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Pseudophilotes bavius casimiri, the most differentiated subspecies of the *P. bavius* species-group. *Pseudophilotes fatma*, a distinct species (Lepidoptera: Lycaenidae, Scolitantiditi)

John G. Coutsis

Abstract. *Pseudophilotes bavius casimiri* (Hemming, 1932) is shown, on the basis of its male genitalia, to be the most differentiated subspecies within the *Pseudophilotes bavius* (Eversmann, 1832) species-group, and it is suggested, pending DNA sequencing, that it may eventually be shown to represent a distinct species. *Pseudophilotes fatma* (Oberthür, 1890) is being separated at species level from *P. bavius* on the basis of pronounced differences in the valvae and falces.

Samenvatting. *Pseudophilotes bavius casimiri*, de meest afgescheiden subspecies van de *P. bavius* soortengroep. *Pseudophilotes fatma*, een aparte soort (Lepidoptera: Lycaenidae, Scolitantiditi).
Op basis van kenmerken in de mannelijke genitalia wordt aangetoond dat *Pseudophilotes bavius casimiri* (Hemming, 1932) de meest afgescheiden subspecies is in de soortengroep van *Pseudophilotes bavius* (Eversmann, 1832). Misschien zal DNA-onderzoek zelfs aantonen dat het om een aparte soort gaat. *Pseudophilotes fatma* (Oberthür, 1890) wordt als aparte soort afgescheiden van *P. bavius* op basis van belangrijke verschillen in de valvae en falces.

Résumé. *Pseudophilotes bavius casimiri*, la sous-espèce la plus différenciée dans le groupe d'espèces de *P. bavius*. *Pseudophilotes fatma*; une bonne espèce (Lepidoptera: Lycaenidae, Scolitantiditi).
Se basant sur des différences dans les genitalia mâles, l'auteur considère *Pseudophilotes bavius casimiri* (Hemming, 1932) comme la sous-espèce la plus différenciée dans le groupe d'espèces de *Pseudophilotes bavius* (Eversmann, 1832). Des recherches de DNA pourront certainement montrer qu'il s'agit d'une espèce différente. *Pseudophilotes fatma* (Oberthür, 1890) est considéré comme espèce distincte basée sur des différences dans les valvae et les falces.

Key words: Lycaenidae – Scolitantiditi – *Pseudophilotes* – *bavius* – *casimiri* – *fatma* – male genitalia – androconia – Greece – Pelopónnisos – Algeria – Morocco.

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Introduction

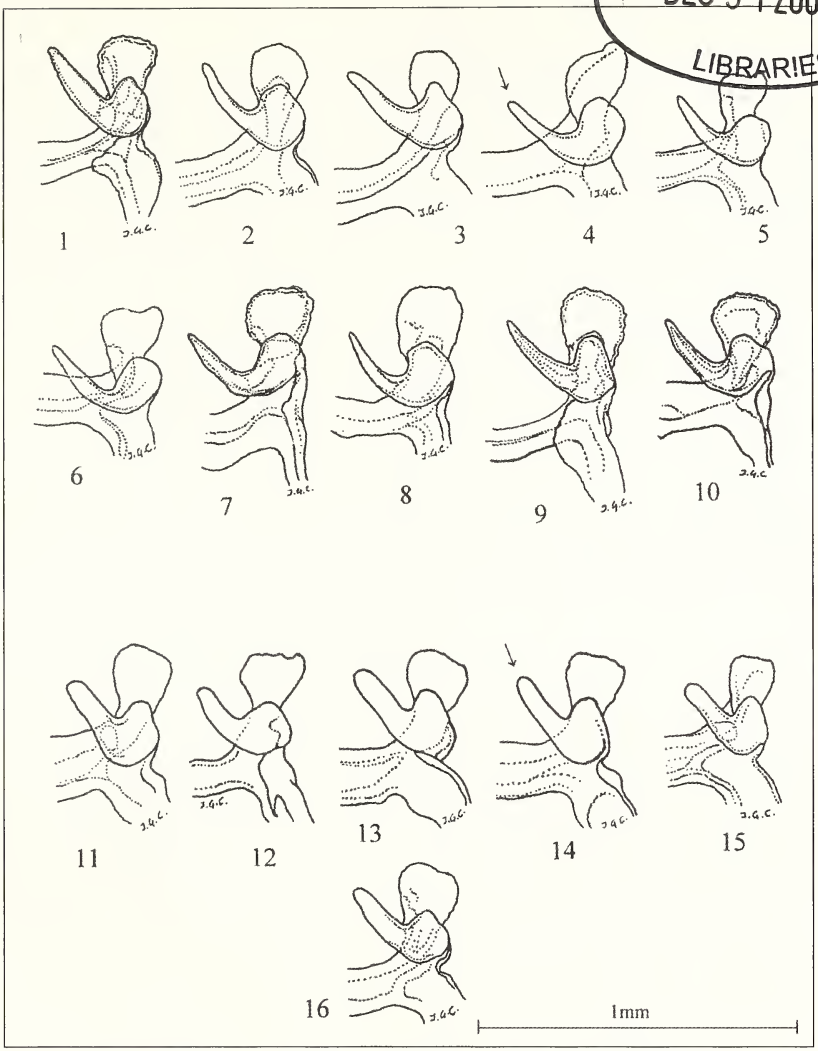
The species-group taxon *Pseudophilotes bavius* (Eversmann, 1832), has been subdivided into the following subspecies: The nominal *bavius*, from European Russia (TL Bashkiria, South Ural Mts.) and Kazakhstan; *hungaricus* (Diószeghy, 1913), from Hungary, Romania, and according to Nekrutenko (1995), Crimea; *macedonica* (Schulte, 1958), from the Republic of Macedonia and Northern Greece; *casimiri* (Hemming, 1932), from Pelopónnisos, Southern Greece; *egea* (Herrich Schäffer, [1852]), from West and Central Anatolia, and according to Tuzov *et al.* (2000), provisionally also from the Caucasus; *vanicola* Koçak, 1977, from Van, Hakkâri and Şırnak Provinces, Turkey; *eitschbergeri* Koçak, 1975, from Urfa and Mardin Provinces, Turkey, as well as from Syria [Descriptions, colour figures and distribution maps for the latter three subspecies are given in Hesselbarth, van Oorschot & Wagener (1995)]; *onalpe* Koçak, 1975, from Ankara Province, Turkey; *fatma* (Oberthür, 1890), from Algeria and Morocco. Some of these subspecies have since been lumped together, but irrespective of the actions taken all but one of the taxonomic decisions concerning the group have been based solely on external wing characters. The exception relates to *fatma*, for which the male genitalia have also been taken into consideration.

Male genitalia

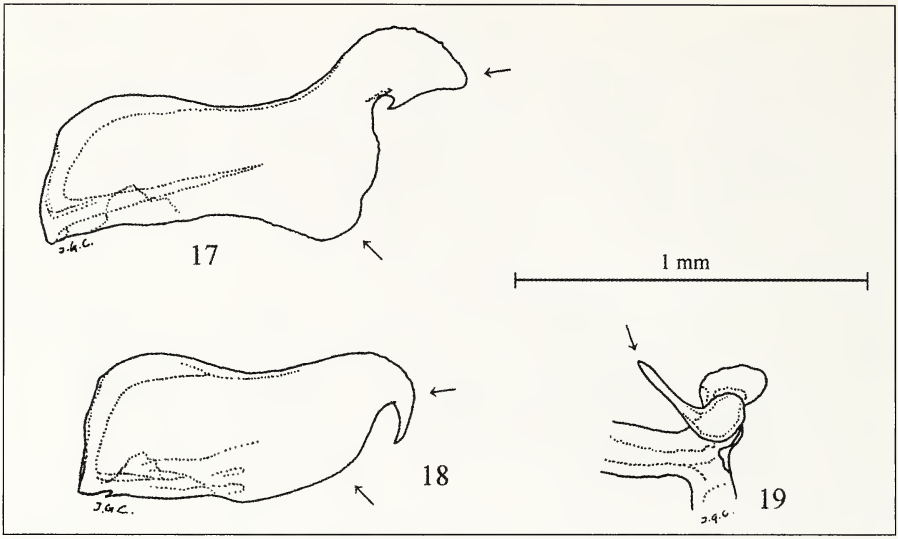
Drawings were made of the falces of all the subspecies listed above with the exception of those of nominal *bavius*, which have been studied in the past but not drawn, and of *onalpe*, which were never made available. Subspecies *bavius*, *hungaricus*, *macedonica*, *egea*, *vanicola* and *eitschbergeri*, have identical to each other genitalia in all respects, and are characterized, among others, by the shape of the falces, which usually are narrow and always gradually taper to a very narrow distal extremity (figs. 1–10). In subspecies *casimiri* the falces are wide and their sides are just about parallel to each other, resulting in a wide and blunt distal extremity (figs. 11–16). Subspecies *fatma*, already known to possess different genitalia (Higgins 1975), differs to such an extent from the other members of the group both in the shape of the valva, as well as in the extreme narrowness of the falces, that it becomes clear that it deserves to be treated as a separate species. In *fatma* the valval dorso-distal process is in the form of a prominent, downwards-pointing hook, and the distal part of the valval ventrum is evenly curved towards the valval distal edge; in all the subspecies of *bavius* the valval dorso-distal process possesses a small ventral spine that is surmounted by a massive, dorsally convex and distally pointed prominence, and the distal part of the valval ventrum forms a right angle with the valval distal edge (figs. 17–19).

Androconia

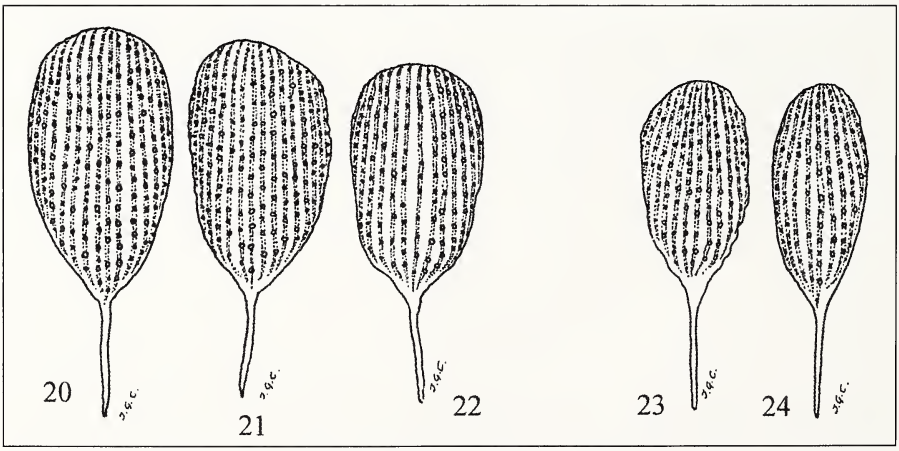
Androconia samples taken from *casimiri* as well as from Greek examples of *macedonica* showed that those of the former are considerably smaller and narrower than those of the latter (figs. 20–24).



