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First record of *Abax carinatus* in Flanders and notes on an inventory of ground beetles in the forest reserve Jagersborg (Maaseik)

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Summary

During recent short-term ground beetle sampling campaigns in the forest reserve Jagersborg (Maaseik, prov. Limburg, Flanders, Belgium), 34 carabid species were observed. One of these species, *Abax carinatus* (DUFTSCHMID, 1812), considered extinct before in Belgium, was found for the first time in Flanders. All available data on this species from Belgium and adjacent parts of the Netherlands, Germany and Luxemburg are summarized in this contribution, along with a detailed account on the area and site where a population of this species was discovered. The presence of this population in the Jagersborg forest reserve is of high scientific and conservation interest.

Keywords: Carabidae, *Abax carinatus*, rediscovery in Belgium, ecology, life cycle, forest reserve, forest history, Jagersborg, conservation

Introduction

Within the framework of biodiversity monitoring of forest reserves in Flanders (VANDEKERKHOVE, 1998), each of the selected and designated reserves is actually being documented by compiling history as well as all available former knowledge of biological values of each site. One of the main goals is also to establish accurate management plans for these sites in view of maintaining and, if possible, increasing biological values. Several of our forest reserves, unfortunately, have not yet been well studied before, especially for invertebrates, and are therefore urgently in need of basic inventories and future ecological and genetic monitoring.

A recent study of the forest reserve Jagersborg, located near Maaseik in the province of Limburg (Belgium), in this respect stimulated to perform a preliminary sampling in order to obtain a first inventory of the ground beetles of the area. At the onset of this study practically no such data were available from this area. Pitfall trapping as well as some hand-collecting were therefore performed on different occasions during 2006. These samplings revealed some highly interesting species, including the carabid *Abax carinatus*, recorded for the first time for Flanders and recently considered extinct in Belgium.

The following paper summarizes the results of the mentioned samplings, after a brief account on the history and location of this forest reserve, and with special emphasis on *Abax carinatus*, a very rare carabid beetle in Belgium and surrounding countries. All present and former data on the detailed occurrence of *Abax carinatus* in our country and adjacent regions have also been compiled.

Material and methods

The forest reserve Jagersborg

The domanial forest Jagersborg covers about 300 hectares, of which 100 hectares is forest

