (1), leg. V.Spuņģis; Gauja NP, ox-bow Tītmaņu near Līgatne, 01.09.2002 (1), leg. M.Kalniņš; Gauja NP, Līgatne, ox-bow Tītmaņu, 11.06.2005 (numerous), leg. L.Hendrich; Gauja NP, Klāmaņi house env., pond, 11.06.2005 (numerous), leg. L.Hendrich; Cēsis city, Gauja NP, ox-bow near the sanatorium Gaujaslīči, 26.06.2004 (1), leg. D.Telnov; Lake Brenkūzis near Taurene, 09.07.2006 (1), leg. M.Kalniņš.

Daugavpils d., Lake Sventes PPNT, possibly near Sebežu peninsula, 15.06.2003 (3), leg. R.Cibuļskis.

Gulbene d., Pededzes lejtece PPNT, ox-bow near Upmalieši house, 05.08.2001 (1), leg. V.Spuņģis; Pededzes lejtece PPNT, ox-bows of left bank of River Pededze, South from Ezernieki forestry, 12.07.2006 (2), leg. D.Teļnovs.

Jelgava d., ox-bow near Dalbe vill., 19.08.1966 (2♂♂), leg. J.Sloka.

Liepāja d., Lake Tāšu PPNT, near Vīnkalni vill., 22.06.2002 (1), leg. V.Spuņģis.

Limbaži d., Augstroze PPNT, pond near Pilskalni vill., 13.06.2001 (2), leg. V.Spuņģis.
Madona d., Lake Vidus, 04.06.1960 (1♂, 1♀), leg. Z.Spuris; Teiči NR, small lake near Siksala, 08.09.1993 (3), leg. M.Holmen; Krustkalni NR, Lake M.Plencis, 03.10.1997 (1), leg. M.Kalniņš; Teiči NR, Lake Isliena, 17.06.1998 (3), leg. M.Kalniņš; Vestiena env., Lake Ilziņš PPNT, 13.06.2000 (1), leg. A.Poppels; Lubāna lowland PPNT, in Meirānu channel, 28.07.2002 (1), leg. G.Akmentiņš.

Rēzekne d., Lake Rāznas, (Качалова 1960); Lubānas un Suļagala bogs PPNT, in Meirānu channel and ditch, 27.07.2002 (2), leg. G.Akmentiņš; Mušas ponds near Lake Rušons,

26.05.2006 (1), leg. C.Fägerström.

Rīga d., Gauja NP, ox-bow Saulstaru near Sigulda, 02.06.1971 (1♂, 1♀), leg. Z.Spuris; Jūrmala city, Lake Slokas, 12.07.1968 (4♂♂, 1♀), leg. S.Lipska; Gauja NP, Sigulda, ox-bow between cave Velnala and Sigulda bridge, 10.06.2005 (1), leg. D.Telnov; Lake Ummeru near River Lorupe, outlet, 27.05.2001 (1), leg. M.Kalniņš.

Talsi d., Talsu pauguraine PPNT, Lake Mācītājmājas, 25.08.1959 (1♂), leg. Z.Spuris; Lake Engure PPNT, NW part, 25.08.1959 (1♂), leg. Z.Spuris; Lake Pļavu, 11.09.1959 (1 ♂), leg. V.Šmits; River Raķupe near bridge (road from Pāce to Upenieki), 26.05.2003 (1), leg. D.Telnov; Pāce meadows PPNT, ox-bow of River Pāce, 31.07.2003 (2), leg. V.Spuņģis; Talsu pauguraine PPNT, Lake Mācītājmājas, 07.06.2002 (1), leg. V.Spuņģis; Slītere NP, Lake Pēterezers, 07.2002 (1), leg. V.Spuņģis.

Tukums d., Ķemeri NP, Lake Kaņieris, 30.05.1968 (2♂♂), leg. S.Lipska; Ķemeri NP, Lielais Tīrelis, 12.06.2005 (numerous), leg. Balfour-Browne Club meeting participants.

Valka d., Mežole PPNT, temporary pools, 08.07.2001 (1), leg. V.Spuņģis; Ziemeļgauja PPNT: ox-bow Pirtsīcis, 01.08.2006 (1), ox-bow Marsi, 01-06.08.2006 (17), ox-bow western from Starkas, 01-06.08.2006 (5), leg. M.Kalniņš.

Valmiera d., Vidusburtnieks PPNT, near Spilvas house, 26.06.2001 (1), leg. V.Spuņģis; Vidusburtnieks PPNT, ox-bow of River Rūja, 26.06.2005 (1), leg. M.Kalniņš; Rūjas paliene PPNT, ox-bow near River Rūja, 29.07.2006 (2), leg. M.Kalniņš; Lake Burtnieku near Dūre, 30.07.2006 (1), leg. A.Skuja.