Figs. **1–16**. Ventral view of right half of tegumen, together with right labis and falx. **1**. *Pseudophilotes bavius hungaricus*, Hungary, Vicze, Com. Szamos, 23.iv.1935. **2–4**. *Pseudophilotes bavius macedonica*. **2.** Republic of Macedonia, Treska Gorge. **3**, **4**. Greece, Makedonía, Kozáni Distr., near Siátista, 800–1000 m. **3**. 10.v.1989. **4**. 19.v.1990. **5**, **6**. *Pseudophilotes bavius egea*. Turkey. **5**. Konya Province, 15 km S of Karaman, 1200 m, 22–23.vi.1982. **6**. Antalya Province, Güzelbağ, 300-500 m, 15-16.v.1988. **7–9**. *Pseudophilotes bavius vanicola*, Turkey. **7**, **9**. Hakkâri Province, Dez Valley, 20 km NE of Hakkâri, 1500–2000 m, 3–10.vii.1992. **8**. Van Province, 8–32 km N of Çatak, 1900–2200 m, 13–19.vi.1990. **10**. *Pseudophilotes bavius eitschbergeri*, Syria, Ain Khadra, 900–1050 m, 24.iv.1997. **11–16**. *Pseudophilotes bavius casimiri*, Greece, Pelopónnisos. **11–15**. Ahaía Distr., Zahloroú, near Kalávrita, 600 m. **11**. 23.v.1990. **12**. 5.v.1971. **13**, **15**. 27.v.1975. **14**. 27.v.1979. **16**. Arkadía Distr. vic. of Trípolis, 750 m, 24.v.1989.



Figs. **17–19**. *Pseudophilotes* male genitalia. **17**, **18**. Side view of outer face of left valva. **19**. Ventral view of right half of tegumen, together with right labis and falx. **17**. *Pseudophilotes bavius macedonica*, Republic of Macedonia, Treska Gorge. **18**, **19**. *Pseudophilotes fatma*, Morocco, Middle Atlas, Ifrane, 1700 m, 15–17.v.1988.



Figs. **20–24**. Androconia of Greek *Pseudophilotes* drawn to same scale. **20–22**. *Pseudophilotes bavius macedonica*, Makedonía, Kozáni Distr., near Siátista, 800–1000 m, 10.v.1989. **23**, **24**. *Pseudophilotes bavius casimiri*. Pelopónnisos, Ahaía Distr., Zahloroú, near Kalávrita, 600 m, 23.v.1990.

Discussion

The constant differences between the male genitalia of subspecies *casimiri* and those of all the other subspecies of *bavius*, coupled with differences present in wing characters (the male of the former always has bright orange sub-marginal markings on HW upper-side in s1c, s2 and s3, while in all the other subspecies these markings, when present, are reduced in number and are not as bright), clearly suggest that the geographically isolated *casimiri* has diverted itself from the norm to a point where it may conceivably be shown in the future, and through DNA sequencing, as representing a distinct species. It is also interesting to note that *casimiri* is unjustly being totally ignored by Higgins & Riley (1970).

The distinct specific position of *fatma*, as explained above, is based on extensive genitalic differences. These were recorded in Higgins (1975), but were obviously deemed not important enough to warrant its separation at species level.

Acknowledgments

In concluding I would like to express my thanks to Willy De Prins, Alain Olivier and Dirk van der Poorten for supplying a good many of the specimens used in this endeavour.

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Boekbespreking

LIKONA: *LIKONA Jaarboek 2007*.
21 × 26 cm, 108 p., doorlopend in kleur geïllustreerd; Provinciaal Natuurcentrum, Het Groene Huis, Domein Bokrijk, B-3600 Genk (D/2008/5857/43).

Dit is alweer het 17de jaarboek van LIKONA. Net als de vorige delen bevat het meer dan 100 pagina's interessante informatie over de natuur in de provincie Limburg. Niet minder dan 137 auteurs hebben de verschillende teksten bij elkaar geschreven. Zoals gewoonlijk bevat het jaarboek een rijke en gevarieerde keuze uit onderwerpen.

Het begint met een studie van de geologie van de landcommanderij Alden Biesen in het Limburgse dorp Rijkhoven (gemeente Bilzen), met een overzicht van de geologische geschiedenis en de tot 33 miljoen jaar oude fossielen die in de verschillende aardlagen werden aangetroffen. Eveneens geologisch van aard is het stuk over de cirkelvormige depressies in de Vlakte van Bocholt. In dit gebied, gelegen tussen Hamont, Bree en Kinrooi, komen ongeveer 200 cirkelvormige depressies in het landschap voor met een doormeter van ca. 140 m en verhoogde wallen van gemiddeld 1,50 m.

Op botanisch gebied volgen twee stukjes, nl. over het dwergwratjesmos (*Cololejeunia minutissima*), waarvan een blad ongeveer 0,2 mm groot is, en over het klein warkruid (*Cuscuta epithymum*), een zeldzame plant van heidegebieden die er een holoparasitaire levenswijze op nahoudt. Dit wil zeggen dat de plant zichzelf niet van water of voedingsstoffen kan voorzien, maar doorvoor is aangewezen op zijn gastheer. Met speciale boorworteltjes dringt hij in de stam van de gastheer en onttrekt er zo de nodige stoffen.

Voor de entomologen zijn er eveneens twee onderwerpen: het doen en laten van de zeldzame zadelsprinkhaan (*Ephippiger ephippiger*) in de gebieden met Opglabbekerzavel (gemeenten Genk, As en Opglabbeek). Als toetje bij dit artikel hoort een reeks opnames, voorzien van een korte uitleg, van de paring en de eiafzet van de zadelsprinhaan. Het tweede entomologisch artikel handelt over de eikenprocessierups (*Thaumetopoea processionea*). Deze voor de mens erg irriterende soort is sedert het einde van de jaren tachtig weer volop aan het toenemen en door deze populatiegroei kwamen er ook stelselmatig ook meer parasieten en predatoren mee. Daarvan wordt een overzicht gegeven en de meest voorkomende soorten worden meer in detail besproken (parasieten *Pales processionae*, *Carcelia iliaca* en *Pipla processionae*; predatoren *Troilus luridus*, *Rhinocoris iracundus*, *R. annulatus*, *Dendroxena quadrimaculata*, *Calosoma inquisitor* en *C. sycophanta*).

Het jaarboek bevat verder nog een studie over de kortsnavelboomkruiper (*Certhia familiaris macrodactyla*), een nieuwe broedvogel in Limburg (Voeren) en Vlaanderen, een studie over het voorkomen van de eikelmuis (*Eliomys quercinus*) in Limburg, en een onderzoek naar de verspreiding van de Europese hamster (*Cricetus cricetus*) in Limburg in de 21ste eeuw.

Achteraan in dit jaarboek volgt nog een becommentarieerd literatuuroverzicht van publicaties in diverse media die over de natuur in Limburg handelen. Daarbij zijn er 22 met een entomologisch onderwerp.

Zoals steeds is dit jaarboek bijzonder keurig uitgegeven. Het is een must voor wie in de Limburgse natuur geïnteresseerd is.

Willy De Prins

Clepsis dumicolana (Lepidoptera: Tortricidae), new to the Belgian fauna

Willy De Prins & Jean-Yves Baugnée

Samenvatting. *Clepsis dumicolana* (Lepidoptera: Tortricidae), een nieuwe soort voor de Belgische fauna.
Op 17 augustus 2008 werd te Luik een exemplaar van *Clepsis dumicolana* (Zeller, 1847) (Lepidoptera: Tortricidae) waargenomen rustend op *Hedera helix*, in de buurt van de Kennedybrug, leg. J.-Y. Baugnée. Nadien werd in dezelfde stad nog een veertigtal exemplaren waargenomen op twee plaatsen op de hellingen van de citadel. Het is de eerste maal dat deze soort uit België wordt vermeld. Details over de levenswijze en de verspreiding worden gegeven.

Résumé. *Clepsis dumicolana* (Lepidoptera: Tortricidae), une espèce nouvelle pour la faune belge.
Le 17 août 2008, un exemplaire de *Clepsis dumicolana* (Zeller, 1847) (Lepidoptera: Tortricidae), posé sur une feuille de *Hedera helix*, fut observé à Liège, près du pont Kennedy, leg. J.-Y. Baugnée. Une quarantaine d'autres exemplaires furent ensuite notés dans la même ville, en deux endroits des Coteaux de la Citadelle. C'est la première fois que cette espèce est mentionnée pour la faune de Belgique. Des informations concernant sa biologie et sa répartition sont données.

Key words: *Clepsis dumicolana* – Faunstics – First record – Belgium.

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On 17 August 2008, a specimen of *Clepsis dumicolana* (Zeller, 1847) was observed in the city of Liège near the "Pont Kennedy", while it was resting on a leaf of *Hedera helix*, leg. J.-Y. Baugnée (Fig. 1). In September 2008, more than forty specimens were observed in the same city, respectively at the "Esplanade Saint-Léonard (8 September) and at the "Terrasse des Minimes" (29 September), in a south exposition, leg. J.-Y. Baugnée. It is the first time that this species is observed in Belgium and it increases the number of Tortricidae species recorded from Belgium to 363 (De Prins & Steeman 2008).

The species is readily recognized as a *Clepsis* mainly by its wing shape, but it is quite different from the other *Clepsis* species which have been recorded from Belgium (De Prins & Steeman 2008). The male has a costal fold. The head is orange brown. The thorax is of the same colour as the basal blotch or a little bit darker brown and has a yellowish ochreous collar. The ground colour of the fore wings is brownish grey and the markings are darker brown, in fresh specimens with a faint violet hue. The basal blotch is less dark brown than the medan band, but in many specimens more prominent than in the picture in Razowski (2002, pl. 15). In some specimens, the basal blotch has almost the same colour as the ground colour of the forewing, but then at least two small dark brown spots remain delimiting the proximal edge of this blotch.The postmedian fascia is very broad and sometimes connected to the rather small subapical blotch. Its interior

border shows two concave waves. Both the basal blotch and the median fascia are edged with some light ochreous yellowish scales (Fig. 1).

Distribution

Clepsis dumicolana has a southern European distribution but it is expanding its areal northwards during the last years. Whether this is due to anthropogenic factors or is caused by the active expansion of its areal, has to be studied. It is known from the following countries or islands (Aarvik 2007): Corsica, Italy, Sardinia, Sicily, Slovenia, Spain, and Switzerland. It has furthermore been recorded from Austria, Croatia and mainland France; the most northern localities in this country are situated in Saône-et-Loire (Seliger *et al.* 2008). Outside Europe, it occurs in Syria and Lebanon (Razowski 2002: 118).

In 2006, it was observed for the first time in Germany, Baden-Württemberg, when in many regions of the city of Stuttgart well established populations of the species were noticed (Hausenblas 2006, 2007). The species was common in the same localities in 2007. *C. dumicolana* was furthermore recorded in Germany from Gaggenau (Hausenblas 2006) and from Berlin-Steglitz (Peschel *et al.* 2008). In 2007, the species had spread till Nordrhein-Westfalen. Many specimens were observed on 3 October in the city of Kempen, flying around *Hedera helix* which was growing on a southern exposed wall (Seliger *et al.* 2008).