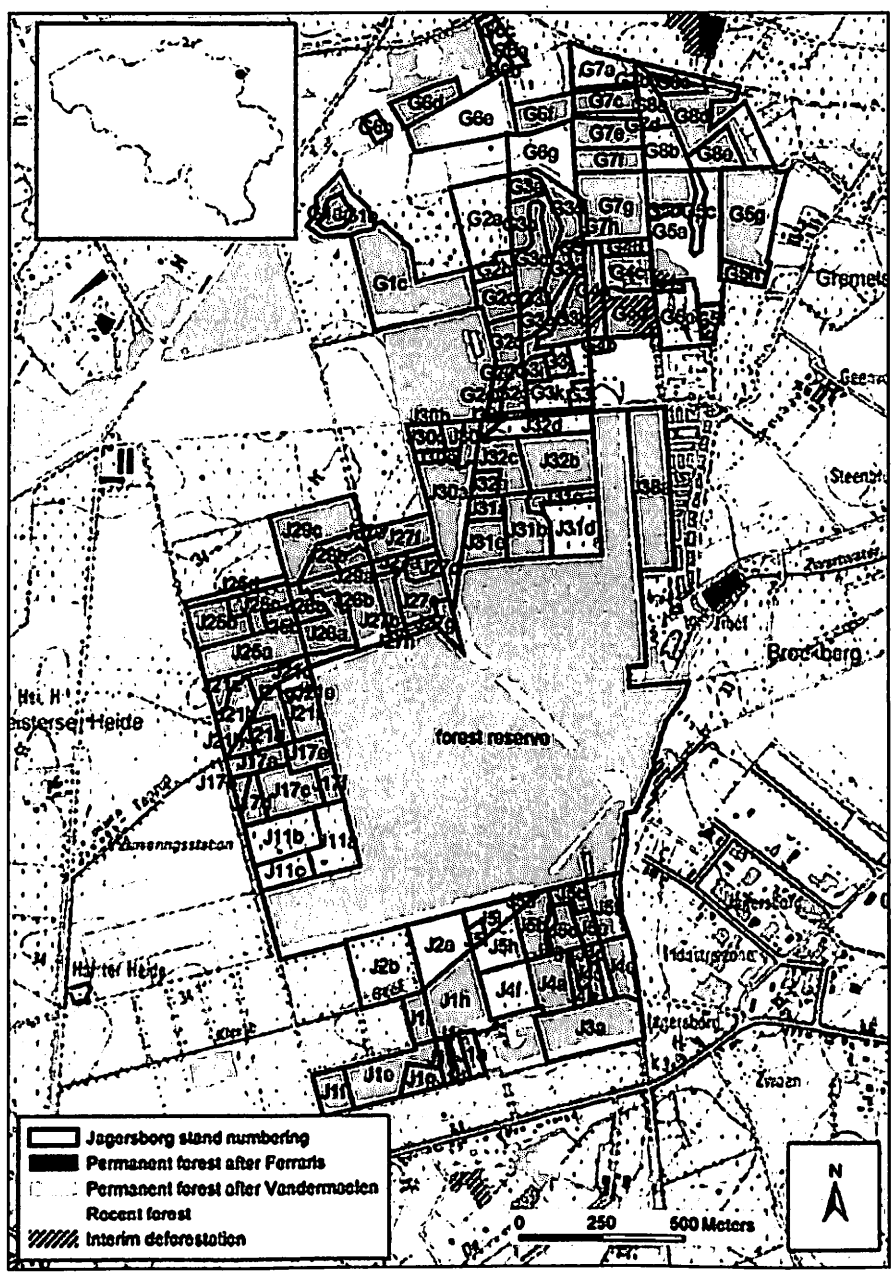

Fig. 1. Afforestation history of the Jagersborg area: approximate forest age, based on digitized forest cover in 1775 (de Ferraris map), 1850 (Vandermaelen map), 1936 (Institute for Military Cartography) and 2000 (Flemish Forest Survey) (DE KEERSMAEKER et al., 2001); background of the recent topographic map (National Geographic Institute).

reserve, and is situated at the border between Maaseik and Neeroeteren in the easternmost part of the province of Limburg (Flanders, Belgium). Until the end of the 19th century, the site was part of a large heathland-marshland area, with some forest patches along its eastern edge. About 1870, the entire area was, as far as possible, drained and largely planted with Scots pine (*Pinus sylvestris* L.). In 1911, the major parts of the domanial forest were replanted with Oak (*Quercus robur* L. and *Quercus rubra* L.), while many parts outside the actual forest were transformed from coniferous forest to agricultural fields or pastures. During the first half of the 20th century, many forest stands, inside as well as outside the domanial forest, were also converted to agricultural areas.

The afforestation history and actual stand numbering of the Jagersborg area is depicted in Figure 1, while the historical evolution is summarized in Figure 2.