Ventspils d., Ance bogs and forests PPNT, ox-bow near River Irbe at Austerlunka, 22.07.2001 (1) and at Rindzivas, 22.07.2001 (1), leg. V.Spuņģis; Oviši PPNT, River Lūžupe near Jaunbelti house, 27.07.2001 (1), leg. V.Spuņģis; Pelcenes bog PPNT, 30.07.2003 (1), leg. V.Spuņģis.

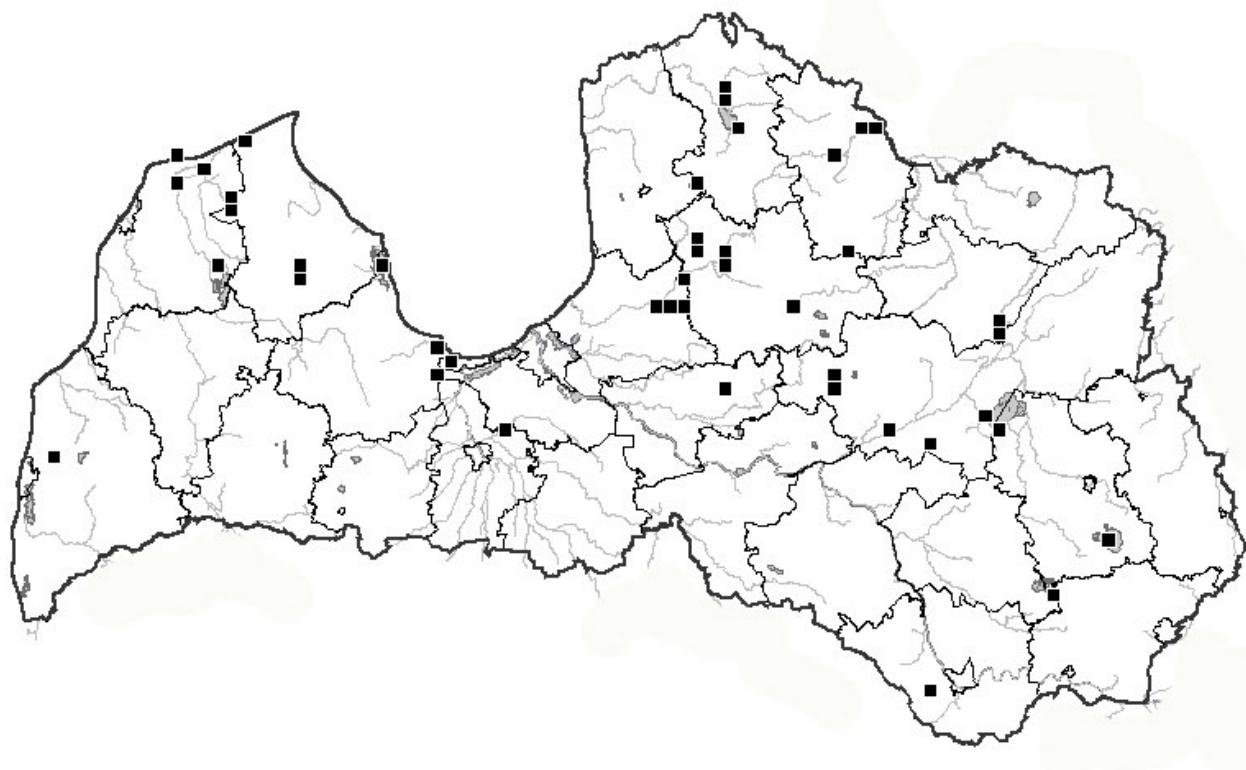


Figure 2. The distribution of *Graphoderus bilineatus* in Latvia.

Discussion

So far assessment of Populations of *G. bilineatus* indicates that there are 13-20 areas where this species occurs in Latvia. As the types of habitats – eutrophic lakes, ox-bows etc. here the species has been found are widespread in Latvia and the environmental conditions of the historically known areas have not changed significantly (Cimdiņš 2001, author's personal observations), the total number of areas where species occurs is likely to be much higher. The current known distribution of the *G. bilineatus* in Latvia is given in Figure 2. In total, *G. bilineatus* is recorded from 43 squares in Latvia. The majority of known localities are situated in the central and the Northwestern part of Latvia. This is partially a result of differences in the frequency of visiting of different regions. 35 of the squares have been discovered within the last decade. This is a result of focused studies of protected nature territories during the project „Analysis of the Specially Protected Nature Territories in Latvia and Establishing of

EMERALD/Natura 2000 Network” and the studies in the ox-bows of the River Gauja.