In June 2008, *C. dumicolana* was first reported from the Netherlands when some specimens were seen in Amsterdam (Werkgroep Vlinderfaunistiek).

It is unclear how this species reached Germany and Belgium. Perhaps, it was imported with its foodplant. It can certainly establish strong populations in a short period as was observed in several German cities (Seliger *et al.* 2008). The Belgian specimens could well have originated from the population in Kempen, but it is also possible that it has been imported from the Mediterranean region by anthropological activities. The fact that the species has been recorded from several localities in Central Europe, makes it clear that the species is expanding its range, probably in part by its own means, and partly because of the introduction of specimens in more northern regions.

Biology

The early stages are still not described (Razowski 2002: 118) but the biology of the species is rather well known. The eggs are deposited on the leaves of *Hedera helix*. As far as known, the caterpillars feed exclusively on this foodplant (Spuler 1910: 248). First instar larvae consume the upper layer of the leaves, and later instars eat holes in the leaves. The species was bred indoors at ca. 18°C from eggs laid in October producing the first adult in March of the next year (Seliger *et al.* 2008).



Figs. 1–2. *Clepsis dumicolana* (Zeller, 1847), Pont Kennedy, Liège, 17.viii.2008, leg. J.-Y. Baugnée; 3. Southern exposed wall at Liège partly covered with *Hedera helix* (photo J.-Y. Baugnée).

Under natural circumstances the species hibernates in the larval stage. Full-grown larvae have been found in April–May. Pupation takes places between leaves of the foodplant spun together. Adults usually fly in the evening around the larval foodplant, but sometimes they are also active during daytime. The flight period is from mid May till mid July (Razowski 2002: 118). However, the species was observed in Belgium from mid August to end of September and in Baden-Württemberg and Nordrhein-Westfalen in October which presumes the occurrence of a (partial) second generation. Such a generation has never been recorded from the south of Europe. The Belgian records are situated in between the known dates and this makes it difficult to distinguish clearly between generations. It is perhaps possible that the caterpillar develops whenever the favourable temperatures are reached, which, in the temperate climate zone, can be throughout the year, except for the cold winter months. In South Europe, it might be too hot and dry during the summer months for the caterpillar to develop.

The species seems to prefer xerotherm habitats as in most of the observations the moths were present in gardens, graveyards, parks etc. where *Hedera helix* was growing on walls, tree trunks or other substrates directed to the south.

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Loopkevers (Coleoptera: Carabidae) aan de Belgische oostkust

Willy Troukens

Abstract. Carabid beetles (Coleoptera: Carabidae) at the Belgium east coast.
A list is given of the 50 species of carabid beetles which were observed during 1975–2005 at Wenduine and in the nature reserve "Het Zwin" at Knokke-Heist (Belgium, Province of West-Vlaanderen).

Résumé. Coléptères carabiques (Coleoptera) sur la côte orientale de Belgique.
Pendant la période 1975–2005, l'auteur a noté les Carabidae à Wenduine et dans la réserve naturelle "Het Zwin" à Knokke-Heist (Belgique, Flandre occidentale). La liste des 50 espèces est donnée.

Key words: Belgium – faunistics – Coleoptera – Carabidae.

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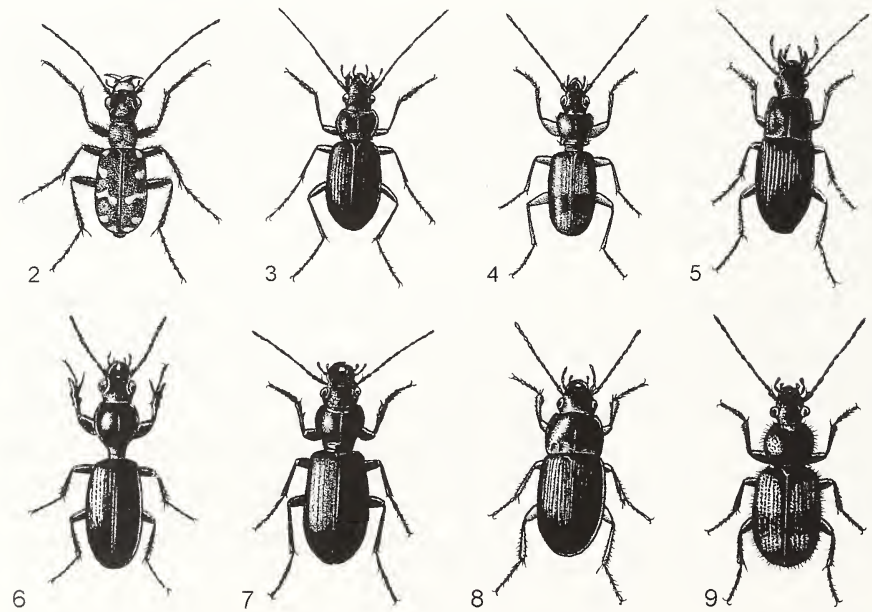
In de periode 1975–2005 bezochten mijn vrouw en ik geregeld de Belgische oostkust. Al wandelend en fietsend ging onze aandacht vooral naar de plaatselijke natuur. Daarom verbleven we het liefst in Wenduine met zijn 150 ha zee- en binnenduinen en zijn uitgestrekte polders.

Bij gelegenheid werd ook Het Zwin te Knokke-Heist bezocht. Dit natuurgebied bestaat uit 125 ha zeeduinen, slikken en schorren. Het is uniek omwille van zijn zoutminnende flora en fauna waaronder enkele typische insecten. In de loop der jaren verzamelden wij een schat aan gegevens. Ook de loopkevers (Carabidae) werden vlijtig geïnventariseerd. Bij het napluizen van mijn oude logboekjes en mijn collectiemateriaal telde ik 50 soorten. Dit is zowat één derde van alle loopkeversoorten die na 1950 aan de oostkust werden aangetroffen (Desender 1986).

Sommige van deze kevers zijn typische kustbewoners; ze worden zelden of nooit waargenomen in het binnenland. Het zijn zoutminnende of warmteminnende soorten die zich alleen thuisvoelen op de schorren of in de duinen. Op de landzijde van de duinen heerst 's zomers als het ware een Middellands-Zeeklimaat waardoor continentale kevers met een meer zuidelijk areaal zich hier nog best kunnen handhaven (Goetghebuer 1928: 22). Mij baserend op de kaartjes van Desender (1986) gaat het om volgende soorten: *Dyschirius salinus*, *Bembidion minimum*, *B. normannum*, *Pogonus chalceus*, *Amara tibialis*, *A. convexiuscula*, *Dicheirotrichus gustavii*, *Harpalus servus*, *Mesoreus wetterhallii* en *Demetrias monostigma*.

In de tabel (p. 13–14) volgt een opsomming van alle Carabidae die sinds 1975 met zekerheid werden gedetermineerd. Naast elke soort wordt met een kruisje (+) de lokaliteit aangeduid. Voor de naamgeving werd de nomenclatuur gevolgd van Boeken *et al.* (2002).

Figuur 1. Natuurreservaat Het Zwin, Knokke-Heist (België, West-Vlaanderen) op 14 juni 1976.



Figuren 2–9. Carabidae aan de Belgische kust; **2**.– *Cicindela hybrida* Linnaeus; **3**.– *Leistus spinibarbis* (Fabricius); **4**.– *Blemus discus* (Fabricius); **5**.– *Calathus fuscipes* (Goeze); **6**.– *Dyschirius thoracicus* (P. Rossi); **7**.– *Broscus cephalotes* (Linnaeus); **8**.– *Amara bifrons* (Gyllenhal); **9**.– *Panagaeus bipustulatus* (Fabricius).

Tabel 1. Lijst van de Carabidae geobserveerd aan de Belgische oostkust

Soortnaam	Wenduine	Het Zwin
Cicindela hybrida Linnaeus, 1758	-	+
Leistus spinibarbis (Fabricius, 1775)	-	+
Nebria brevicollis (Fabricius, 1792)	-	+
Notiophilus biguttatus (Fabricius, 1779)	+	-
Dyschirius salinus Schaum, 1843	-	+
Dyschirius thoracicus (P. Rossi, 1790)	+	+
Broscus cephalotes (Linnaeus, 1758)	-	+
Blemus discus (Fabricius, 1792)	+	+
Trechus quadristriatus (Schrank, 1781)	+	-
Bembidion lampros (Herbst, 1784)	-	+
Bembidion varium (Olivier, 1795)	+	+
Bembidion minimum (Fabricius, 1792)	+	+
Bembidion normannum Dejean, 1831	-	+
Bembidion lunulatum (Geoffroy, 1785)	+	-
Bembidion femoratum Sturm, 1825	+	+
Bembidion tetracolum Say, 1823	+	-
Pogonus chalceus (Marsham, 1802)	-	+
Poecilus cupreus (Linnaeus, 1758)	+	-
Pterostichus melanarius (Illiger, 1798)	+	-
Pterostichus strenuus (Panzer, 1797)	+	+
Calathus erratus (C. R. Sahlberg, 1827)	+	+
Calathus fuscipes (Goeze, 1777)	+	+
Calathus melanocephalus (Linnaeus, 1758)	+	+
Calathus mollis (Marsham, 1802)	+	+
Agonum marginatum (Linnaeus, 1758)	+	-
Agonum muelleri (Herbst, 1784)	+	-
Amara plebeja (Gyllenhal, 1810)	+	-
Amara aenea (De Geer, 1774)	+	+
Amara curta Dejean, 1828	+	+
Amara familiaris (Duftschmid, 1812)	+	+
Amara spreta Dejean, 1831	+	-
Amara tibialis (Paykull, 1798)	-	+
Amara bifrons (Gyllenhal, 1810)	+	-
Amara fulva (O. F. Müller, 1776)	-	+
Amara convexiuscula (Marsham, 1802)	-	+
Pseudoophonus rufipes (De Geer, 1774)	+	-
Harpalus affinis (Schrank, 1781)	+	+
Harpalus anxius (Duftschmid, 1812)	+	+
Harpalus rubripes (Duftschmid, 1812)	+	-
Harpalus servus (Duftschmid, 1812)	-	+
Harpalus tardus (Panzer, 1797)	+	+
Dicheirotrichus gustavii Crotch, 1871	-	+

Stenolophus mixtus (Herbst, 1784)	+	-
Badister bullatus (Schrank, 1798)	+	-
Badister dilatatus Chaudoir, 1837	+	-
Panagaeus bipustulatus (Fabricius, 1775)	-	+
Masoreus wetterhallii (Gyllenhal, 1813)	+	-
Demetrias monostigma Samouelle, 1819	+	-
Paradromius linearis (Olivier, 1795)	-	+
Syntomus foveatus (Geoffroy, 1785)	+	+

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Dit artikel is het resultaat van jarenlang veldwerk. Ik dank hierbij mijn echtgenote Nicole, evenals Aubin De Turck (Wenduine) en niet in het minst de leerlingen van de 3de klas van de basisschool "De Vlinder" (Dilbeek) die mij behulpzaam waren bij tal van speurtochten. Mijn dank gaat ook naar Konjev Desender (K.B.I.N., Brussel), voor zijn gewaardeerde hulp bij het determineren van enkele twijfelgevallen.