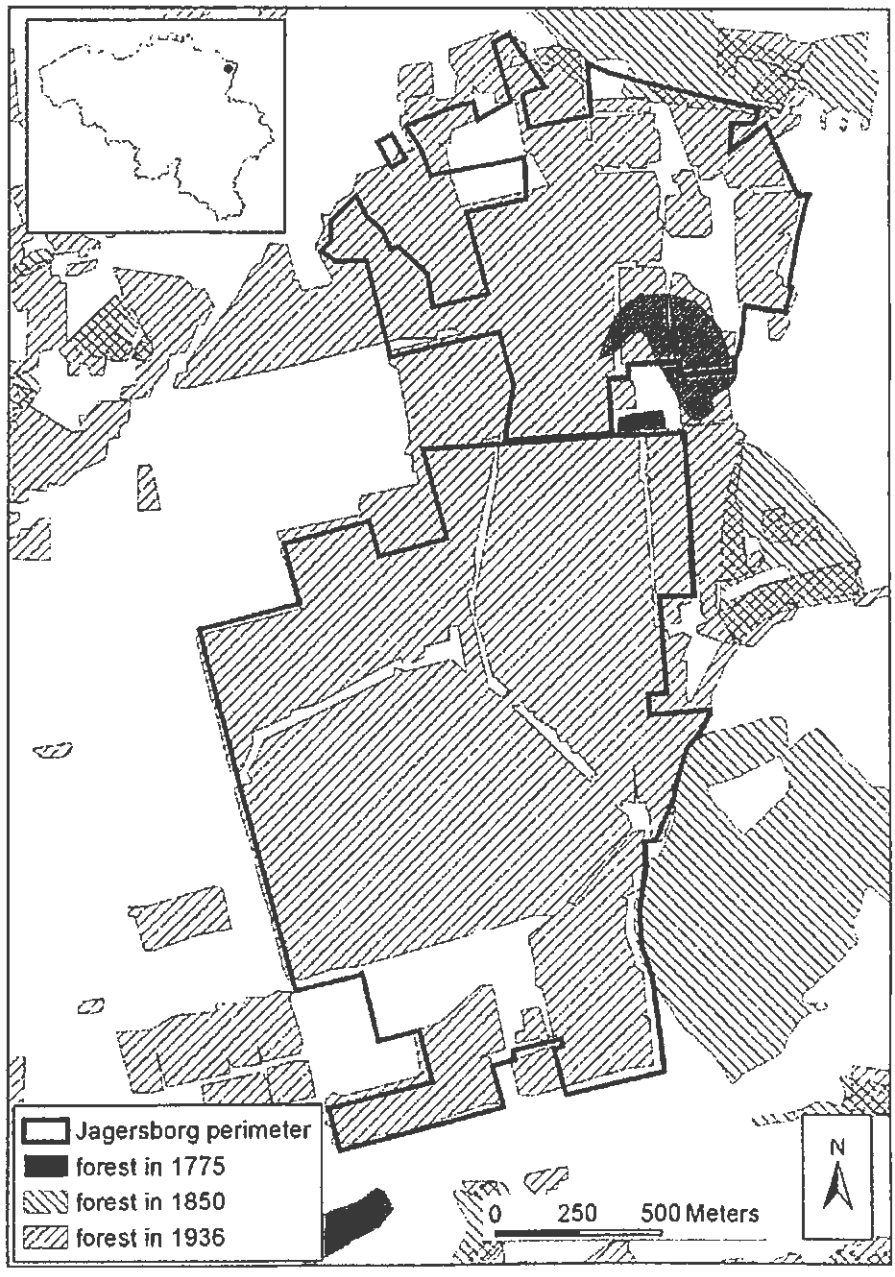

Fig. 2. Historical evolution of the Jagersborg area: digitized forest cover in 1775 (de Ferraris map), 1850 (Vandermaelen map) and 1936 (Institute for Military Cartography).

Sampling methods

Hand-collecting as well as short-term pitfall trapping was performed at Jagersborg during April-June and November 2006. On the whole, we performed a preliminary sampling on 8 sites, in different habitats and locations of the forest.

Results

Observed carabid beetles

Table 1 summarizes the carabid beetles that were observed during 2006 in the Jagersborg area, mentioning the UTM 1 km grid reference codes and main investigated habitat type. Numbers cannot be compared directly between investigated sites, as sampling effort differed between them.

On the whole, we identified more than 500 ground beetles, belonging to 34 species, for the area. These include some species of special faunal interest: *Abax carinatus* (first confirmed population for Flanders!; cf. DESENDER *et al.*, 1995; see further), *Calosoma inquisitor* (a stenotopic caterpillar hunter from oak forests) and *Pterostichus quadrifoveolatus* (a typical ground beetle for burned forest sites).

Table 1. Carabid beetles observed during 2006 in the Jagersborg area, mentioning the UTM 1 km grid reference codes and main investigated sites and habitat types.

UTM 1 KM CODE	FS9164	FS9165	FS9165	FS9166	FS9166	FS9167	FS9265	FS9267	total
HABITAT / SPECIES	DECIDUOUS FOREST	MARSH FOREST	OAK AND PINE FOREST	DECIDUOUS FOREST	FOREST EDGE AND CLEARING	DECIDUOUS FOREST	DECIDUOUS FOREST	POPLAR FOREST	
Abax carinatus			6						6
Acupalpus dubius								1	1
Agonum assimile				1		1	2	12	16
Agonum fuliginosum		1							1
Agonum muelleri		1			1				2
Agonum obscurum							6	1	7
Agonum sexpunctatum		1							1
Agonum thoreyi		1							1
Anisodactylus binotatus			1		2				3
Badister lacertosus								1	1
Badister sodalis								1	1
Bembidion biguttatum								2	2
Bembidion lampros			1						1
Bradycellus harpalinus	1								1
Calosoma inquisitor			2						2
Carabus granulatus	1		91	2		40	5	11	150
Carabus nemoralis			60		1		8	4	73
Carabus problematicus			32	1			7		40
Carabus violaceus purpurascens			6				5		11
Clivina fossor			5						5
Dyschirius globosus								6	6
Harpalus rufipes	1					1			2
Leistus rufomarginatus							2		2
Loricera pilicornis			2			1			3
Nebria brevicollis							51		51
Notiophilus rufipes			1						1
Pterostichus cupreus					1				1
Pterostichus niger	1	7	9			1	8		26
Pterostichus nigrita			1				1	1	3
Pterostichus oblongopunctatus			85	1		1	3	2	92
Pterostichus quadrifoveolatus			1						1
Pterostichus rhaeticus								2	2
Pterostichus strenuus								11	11
Pterostichus versicolor						1			1
	4	11	303	5	5	46	98	55	527