So far *G. bilineatus* was found in 4 ox-bows along the River Gauja inside the Gauja NP and in 3 ox-bows along the River Gauja inside the Ziemeļgauja PPNT. Approximately 350-400 oxbows are estimated to occur along River Gauja from Gaujiena to the estuary (stretch length about 250 km) (personal observations). Based on data on the species density and habitat requirements, it is considered that *G. bilineatus* populations may be found in ca. 1/3 of all oxbows inside the Gauja NP (about 30-40 oxbows). Probably, the valley of the River Gauja is also a natural migration corridor, because of habitat continuity. The single locality of this species in the saouthern Estonia is also situated near the valley of River Gauja (Süda, Voolma 2005) also.

Based on the above, the minimum number of sites where *G. bilineatus* occurs in Latvia could be estimated as at least 90-100 sites.

According to Klausnitzer (1996) the species tends to be more halophilic within the periphery of its distribution range, whereas it is subhalophilic or acidophilic in its main range. It is recorded both in large and permanent water reservoirs and in temporary pools. Latvia is situated within the main distribution range of the species (Nilsson 2005). It is apparent that the majority of Latvian population of *G. bilineatus* has been recorded in natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* – type vegetation (13 records) and ox-bows (17 records). Other *G. bilineatus* habitats are hard oligo-mesotrophic lakes with benthic vegetation of *Chara* spp. (3 records), natural dystrophic lakes and ponds, in active

raised bogs or transition mires (7 records). Only a few specimens have been observed in rivers, ponds and temporary pools (2 records). Most ox-bows inspected by author have a dense vegetation with high diversity of aquatic plants species.

G. bilineatus has been mainly recorded in June (15 records), July (14 records) and August (9 records), rarely in May (4 records), September (3 records) and October (1 record). In most cases 1 to 2 beetles were caught, and in only a few cases were more than 5 beetles caught in one place. *G. bilineatus* has been recorded together with other species of *Graphoderus* in two ox-bows in PPNT Ziemeļgauja (table 1).

Table 1. Numbers of *Graphoderus* species individuals collected by use of bottle-type traps in ox-bows of the River Gauja (Ziemeļgauja PPNT) in 01-06.08.2006.

Site (trap No.) Species	Ox-bow Starkas			Ox-bow Pirtsīcīs			Ox-bow Marsi		
	No.1	No.2	No.3	No.1	No.2	No.3	No.1	No.2	No.3
<i>G. bilineatus</i>	1	0	4	0	0	0	10	0	7
Other <i>Graphoderus</i>	20	0	8	0	0	0	3	0	2

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Kopsavilkums

Divjoslu airvabole *Graphoderus bilineatus* (DEGEER, 1774) ir viena no īpaši aizsargājamām kukaiņu sugām Latvijā. Suga ir sastopama lielākajā daļā Eiropas. Datu analīzē izmantoti publicētie dati, kolekciju materiāli,

projekta “Latvijas īpaši aizsargājamo teritoriju sistēmas saskaņošana ar EMERALD/NATURA 2000 aizsargājamo teritoriju tīklu” dati un Latvijas entomologu ievāktais materiāls. *G. bilineatus* izplatības attēlošanai izmantots 5x5 km kvadrātu tīkls Baltijas koordinātu sistēmā. Visi dati apkopoti autora datu bāzē (kopā 48 ieraksti).

Līdz šim Latvijas populācijas novērtējums bija 13-20 atradnes, kas pamatā bija balstīts uz literatūras datiem un atsevišķiem sugas atradumiem. Pašlaik *G. bilineatus* konstatēta 43 kvadrātos. Vairums atradņu koncentrējas Latvijas centrālajā, ziemeļu un ziemeļrietumu daļā. Pamatojoties uz apkopotajiem datiem, var prognozēt, ka sugai Latvijā varētu būt vismaz 90-100 atradnes.

Lielākā daļa Latvijas populācijas konstatēta dabīgos eitrofos ezeros ar iegrīmušo ūdensaugu un peldaugu augāju (13 vietas) un vecupēs (17 vietas). Citi *G. bilineatus* apdzīvotie biotopi ir mezotrofas ūdenstilpnes ar bentisku mieturaļgu augāju (3 vietas), distrofi ezeri, arī augstajos un pārejas purvos (7 vietas). Tikai daži individuīdi atrasti upēs, dīķos vai

īslaicīgās ūdenstilpnēs (2 vietas).

Vairumā gadījumu *G. bilineatus* konstatēta (noķerta) jūnijā-augustā, retāk - maijā, septembrī un oktobrī. Vairumā gadījumu vienā vietā noķerta 1 vai 2 vaboles un tikai dažos - vairāk kā 5 vaboles. Ziemelgaujas aizsargājamo ainavu apvidū *G. bilineatus* konstatēta kopā ar citām *Graphoderus* sugām.

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