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Seasonal abundance of the leaf-cutting bee, *Megachile minutissima* (Hymenoptera: Megachilidae)

Mohamed A. Shebl, Soliman M. Kamel, Talaat A. Abu Hashesh & Mohamed A. Osman

Abstract. Solitary bees such as bees belonging to the family Megachilidae are most efficient pollinators of alfalfa, *Medicago sativa*. During April to June of the years 2005–2007, artificial nests of leaf-cutting bees were transferred to an experimental farm to study the seasonal abundance of the bees. Samples of bees were taken by a sweeping net in an experimental field of alfalfa, three times per day: at 10 am, 1 pm and 3 pm respectively. The collecting was repeated every 7 to 10 days from the beginning of flowering time till the end of the season. The results revealed that alfalfa had a flowering time in the experimental farm of about 8 weeks starting from late March till the end of May. During the flowering time *Megachile minutissima* (Radoszkowski, 1876) visited and pollinated the alfalfa flowers. Observations also indicate that males of leaf-cutting bees start flying a few days before females but there is no role for males in tripping of alfalfa flowers. Females start to visit alfalfa flowers not before 9 am, the maximum activity was at 1 pm and there is no activity after 5 pm.

Samenvatting. Seizoensgebonden talrijkheid van de bladsnijderbij, *Megachile minutissima* (Hymenoptera: Megachilidae).
Solitaire bijen, voornamelijk bijen uit de familie Megachilidae, zijn de meest efficiënte bestuivers van alfalfa, *Medicago sativa*. Kunstnesten met bladsnijderbijen werden van april tot juni in de jaren 2005, 2006 en 2007 opgesteld in een experimenteel veld om de seizoensgebonden aanwezigheid van de bijen te bestuderen. Stalen van de bijen werden 3 keer per dag (10, 13 en 15 uur) genomen door met een sleepnet door de alfalfa-vegetatie te slepen, en dit met een interval van 7 tot 10 dagen vanaf het begin van de bloei tot het einde van het seizoen. De resultaten tonen aan dat alfalfa gedurende 8 weken bloeit van einde maart tot begin mei. *Megachile minutussuma* (Radoszkowski, 1876) bezocht en bestoof de alfalfa bloemen. Mannetjes begonnen enkele dagen vroeger te vliegen dan vrouwtjes maar zij spelen geen rol in de "tripping" van de alfalfa bloemen. Vrouwtjes starten hun activiteit vanaf 9 uur; de maximale activiteit lag rond 13 uur en na 17 uur stopt de bestuiving.

Résumé. Abondance saisonnière de l'abeille solitaire, *Megachile minutissima* (Hymenoptera: Megachilidae).
Des abeilles solitaires, comme les Megachilidae, sont parmi les meilleurs pollinisateurs d'alfalfa, *Medicago sativa*. Pendant la période d'avril-juin des années 2005–2007, des nids artificiels furent construits et placés dans un champ expérimental d'alfalfa afin d'étudier l'abondance saisonnière des abeilles. Des échantillons d'abeilles furent pris avec un filet trois fois par jour: à 10, 13 et 15 h, et cela tous les 7 à 10 jours pendant la saison des fleurs. Les résultats montrent que l'alfalfa à une période de floraison de 8 semaines, de fin mars jusqu'à fin mai. *Megachile minutissima* (Radoszkowski, 1876) visitait et pollinisait les alfalfa. Les observations ont aussi montré que les mâles commencent à voler quelques jours avant les femelles mais qu'ils ne jouent aucun rôle dans la pollinisation. Les femelles commencent leurs activités à partir de 9 heures; l'activité maximale se situe à 13 h. et qu'après 17 h. il n'y a plus d'activité.

Key words: Artificial nesting – alfalfa pollination – population dynamics – seed production – *Megachile minutissima* – Megachilidae

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1. Introduction

Alfalfa flowers, *Medicago sativa* Linnaeus, 1753, require visiting bees to trip the sexual column, thereby providing pollination and subsequent pot and seed

set. Previous studies have compared the pollination values of different bee species solely by the speed with which they handle flowers and the proportion of visited flowers tripped.

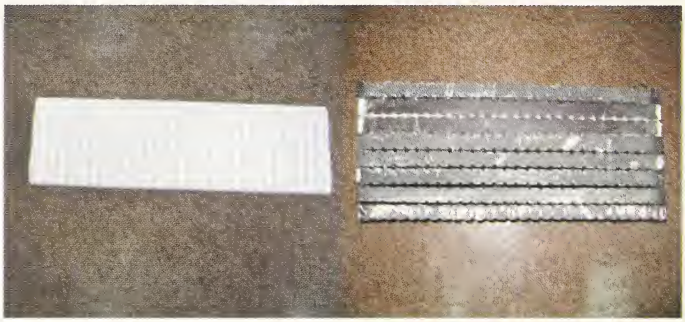

Fig. 1. Foam pieces used for artificial nesting of leaf-cutting bees.

Fig. 2. Complete artificial nest of leaf-cutting bees.

Females of the alkali bee, *Nomia melanderi* (Cockerell, 1906) and the alfalfa leaf-cutting bee *Megachile rotundata* (Fabricius, 1793) tripped 81% and 78% of visited flowers, respectively. Males of these species were significantly less effective (61% and 51 %, respectively), but still significantly superior to the

honey bee *Apis mellifera* (Linnaeus, 1758) (22% of visited flowers tripped). One candidate pollinator, *Osmia sanrafaelae* Parker 1985, shows promise (44% tripped), but not the congeneric *O. aglaia* (Sandhouse, 1939) (13% tripped) (Cane 2002). However, tripping done by a specialized group of bees which enter the flowers and press their keel by their own weight thereby releasing male and female organs to distribute pollen and effect cross- pollination (Abrol 1993).

Leaf-cutting bees are the main pollinators of alfalfa, the activity of these bees are regulated by both temperature and light intensity (Klostermeyer & Gerber 1969). The number of flowers visited per trip, the time spent flying from flowers tripped per unit time are influenced by weather conditions (i.e. temperature and light intensity), agronomic practices (i.e. plant or flower density and irrigation), and the alfalfa cultivar. Females visit from five flowers per minute under cool, partly cloudy weather conditions in a thin plant density, to 25 flowers per minute under hot, clear conditions in a thick plant density. Each flower visit averaged approximately four times longer under the first condition, but the percentage of flowers pollinated under both conditions was similar (Richard 1984).

The flight activity of the bees, *Megachile nana* (Bingham, 1897) and *Megachile flavipes* (Spinola, 1838) on alfalfa were affected by environmental factors, specially cessation of light intensity and solar radiation. Also, Abrol (1990) found a positive correlation with air temperature, light intensity, solar radiation, nectar sugar concentration and negative correlation with relative humidity. Path coefficient analysis revealed that the direct of solar radiation on *M. nana* and solar radiation and light intensity on *M. flavipes* was pronounced. While the direct effect of other factors were negative or negligible, *M. nana* spent less time than *M. flavipes* with an average of 2.35 seconds. However, the mean tripping efficiency was higher in the latter species (89.5 %) than the former (87.5 %) (Abrol 1990). The excessive high temperatures (40° C or above) in the nesting media can kill the eggs and early instar larvae. Poorly constructed shelters can act as heat traps and thus produce lethal temperatures. If nesting media are exposed to direct sunlight this can result in high cell temperatures. Cell temperatures below 4° C can cause immature mortality though it is doubtful whether this occurs in the field (Mayer 1992).

The flight activity of *Osmia cornuta* (Latreille, 1805) started at 7.40–10.20 am and at 9–12° C and ended at 6.00–6.30 pm, often after sunset. Females mark their nest entrance with secretions, probably from the mandibular glands, and individuals with severed antennae are unable to recognize their nesting cavity (Vicens & Bosch 2000). The population dynamics and foraging behaviour of *Megachile rotundata*, as well as the alfalfa bloom and pollination rates in two fields in eastern Oregon were studied by Bosch & Kemp (2005). Despite marked differences in bee management, establishment was very similar in the two fields (0.5 females per nesting cavity) and a lagged peak bloom by 2 weeks. Pollination rates increased from 0–10% in the first 3 weeks to 80–90% in week

4–5. By then, *M. rotundata* females had difficulty finding untripped (non-pollinated) flowers and visited large numbers of already tripped or not fully matured flowers. The mortality of the *M. rotundata* progeny was very high (54–78%). Estimated seed yields were similar in both fields. We contend that similar seed yields, and improved bee production, could be accomplished with smaller bee populations, better timed with alfalfa bloom (Bosch & Kemp 2005). Artificial nests were prepared and moved to the experimental field (Kamel *et al.* 2007). The present work is aimed to study the population abundance of leaf-cutting bees during the season and their relation to the blooming season of alfalfa with the aim to obtain higher rates of pollination and seed yields.

Nesting activities of *Megachile uniformis* (A.) started shortly after the emergence of the females, i.e. during the mating period, and continued to the end of the activity season. The emergency of bees started on 10 April in the two seasons of 2001, and 2003. Females were active from 10 April 10 to 6 June. A female usually hovers around the nests to select a suitable nesting site for herself. After selecting the nest, she starts cleaning it before inhabiting it (Shoukry *et al.* 2004).

2. Material and Methods

2.1. Artificial nesting of *Megachile minutissima* (Radoszkowski, 1876)

Artificial bee nests were prepared during the years 2004, 2005, and 2006 in March and transformed to natural nest sites in Tel El Kebir (30°33'30"N, 31°56' 13"E) about 50 km west of Ismailia in the Delta of River Nile (Kamel *et al.* 2007). The artificial material used for nesting bees was foam. The nests consist of 50 pieces of foam, each piece 50 cm long, 12 cm wide and 2 cm thick. Each piece of foam has 26 holes of 10 cm depth and 6 mm diameter. After sticking the foam pieces upon each other, holes were created in this block and the shelter was performed. Straws of paper tubes 10 cm in length and 5.2 mm internal diameter, one tube was put in each hole. All foam nests were painted in black to imitate natural nests. The artificial nests were transferred to the natural nesting sites in different villages of Tel El Kebir in April till the end of July in the years 2004, 2005 and 2006 (Fig. 1 and 2). By the end of June the foam nests were collected from the natural nest sites and transferred to the experimental field for emergency of bees in the following year, the nests were preserved and kept from any damage by other pests and ants.

2.2. Experimental field preparation

In the beginning of October 2005, 2006 and 2007 the experimental field of the bees research unit, Suez Canal University, Ismailia was prepared for alfalfa seed cultivation. The variety used was Ismailia 1 produced by the Agricultural experimental station in Ismailia. The grown distance between the plants was 30 cm and there were a total number of 1200 plants in the field. Normal nitrogen fertilizer was added to the field. The experimental field was divided into three

parts: nearest to the nest (20 m), near to the nest (30 m), and far from the nest (40 m).