Rediscovery of *Abax carinatus* in Belgium

Figure 3 illustrates the forest habitat where a population of *Abax carinatus* was discovered. It is a rather open forest dominated by oak (*Quercus robur* L.) with some beech (*Fagus sylvatica* L.) and Japanese larch (*Larix kaempferi* (LAMBERT) CARR.) in the near surroundings. The soil is covered with leaf litter, a lot of dead wood, some ferns, mosses and here and there some *Molinia caerulea* (L.) MOENCH tussocks. As can be derived from Figure 4, *Abax carinatus* (total length about 10 mm), can relatively easily be distinguished from other *Abax* species by the

Table 2. Records of *Abax carinatus* in Belgium and surrounding areas (BEL= Belgium, NL=the Netherlands, LUX= Luxemburg and GER= Germany)

Locality	UTM 10 km	Country	Year	Plotnumber on Fig. 5
Maaseik-Jagersborg	FS96	BEL	2006	1
Spa	GR09	BEL	1951	2
Hautregard	FR99	BEL	1942	3
Hautregard	FR99	BEL	1932	4
Sart-Hockai-La Vecquee	GR09	BEL	1931	5
Remouchamps	FR99	BEL	1931	6
Hautregard	FR99	BEL	1931	7
Hautregard	FR99	BEL	1930	8
La Reid-La Porallee	FR99	BEL	1929	9
Hautregard	FR99	BEL	1928	10
Deigne-Bois de Deigne	FR99	BEL	1928	11
Hautregard	FR99	BEL	1927	12
Francorchamps	GR09	BEL	1913	13
Gomzé-Andoumont	FS90	BEL	1899	14
Francorchamps	GR09	BEL	1899	15
Theux	GS00	BEL	<1850	16
Spa	GR09	BEL	<1850	17
Gerendal	GS03	NL	1995	18
Herckenbosch-Meinweg	KB97	NL	1994	19
Herckenbosch-Scheidingsweg	KB97	NL	1987	20
Herckenbosch	KB97	NL	1987	21
Haelen-Spar	GS08	NL	1970	22
St-Odilien	GS06	NL	1944	23
Epen	GS02	NL	1931	24
Epen	GS02	NL	1921	25
Baexem-Exaeten	GS07	NL	1885	26
Roermond	KB97	NL	<1850	27
Houthem	FS93	NL	<1850	28
Baexem-Exaeten	GS07	NL	<1850	29
Brunssum	GS04	NL	<1850	30
Dudelange (GEREND, 1989)	KV98	LUX	1989	31
Brüggen (HANNING, 2006)	LB07	GER	1978	32
Bissen (MERCATORIS, 1992)	KA85	LUX	1989	33
Medernach (MERCATORIS, 1992)	KA92	LUX	1989	34
Folkendange (MERCATORIS, 1992)	LA02	LUX	1989	35
Brouderbour (MERCATORIS, 1992)	KA92	LUX	1989	36

strongly punctated basal regions of the pronotum, as well as the punctated elytral striae.

Distribution of *Abax carinatus* in Belgium and surrounding areas

The distribution of *Abax carinatus* in Belgium and surrounding areas is depicted in Figure 5. All former records (dates and localities) for this carabid beetle, are mentioned in Table 2. In the Netherlands, the distribution of *A. carinatus* is limited to some records in the centre and the southeast of the country (pers. comm. Dutch Carabid Research Group; TURIN, 2000).

It is clear that the discovered *Abax carinatus* population at Jagersborg reaches the westernmost border of the distribution area of this Central European carabid beetle. So far, known westernmost records were from Belgium (western edge of the 'Hautes Fagnes', around the town of Spa) and the north-eastern part of France (MARCHAL, 1998; NEURAY, 1998 (dept. Meuse)) as well as Luxemburg (GEREND, 1989; MERCATORIS, 1992). In the south of Europe,

Fig. 3. Forest habitat in Jagersborg where a population of *Abax carinatus* was discovered.
Fig. 4. Habitus of *Abax carinatus* (total length about 10 mm), with strongly punctated basal regions of the pronotum, as well as punctated elytral striae.