2.3. Population dynamics of *Megachile minutissima* on alfalfa flowers

The experiment conducted at the experimental field of Bee research unit, Suez Canal University, Ismailia, Egypt. Artificial bee nests were installed at the eastern part of the experimental field to be in the front of the sun rise in March of the years 2005, 2006 and 2007. The emergency of *M.* started after the blooming of alfalfa flowers which usually occurs around late March. Samples of bees were taken by a sweeping net in the experimental field of alfalfa, □25 double strokes per sweep□. Samples were taken three times a day of work at 10 am, 1 pm and 3 pm respectively. This was repeated every 7 to 10 days from the beginning of blooming till the end of the season. Numbers of bees were recorded and bees were released again into the field for maintaining the population of bees till the end of the season.

However, samples of *M. minutissima* were taken from three different distances of bees from the artificial nest site, at 20, 30 and 40 m^2. In each area samples of bees were taken in the same times as in the previous experiment. The number of bees was recorded and the bees were released again.

2.4. Meteorological data at the time of the experiment

The high and low temperature and relative humidity from March to June have been recorded during March until July 2005, 2006, and 2007 using a thermo-hygrograph.

3. Results

3.1. The seasonal abundance of leafcutting bees

The seasonal abundance of leafcutting bees was different at the start and the end of the generation. For the season 2005, the bees started flying at the beginning of April and the season lasted until the last day of May (Fig. 3). For the season 2006, the bees started flying mid April until the first day of June (Fig. 4). In 2007, the bees started flying mid March and the season lasted till mid May. (Fig. 5).

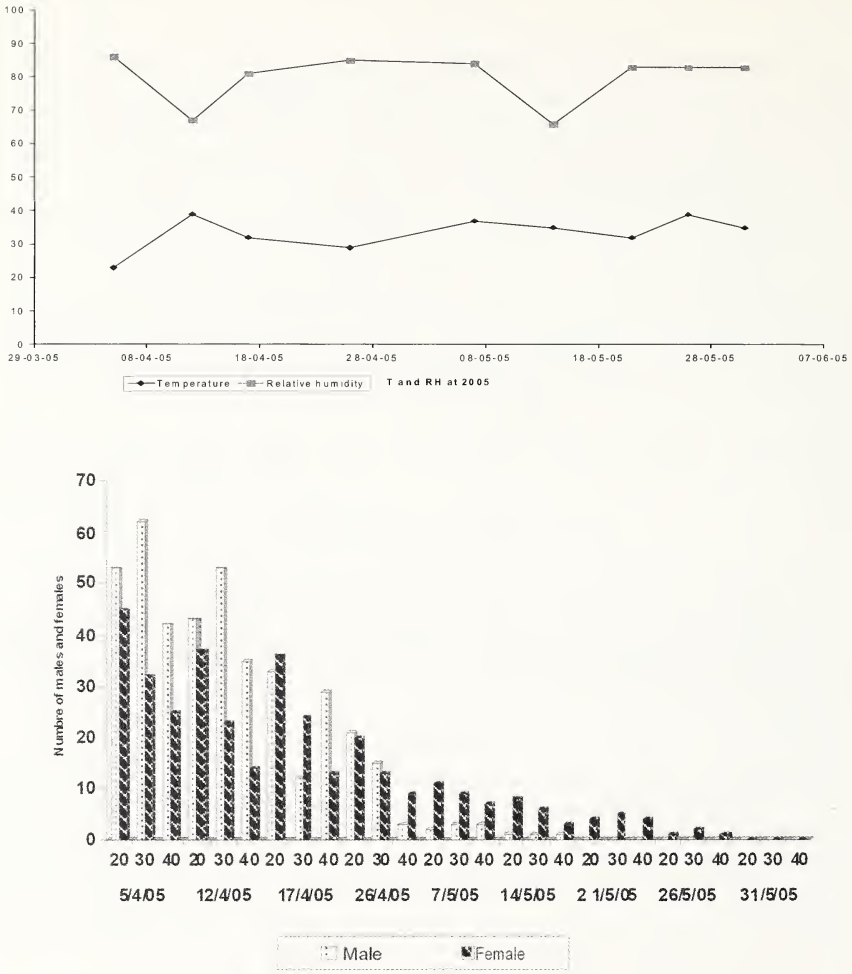

Fig. 3. Seasonal and daily activity, numbers of males, females and the total of *Megachile minutissima* (Radoszkowski, 1876) bees on alfalfa flowers at three different distances: the first distance (20 m), second distance (30 m) and third distance (40 m), away from the nests during 2005.

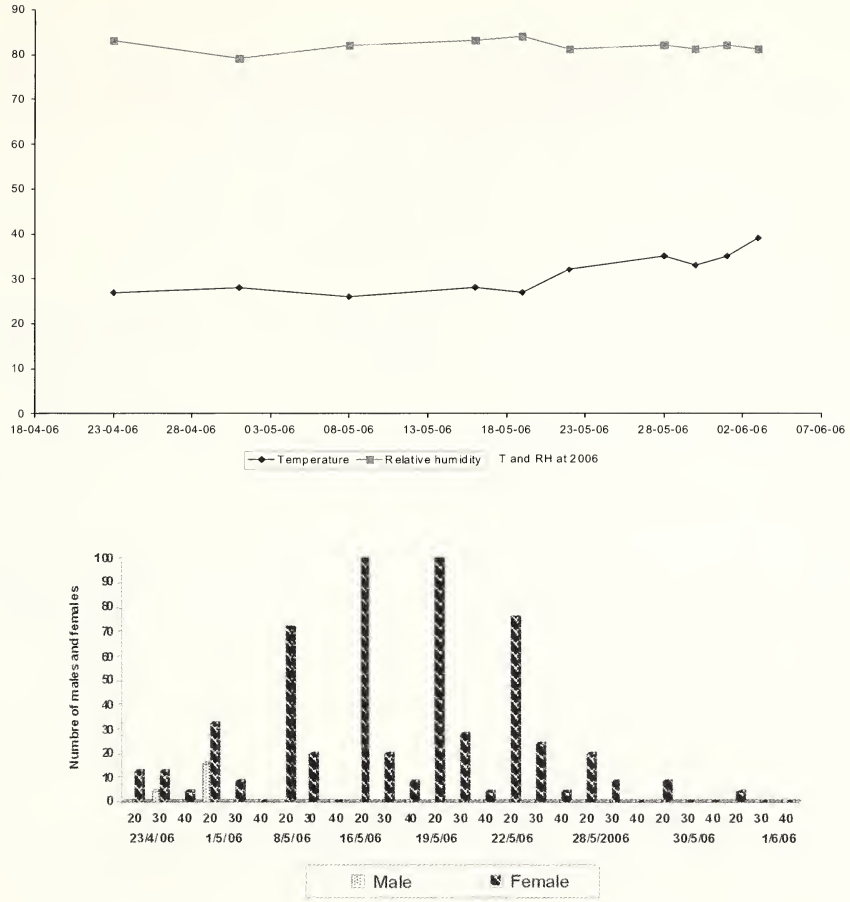

Fig. 4. Seasonal and daily activity, numbers of males, females and the total of *Megachile minutissima* (Radoszkowski, 1876) bees on alfalfa flowers at three different distances: the first distance (20 m), second distance (30 m) and third distance (40 m), away from the nests during 2006.

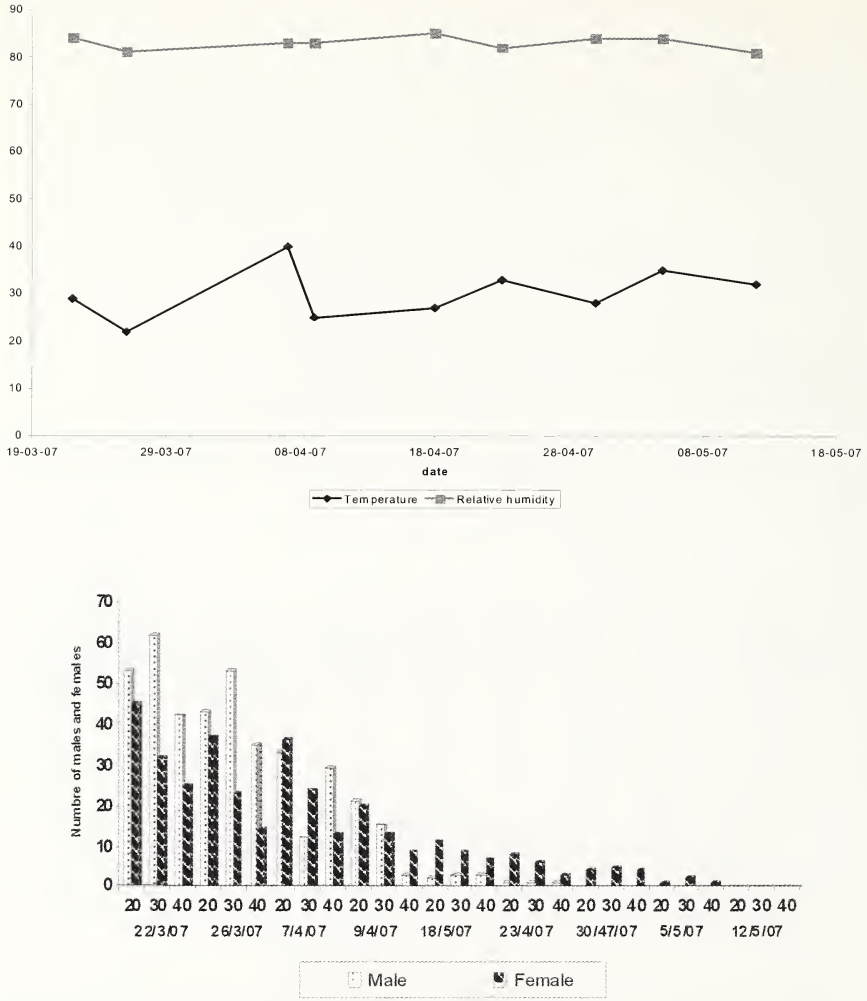

Fig. 5. Seasonal and daily activity, numbers of males, females and the total of *Megachile minutissima* (Radoszkowski, 1876) bees on alfalfa flowers at three different distances: the first distance (20 m), second distance (30 m) and third distance (40 m), away from the nests during 2007.

3.2. The daily abundance of leafcutting bees

The daily activity of bees has been studied for three seasons from 2005, 2006 and 2007. The bee numbers increased from 9 am to reach maximum numbers at 1 pm, after that the activity decreased till sunset (tables 1, 2, and 3, and fig. 6). However, the number of bees were so high in the distances so close to the nest than far. There is a linear relationship between the distance and the number of

bees, increasing the distance is followed by decreasing of bees numbers (table 1, 2, and 3, and fig. 7).

Table 1. Total number of bees at different times and distances in 2005.

Time	Distance 20 m		Distance 30 m		Distance 40 m		Total	
	No	%	No	%	No	%	**No**	**%**
10 am	76	9.9	65	8.5	75	9.9	**216**	**28.3**
1 pm	169	22.1	102	13.3	65	8.5	**336**	**43.9**
3 pm	71	9.3	92	12.0	50	6.5	**213**	**27.8**
Total	**316**	**41.3**	**259**	**33.8**	**190**	**24.9**	**765**	**100.0**

Table 2. Total number of bees at different times and distances in 2006.

Time	Distance 20 m		Distance 30 m		Distance 40 m		Total	
	No	%	No	%	No	%	**No**	**%**
10 am	136	23.8	52	9.1	0	0.0	**188**	**32.9**
1 pm	200	34.9	52	9.1	20	3.5	**272**	**47.5**
3 pm	92	16.1	20	3.5	0	0.0	**112**	**19.6**
Total	**428**	**74.8**	**124**	**21.7**	**20**	**3.5**	**572**	**100.0**

Table 3. Total number of bees at different times and distances in 2007.

Time	Distance 20 m		Distance 30 m		Distance 40 m		Total	
	No	%	No	%	No	%	**No**	**%**
10 am	290	19.4	225	15.1	151	10.1	**666**	**44.6**
1 pm	308	20.6	220	14.7	118	7.9	**646**	**43.2**
3 pm	79	5.3	62	4.1	42	2.8	**183**	**12.2**
Total	**677**	**45.3**	**507**	**33.9**	**311**	**20.8**	**1495**	**100.0**

4. Discussion

Alfalfa, *Medicago sativa*, had a blooming period in the experimental farm of about 8 weeks from late March till the end of May. During the blooming period *Megachile minutissima* visited and pollinated the alfalfa flowers. Observations indicated that males of leaf-cutting bees start flying a few days before the females but there is no role for the males in the tripping of alfalfa flowers. In this way the male has no efficiency in the pollination of alfalfa (Cane 2002). Moreover, the numbers of males were lower in the season 2006 (Fig. 4). This is due to the strong wind in the spring of 2006 destroying some artificial nests. Bees start to visit alfalfa flowers around 9 am, the number of bees increased considerably at 10 am; bees were most active around 1 pm (Fig. 6).

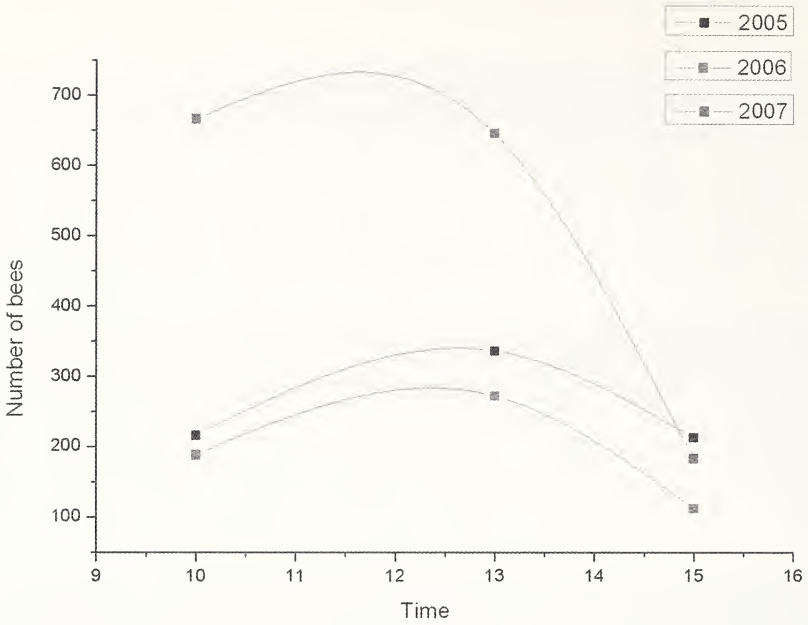

Fig. 6. The total number of bees at three times per day at 2005 (centre), 2006 (below) and 2007 (above).

The influence of temperature and light intensity at the beginning of flight of males and females was studied. Bees start foraging under conditions of low temperature and high light intensity or vice versa. By adapting to new conditions, the bee has become more widely used to pollinate alfalfa. Peak flight occurs during midday and at high temperatures. Decreasing light intensity appears to be the main factor that ends daily foraging, even though summer temperatures during early evening are often above 20°C. The females spend the night in the nest, faced inward. As temperatures rise in the morning, they turn around and face the entrance but do not come out and fly only when the temperature exceeds 20°C and the sun's radiation reaches 0.7 Langley. Bees foraged at 1075 lux when the temperature was 25°C but needed 6450 lux at 17°C. Bees stopped foraging in the evening when radiation dropped to 0.3 Langley and also stopped if clouds reduced radiations to that level. Leaf-cutter bees fly approximately ¼ mile to find food (Peterowski 1991). Alfalfa flower production in commercial fields declines exponentially over the season (after an initial burst of bloom). In addition, standing crop of open flowers declines exponentially at a more rapid rate than open flower production, suggesting that the decline in standing crop of flowers is due in part to increasing pollinator

activity. The more rapid decline in open flowers per raceme close to bee shelters was consistent with this interpretation. The model of alfalfa pollination predicts a similar decline in flower standing crop of open flowers decreases and thus pollination was completed sooner. An exponential decline was standing crop of open flowers provides an explanation for the advantage of using large numbers of bees to pollinate alfalfa rapidly (Strickler 1997). The impact of flower abundance and pollinator movement on seed or fruit yield is of economic importance, and may have implications for crop pollinator management. Field observations of within versus between plant movement of the pollinator, *Megachile rotundata*, indicate that the bees visit more flowers per raceme when standing crop is high than when standing crop is low (Strickler 1999). Fig. 7 shows that increasing distance from the nest correlates with a decreasing number of bees.

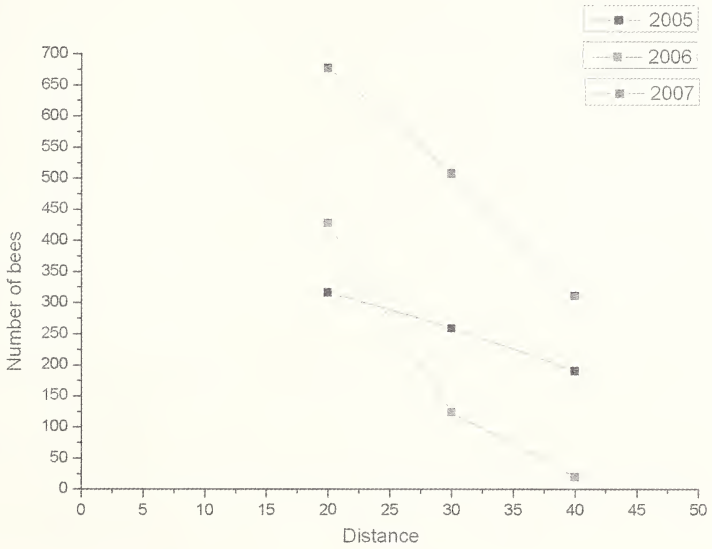

Fig. 7. The total number of bees at three distances from the nest at 2005 (centre), 2006 (below) and 2007 (above).

The number of open flowers and nectar availability declined more rapidly close to bee shelters than at a distance. Interrupted the rapid decline in floral resources partly as a result of steady pollination over time (Strickler & Freitas 1999). The bee patterns of abundance and distribution vary on many scales across years, that patterns were not consistent between years, and raised questions as to what this implies about bee-plant host relationships (Messinger & Griswold 2002). The problems with the seasonal abundance and the plant-

pollinator relationship of leaf-cutting bees and other bee pollinators need more studies in order to understand many remaining questions.

Conclusion

Leaf-cutting bees are considered as one of the most important pollinators of alfalfa worldwide. The emergency of leaf-cutting bees from artificial nests is synchronized with the alfalfa blooming seasons in Ismailia, Egypt. The leaf-cutting bees' activity varied at three different times per day but it reached its maximum at 1 pm. The number of bees decreased by increasing the distance from the artificial nests. So, if farmers use artificial nests with alfalfa leaf-cutting bees it is recommended to distribute the nests to cover the whole field instead of putting the artificial nests at one site of the field only.

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Boekbespreking

Bengtsson, B. Å. & Palmqvist, G.: *Fjärilar: Käkmalar–säckspinnare (Lepidoptera: Micropterigidae–Psychidae).*
22,5 × 28 cm, 646 pagina's, doorlopend in kleur geïllustreerd, te verkrijgen bij Apollo Books, Kirkeby Sand 19, DK-5771 Stenstrup, Denmark, apollobooks@vip.cybercity.dk, gebonden met veelkleurige stofomslag, 2008, 49,- € (ISBN978-91-88506-60-3).

Dit boek is het derde deel dat in de prestigieuze reeks "*Nationalnyckeln till sveriges flora och fauna*" (National encyclopedia of the Swedish flora and fauna) verschijnt, en meteen het dikste, hoewel het over de zogenaamde Microlepidoptera handelt. De twee eerder verschenen boeken bevatten respectievelijk de dagvlinders (2005) en de families Lasiocampidae, Endromidae, Saturniidae, Lemoniidae, Sphingidae, Notodontidae, Nolidae, Arctiidae en Lymantriidae (2007). In het huidige deel worden de meest primitieve vlinderfamilies bewerkt: Micropterigidae, Eriocraniidae, Hepialidae, Nepticulidae, Opostegidae, Heliozelidae, Adelidae, Prodoxidae, Incurvariidae, Tischeriidae, Tineidae, Lypusidae en Psychidae.

In de algemene, maar redelijk korte inleiding geven de auteurs een goed beeld van deze primitieve motjes, hun fylogenie en systematiek, biologie, morfologie en tevens worden raadgevingen opgesomd voor het bestuderen van deze groep insecten. Dit inleidend deel is geïllustreerd met prachtige foto's van vlindertjes in hun natuurlijk milieu. Dit deel sluit af met een systematisch overzicht van alle behandelde soorten. Dat zijn niet alleen de strikt Zweedse soorten, maar alle soorten die in Scandinavië, Finland en Denemarken voorkomen.

In het systematisch deel worden de verschillende groepen op zeer uitgebreide wijze behandeld. Eerst komt er een overzicht van de familiekenmerken, rijkelijk geïllustreerd met foto's uit de natuur, tekeningen van vleugeladering, kop, mannelijke en vrouwelijke genitalia en een hoogst praktische determineertabel. In de linkerkolom staan de kenmerken opgesomd in het Zweeds, in de rechterkolom in het Engels en in het midden staan de vlindertjes in kleur afgebeeld met streepjes naar die kenmerken waarop moet gelet worden.

Elke soort krijgt daarna minstens 1 pagina waarop de morfologische kenmerken uitgebreider worden herhaald en waar ook info over de biologie en de geografische verspreiding wordt gegeven. Aan de nomenclatuur wordt veel aandacht besteed: de volledige Latijnse naam met alle synoniemen indien van toepassing, de Zweedse naam, de etymologie van de Latijnse naam en de uitspraak (weliswaar voor Zweedse lezers). Deze teksten zijn in het Zweeds maar telkens is er een korte samenvatting in het Engels afgedrukt. Bij elke soort hoort ook minstens 1 afbeelding in kleur, een tekening van de genitalia, meestal beide geslachten en een verspreidingskaartje van Noordwest-Europa.