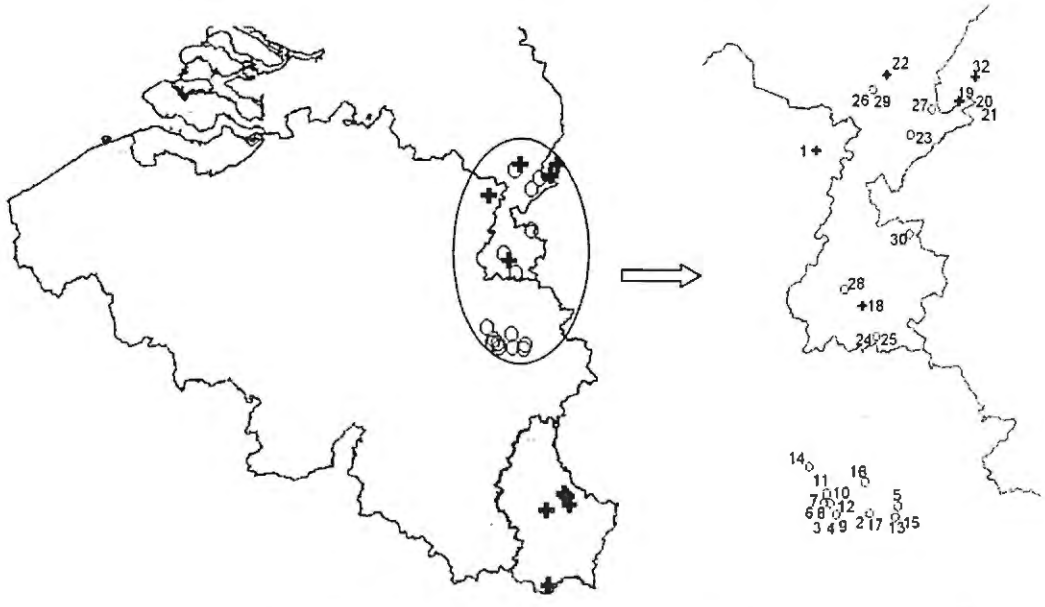

Fig. 5. Distribution of *Abax carinatus* in Belgium and surrounding areas (+= records after 1970 and o = records before 1951. Location numbers are explained in Table 2.

Abax carinatus occurs from northern Italy to the Balkan, Albania and, in the east, until Rumania, Bulgaria and European Turkey (NEURAY, 1998; TURIN, 2000). To the north, there are also records from the central parts of the Netherlands (Veluwe, TURIN, 2000) and one (northernmost?) population from lower Saxony (Germany; pers. comm. ASSMANN). The single record from Rheinland-Westphalen (HANNIG, 2006) is closely situated to the localities in the southern parts of the Netherlands. The species is completely lacking on the British Isles, in Denmark and Fennoscandinavia and rare elsewhere in Central and Southern Germany (TURIN, 2000).

Discussion

Abax carinatus, according to TURIN (2000), shows a European distribution pattern, occurring in the Netherlands as well as in Belgium at the fringes of its relatively small distribution area. There are only few available ecological data on the species, suggesting a preference for rather wet peatland and forest (TURIN, 2000), including hardwood floodplain *Querco-Ulmetum* forest, flooded once or twice a year for a short period (ASSMANN, pers. comm.) and *Primulo-Carpinetum* forest (MERCATORIS, 1992; GEREND, pers. comm.). In the northernmost populations of the Netherlands ('Hoge Veluwe'), the species was

encountered mainly in wet parts, but also in more open sites such as grasslands and heathland managed by sod cutting (TURIN, 2000). MARGGI (1992) mentions the species as stenotopic in Swiss forests up to an elevation of 750m.

The area in Jagersborg corresponds more or less with these suggested habitat demands, but more data are needed for a better understanding of the species' ecology. On one aspect all authors agree: extant populations of this constantly wingless ground beetle (cf. DESENDER, 1989) occur highly localized and therefore are included on most Red Lists with species of special conservation interest. The soil of many of these sites (including Jagersborg) is a humid to wet sandy loam, whereas surrounding areas (apparently without the species) mainly are composed of more sandy soils. This further suggests the preference for floodplain humid forest areas and could well have been responsible for the northernmost extension of beetles along river valleys. The sampling site at Jagersborg as such seems to be connected more or less to the nearby Dutch sites through valleys with somewhat heavier soil composition. A real connectivity however nowadays no longer is present as in this region beetles only were found in discontinuous forests.