Omdat veel van de behandelde soorten bladmineerders zijn, wordt aan dit fenomeen extra aandacht besteed in een apart hoofdstuk met tekeningen van alle mijnen en bijhorende uitleg.

Achteraan in het boek worden nog eens alle behandelde soorten op kleurenplaten afgedrukt, meestal in een vergroting van 5×. Deze figuren worden ook gebruikt in de determineertabellen en op de individuele soortenpagina's. Het zijn schitterende aquarellen door Ronald Johansson.

Het boek sluit af met een verklarende woordenlijst, een literatuurlijst en een alfabetische index. Het is zeer keurig uitgegeven en stevig ingebonden. De prijs is haast belachelijk laag te noemen voor een werk van deze kwaliteit, maar dat komt door een stevige subsidiëring van het Zweedse koningshuis. Hoewel het boek overwegend in het Zweeds is opgesteld, is het toch handig bruikbaar voor elke vlinderliefhebber die ook met Engels overweg kan. Ik kan het ten zeerste aanbevelen!

Willy De Prins

First record of the Strepsiptera genus *Caenocholax* in Baltic amber with the description of a new species

Jeyaraney Kathirithamby & Hans Henderickx

Abstract. A new species of Strepsiptera, *Caenocholax groehni* **sp. n.**, in Baltic amber (44 myo) is described. This might prove morphological stasis and the existence of a largely recent New World lineage in the Baltic region more than 40 million years ago. It also supplies evidence concerning the ancient origin of Strepsiptera, and shows that species of this genus were in existence throughout most of the Tertiary. A revised diagnosis of the genus *Caenocholax* is also provided.

Samenvatting. Eerste vermelding van het genus *Caenocholax* (Strepsiptera) in Baltische barnsteen en beschrijving van een nieuwe soort.
Een nieuwe soort Strepsiptera, *Caenocholax groehni* **sp. n.**, uit Baltische barnsteen (44 miljoen jaar oud) wordt beschreven. Deze soort kan eventueel morfologische stasis bevestigen en het bestaan aantonen van een tamelijk recente verbinding van de Baltische streek met de Nieuwe wereld iets meer dan 40 miljoen jaar geleden. Het biedt tevens bewijs voor het oeroude ontstaan van de Strepsiptera en toont verder aan dat de soorten uit dit genus voorkwamen gedurende het Tertiair. Een aangepaste diagnose voor het genus *Chaenocholax* wordt gegeven.

Résumé. Première mention du genre *Caenocholax* (Strepsiptera) dans l'ambre baltique avec description d'une espèce nouvelle.
Une espèce nouvelle de Strepsiptère, *Caenocholax groehni* **sp. n.**, provenant de l'ambre baltique (44 millions d'années) est décrite. Cette découverte pourrait confirmer le stasis morphologique et l'existence d'une relation entre la région baltique et le Nouveau Monde d'il y a plus de 40 millions d'années. De plus, l'origine très ancienne des Strepsiptera est ainsi confirmée ainsi que la présence des espèces de ce genre pendant la période tertiaire. Une diagnose revisée du genre *Chaenocholax* est présentée.

Key words: Strepsiptera – Baltic amber – *Caenocholax* – new species.

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Introduction

Since the description of the first strepsipteran by Rossi in 1793, morphological stasis has been observed in Strepsiptera, mainly from extant species. However, in the present study we report that fossil Strepsiptera display stasis for 40 million years, and we describe a new species of *Caenocholax* (Myrmecolacidae) from Baltic amber.

The sexes in Strepsiptera exhibit extreme dimorphism: adult males are morphologically highly specialized and free-living, while females are neotenic, endoparasitic (except in the family Mengenillidae), and devoid of most recognizable insect features. The extreme sexual dimorphism in Strepsiptera extends in the members of the family Myrmecolacidae even to their hosts which are disparate: the sexes parasitize hosts belonging not only to different species, but to different orders of insects. Heteronomy is found in only two lineages of insects: the strepsipteran family Myrmecolacidae (Kathirithamby 1991) and the hymenopteran subfamily Aphelinidae (Walter 1982), both of which are parasitic

insect groups. Males of Myrmecolacidae parasitize Hymenoptera (ants) and females parasitize Orthoptera (grasshoppers and crickets) and Mantodea (Ogloblin 1939, Kathirithamby 1991, Kathirithamby & Hamilton 1992, Kathirithamby & Johnston 2004). The here described new myrmecolacid appears to belong to *Caenocholax*, a genus with extant members that are morphologically remarkably similar but genetically very divergent.

Materials and Methods

The specimen is fossilized in a clear yellow piece of Baltic amber (14×5×2 mm) showing a trace of the original crust and stellate hairs which are typical of this amber.

FTIR analysis was conducted. In the graphic of the sample (Fig. 1) the typical 'Baltic shoulder curve' is clear (Y. Sashoua, personal communication).

After examination, the amber was coated for preservation on a rotating device in viscoused Epoxy (Araldite 2020). Examinations and measurements have been carried out with a Leitz microscope and Optika Photolib software, additionally with a Zeiss measuring ocular and object plate. Pictures were taken with a Fuji Finepix S2 camera, combined when necessary with Helicon Focus software.

All measurements are in mm.

Family Myrmecolacidae Saunders

Myrmecolacides Saunders, 1872

Genus *Caenocholax*

Caenocholax Pierce, 1909

Type species: male *Caenocholax fenyesi* Pierce, 1909, from Cordoba, Veracruz, Mexico: USNM type 10081, originally part of the Fenyes collection at the Californian Academy of Sciences, San Francisco.

Diagnosis of *Caenocholax*: The following are the general characteristics of the *Caenocholax* complex:

Aedeagus: dorsally curved prong, with anchor-shaped dorsal terminal plate with a long medial and two lateral spines (Kathirithamby & Johnston 1992, Kathirithamby & Grimaldi 1993), or with median spine only.

Abdominal segment X: enlarged lobate plate overhanging abdominal segment IX (Kathirithamby & Johnston 1992).

Wing: R_2 short, R_3 absent; MA slightly longer than CuA, CuP absent (Kathirithamby & Johnston 1992).

Description

***Caenocholax groehni* sp. n.** (Fig. 2)

Male fossil material: Type specimen in a clear piece of Baltic amber from Kaliningrad, Russia, ex coll. Gröhn 1500, deposited at the Geologisch-Paläontogisches Institut und Museum, Hamburg (GPIH 4495).

Etymology: named after the collector Carsten Gröhn.

Diagnosis:

Head: Mandibles short, 0.11 mm (L), 0.02 mm (W); maxilla 0.25 mm (L), 0.02 mm (W); eyes large with about 20 eyelets.

Antennae: 7-segmented; antennomere III (0.39 mm) lamellate; antennomere IV (0.03 mm), V (0.18 mm) and VI (0.11 mm) almost half the length of antennomere VII (0.20 mm).

Wing venation similar to *C. fenyesi* sensu lato: R_2 short, R_5 ending considerably distant from wing margin; MA slightly longer than CuA; CuP absent.

Tarsi: 4-segmented without pretarsal claws; sensory spots visible on basitarsus.

Aedeagus: only the large and curved basal part is visible.

Abdominal segment X: large lobate plate, which narrows apically overhanging abdominal segment IX.

Body length: 1.35 mm.

Caenocholax groehni **sp. n.** differs from the other three extant genera of Myrmecolacidae in the absence of R_3, CuA_1 and CuA_2 veins (*Lyncholax* Bohart, 1951), absence of CuP (which is long in *Myrmecolax* Westwood, 1861), and absence of MA_1 (which is long in *Stichotrema* Hofeneder, 1910). The wing venation (short R_2, absence of MA_1 and CuP) and short mandibles in the new fossil species are typical of *Caenocholax*. It differs from *C. fenyesi* sensu lato in the proportions of the antennae. Antennomere III plus flabellum is shorter (0.39 mm) in *C. groehni* **sp. n.** than in the two fossil specimens from Dominican amber, *C. dominicensis* (, 1993) and *C. brodzinskyi* (Kathirithamby & Grimaldi, 1993). The antennomeres VI and VII are not equal in length (VII twice that of VI) in *C. groehni* **sp. n.**, whereas they are equal in length (VI 0.19–0.24 mm, VII 0.19–0.28 mm) in *C. fenyesi* and in both Dominican fossil species (*C. dominicensis* VI, VII 0.71 mm; *C. brodzinskyi* VI, VII 0.56 mm in DR-10-3 and 0.68 in DR-10-5). The large Xth abdominal segment, typical of *C. fenyesi* sensu lato, narrows apically in *C. groehni* **sp. n.** whereas it is broad with a straight posterior margin in *C. fenyesi texensis* Kathirithamby & Johnston, 2004 and *C. fenyesi waloffi* Kathirithamby & Johnston, 2004 and distinctly narrowed and notched apically in *C. brodzinskyi*.

Caenocholax groehni **sp. n.** differs from the fossil *Palaeomymecolax succineus* (Kulicka, 2001) by the shape of the maxilla (which is round and narrow, rather than wide and flat as in *P. succineus*) and the antennomere VII is three times as long as VI in *P. succineus*. The R_3 and CuP veins are present in *P. succineus*, *P. giecewiczi* Kulicka, 2001 and *P. gracilis* Kulicka, 2001, but are absent in *C. groehni* **sp. n.**; the MP and CuA veins extend to the wing margin in *P. succineus*, *P. giecewiczi* and *P. gracilis* but not in *C. groehni* **sp. n.**

Fig. 1. *Caenocholax groehni* **sp. n.**, holotype; ventral view of head with right antenna and right mandibula.

Fig. 2. *Caenocholax groehni* **sp. n.**, holotype; a: dorsal view, b: ventral view.

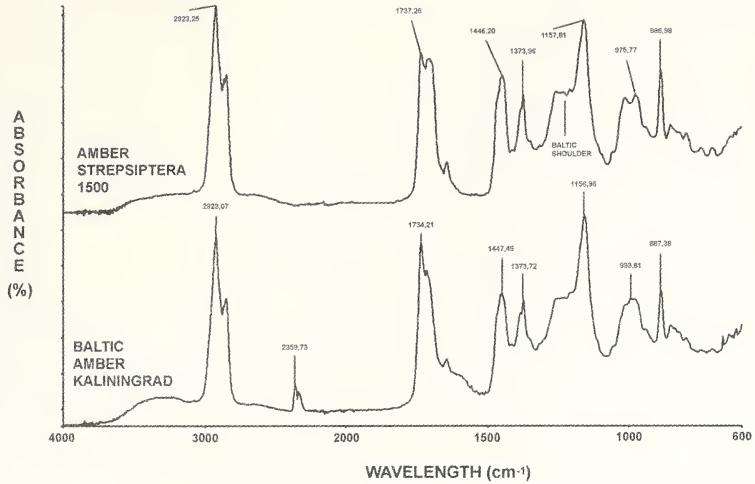

Fig 3. FTIR analysis of *Caenocholax groehni* **sp. n.** holotype amber matrix, graphic, Baltic shoulder indicated.