All data on *Abax carinatus*, regrouped in this paper (Belgium, the Netherlands) were obtained between the end of April till early September with a peak in May-July. Most individuals from Belgium appear to have been collected during May, suggesting that the species mainly breeds in spring and/or early summer in our region. In France, NEURAY (1998) found one male specimen early June. MARGGI (1992) mentions the presence of hibernating beetles in Switzerland. All individuals found in Jagersborg (5 males/1 female) were captured in pitfalls during the second half of May 2006. Additional collecting at the same location in Jagersborg during November 2006 did not reveal any beetles, nor larvae. Some sites of this forest reserve will now be sampled continuously during one year, which could yield more data in order to elucidate the ecology and life cycle of this special carabid in our region. Because the Jagersborg forest reserve, at least to Belgian standards, is rather large, it is hoped that (a) large population(s) persist(s) in this area. In the near future, we also plan to study the genetics of this highly endangered species in cooperation with colleagues from abroad.

It is not yet clear how far *Abax carinatus* would be a strong indicator of ancient forest in our region and adjacent areas, though at present the data suggest the occurrence of only highly localized, and therefore severely threatened, relic populations (cf. TRAUTNER & BACK, 2005; HANNIG, 2006). NEURAY (1998), on the other hand, mentioned that the suggested highly discontinuous occurrence of this species could partly be explained by a lack of sufficient observations, partly maybe also due to the fact that *Abax carinatus* can easily be confused with the related species *Abax parallelus*. We therefore suggest it might be wise in future studies to check former identifications of these species from the same and adjacent areas whence *Abax carinatus* is now known. A similar strategy, used by HANNIG (2006), led only very recently to the first confirmed observation for Rheinland-Westphalen. Hopefully, additional future samplings will reveal some more persisting populations of this extremely rare and constantly flightless carabid. The population at Jagersborg, possibly the only one in our region, in any case is of utmost scientific and conservation value and should be continuously protected and monitored.

Acknowledgements

We want to thank the Dutch Carabid Research Group for the details on all Dutch records of *Abax carinatus*. Special thanks go also to Karsten Hannig for his details concerning the here-mentioned German record of *Abax carinatus*, to Thorsten Assmann, Jürgen Trautner, Heinrich Terlutter and David Wrase for helping us in the search of data for Rheinland-Westphalen (Germany) and other regions of Germany, and to Raoul Gerend for information about the species in Luxemburg. Flemish forest authorities kindly allowed us to sample the Jagersborg forest reserve. This study was made possible through the financial support of Belspo-project 2005 MO/36/14 ('How does forest history influence invertebrate diversity and evolution?') and also fits into the research project INBO/TWOL-2006/01 ('A new distribution atlas and Red List of the ground and tiger beetles in Flanders (Coleoptera, Carabidae)').

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Haplophthalmus montivagus VERHOEFF, 1940 : a new species for Belgium (Isopoda Trichoniscidae)

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Abstract

Haplophthalmus montivagus VERHOEFF, 1940 was observed for the first time in Belgium on the 13th of June 2006. The species was found on slopes along the river Ourthe in Vieuxville and Durbuy. Animals lived under boulders and in rotting wood in deciduous forests with a calcareous soil. The species is difficult to distinguish from *H. mengei* (ZADDACH, 1844) and may therefore have been overlooked in the past. An identification key is given for the three species of *Haplophthalmus* occurring in Belgium. With the observation of *H. montivagus*, the number of terrestrial isopods in Belgium has risen to 34.

Keywords : *Haplophthalmus montivagus*, Isopoda, Belgium.

Samenvatting

Haplophthalmus montivagus VERHOEFF, 1940 werd voor het eerst waargenomen in België op 13 juni 2006. De soort werd aangetroffen op hellingen langs de Ourthe in Vieuxville en Durbuy. De dieren leefden er onder stenen en in rottend hout op kalkhoudende bodem in loofbossen. De soort is moeilijk te onderscheiden van *H. mengei* (ZADDACH, 1844) en is daardoor misschien over het hoofd gezien in het verleden. Een determinatiesleutel werd opgemaakt voor de drie soorten *Haplophthalmus* die