Based on the morphology of the striking wing venation similar with *Caenocholax fenyesi* sensu lato, the shape of the Xth abdominal segment and the antennal proportions this specimen appears to be closest to the genus *Caenocholax*, and is therefore described in this genus.

Discussion

The hypothesis is that Strepsiptera originated in the Early Cretaceous or Late Jurassic (Grimaldi *et al.* 2005, Grimaldi & Engel 2005). Fossil records of Strepsiptera have shown punctuated change in extinct species (Grimaldi *et al.* 2005, Pohl *et al.* 2005). A primitive extinct strepsipteran, *Cretostylops* (Grimaldi *et al.* 2005), was described from the Cretaceous Burmese amber while the Eocene Baltic amber contained the most primitive strepsipteran *Protoxenos*, a sister group to all other strepsipterans (Pohl *et al.* 2005), and the extinct primitive genus *Menge* (Menge 1866). Myrmecolacids *Stichotrema* and *Palaeomyrmecolax* have been found in the Baltic amber (Kinzelbach & Pohl 1994, Pohl & Kinzelbach 1995, Kulicka 2001), and 1st instar larvae are known from Eocene brown coal (Kinzelbach & Lutz 1985) but no *Caenocholax* has so far been reported from this age. From the Miocene Dominican amber the extant families Myrmecolacidae (Kinzelbach 1983, Kathirithamby & Grimaldi 1993, Kinzelbach & Pohl 1994, Pohl & Kinzelbach 1995), Elenchidae (Kinzelbach

1979, Kinzelbach & Pohl 1994) and Bohartillidae (Kathirithamby & Grimaldi 1993, Kinzelbach & Pohl 1994) have been described. These findings suggest that the Eocene was probably a transitional period between archaic and modern Strepsiptera faunas (Grimaldi *et al.* 2005). Stasis has been observed in Dominican amber in the case of *Bohartilla megalognatha* (Kathirithamby & Grimaldi, 1993), two species of *Caenocholax* and three species of *Stichotrema* (Kathirithamby & Grimaldi 1993, Kinzelbach & Pohl 1994). *Caenocholax groehni* **sp. n.**, however, is the first extinct species to indicate such an extensive period of morphological stasis in Strepsiptera.

The discovery of the genus *Caenocholax* in Baltic amber offers a possible explanation of the biogeography of the *C. fenyesi* species complex: the ancestors were possibly widespread during the globally tropical/subtropical Eocene. Recent males of *Caenocholax* have a general similarity in morphology and secondary sexual characters through out their range from southern United States, through Central America to South America, and from Vietnam (East Asia). The present report of a myrmecolacid from Baltic amber, close to recent males of the *fenyesi* complex, establishes even with more certainty that Strepsiptera undergo long periods of morphological stasis. The extreme sexual dimorphism in Strepsiptera allows stasis to be observed prominently only in one sex – the male.

Molecular genetic studies are revealing that there is cryptic speciation in Strepsiptera. Recent male *C. fenyesi* are similar morphologically but show dramatic underlying genetic divergence (Kathirithamby & Johnston 2004, Kathirithamby *et al.* 2007). Speciation in this group of bizarre entomophagous parasitoids might entail gradual Darwinian microevolutionary changes in genetic divergence.

Morphological stasis in Strepsiptera has been observed over a wide geographical range in recent taxa (Kathirithamby *et al.* 2007), and we here show that it is also observed over a long time span. Morphological stasis is recognized as one of the striking aspects of fossil records (Williamson 1981), and the geological time of morphological stasis varies greatly between taxa. Morphological stasis is seen here for the first time in Strepsiptera to be more than 40 million years.

There are only two fossil records of parasitized ants. Pohl & Kinzelbach (2001) describe a possible female myrmecolacid parasitic in a now extinct ant subfamily Prionomyrmecinae, *Prionomyrmex* sp., from the Baltic amber. But the photograph provided in the paper is not very convincing that it is a female myrmecolacid. A more convincing suggestion that males of myrmecolacids parasitized ants in the Eocene was advanced by Lutz (1990), who reports of a find of a *Camponotus* sp. with two male puparia of *Stichotrema* in Middle Eocene oil slate. Males of *C. fenyesi* have so far been found to parasitize the ant subfamilies Dolichoridinae, Formicinae and Myrmicinae in the Nearctic, Central and South America (Kathirithamby 2009, in press). All three subfamilies of ants have also been found in Eocene Baltic amber (Grimaldi & Engel 2005). Only two records of female strepsipterans are found in fossil records: one in an ant

(doubtful if female, Pohl & Kinzelbach 2001) and a delphacid with a female with 1st instar larvae (Poinar 2004).

All fossil Myrmecolacidae are from the Eocene, and that they parasitized ants in the Eocene is indicated by the parasitized *Camponotus* in the Eocene brown coal. The age of the host-relations of the female myrmecolacids are more difficult to estimate, as no specific records have been found. This may be because stylopized hosts, especially those with endoparasitic female strepsipterans exhibit a change in behaviour (Kathirithamby 2005). Hence more fossil free-flying male strepsipterans are found than females which remain endoparasitic in hosts (except in the family Mengenillidae).

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Omalisus fontisbellaquei (Coleoptera: Omalisidae) in België

Willy Troukens

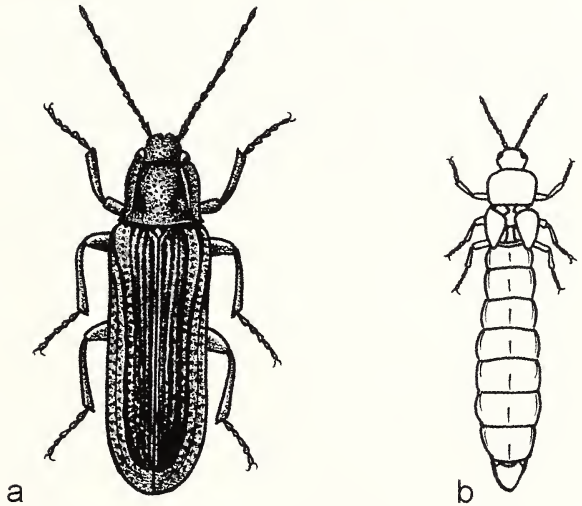
Abstract. *Omalisus fontisbellaquei* (Coleoptera: Omalisidae) in Belgium.
The author examined the 115 specimens of *O. fontisbellaquei* in the Royal Belgian Institute of Natural Sciences (Brussels), and he found only males, no females. Until now, the biology of this beetle seems to be unknown.

Résumé. *Omalisus fontisbellaquei* (Coleoptera: Omalisidae) en Belgique.
L'auteur a examiné les 115 exemplaires de *O. fontisbellaquei* de l'Institut royal des Sciences naturelles de Belgique (Bruxelles). Il n'a trouvé que des mâles. Jusque maintenant, la biologie de ce coléoptère semble inconnue.

Key words: Belgium – faunistics – *Omalisus fontisbellaquei*.

Troukens, W.: Ninoofsesteenweg 782/8, B-1070 Anderlecht.

Op 29 juni 2006 werd in het Zoniënwoud te Sint-Genesius-Rode een mannetje van *Omalisus fontisbellaquei* Geoffroy, 1785 ontdekt (fig. 1a). Deze soort was in Brabant nooit eerder gezien. Qua uitzicht doet ze denken aan een Lycidae-soort waar het trouwens ook mee verwant is (Geisthardt 1979: 9–14).

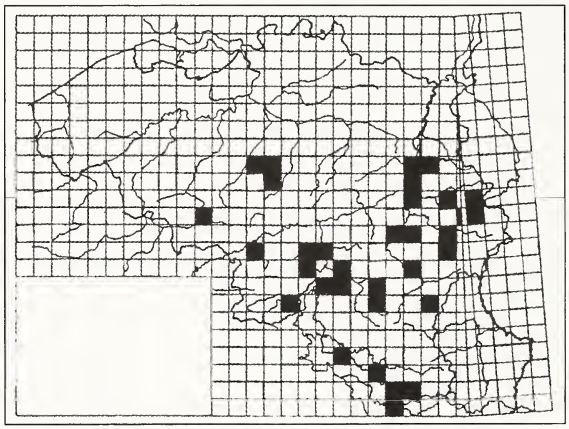


Figuur 1. *Omalisus fontisbellaquei* Geoffroy, 1785. België, Vlaams-Brabant, Sint-Genesius-Rode, 29.vi.2006, leg. W. Troukens. **a**.– mannetje, **b**.– wijfje (vrij naar Geisthardt 1979).

De mannetjes zijn langgerekte insecten van 5 à 10 mm lengte. De zwarte sprieten zijn vrij lang. Kop en halsschild zijn zwart en vertonen een ruwe stippelstructuur. De dekschilden zijn grof gestippeld-gestreept; ze zijn roodbruin

met een sterk verbrede, zwarte naadstreep die naar het uiteinde toe smaller wordt en de achterrand niet bereikt. De dunne pootjes zijn bruin; de dijen donkerder.

Uit de bestaande literatuur blijkt dat rond *O. fontisbellaquei* nog heel wat mysterie hangt. De wijfjes zijn brachypteer; zowel de vleugels als de dekschilden zijn sterk gereduceerd (fig. 1b). Bovendien zijn ze haast onvindbaar. Keer (1930: 415) meldde dat er in Nederland nog geen wijfjes gevonden waren, hoewel de kever toentertijd niet zeldzaam was in Zuid-Limburg (Nederland). In België is dat niet anders. In de collecties van het K.B.I.N. te Brussel bevinden zich 115 mannetjes maar geen wijfjes. Dit wijst erop dat de wijfjes een zeer verborgen leven leiden. Volgens Geisthardt (1979: 14) is over de biologie van *O. fontisbellaquei* niets bekend. Aubert (1971: 14) beweert dat de Omalisidae zich voeden met huisjesslakken zoals de soorten van enkele verwante families—eveneens met brachyptere wijfjes—zoals de Lycidae, Lampyridae en Drilidae. Toch wordt dit door geen enkele andere auteur bevestigd.



Figuur 2. Verspreiding in België van *Omalisus fontisbellaquei* Geoffroy, 1785 (Bron K.B.I.N., Brussel).

O. fontisbellaquei moet gezocht worden in bossen, o.a. op bomen zoals eiken (*Quercus*), haagbeuken (*Carpinus betulus*) en verder op grassen op beschaduwde plaatsen (Keer 1930: 415). In België is de kever vooral te vinden in juni ten zuiden van Samber en Maas en in het Zoniënwoud (fig. 2).

Dankwoord

Dit artikeltje kwam tot stand, dankzij de medewerking van Konjev Desender en Alain Drumont (K.B.I.N., Brussel) die mij met raad en daad behulpzaam waren bij het raadplegen van de collecties van het Departement Entomologie. Hiermee was het mogelijk om het verspreidingskaartje samen te stellen. Hartelijk dank!

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Boekbespreking

Baytaş, A.: *A field guide to the butterflies of Turkey*.
14 × 21 cm, 218 p., NTV Yayinlari, Istanbul, te verkrijgen bij Entomologiezaak Vermandel, paperback 21,20 € (ISBN 978-975-6690-79-6).

Dit boekje, dat ook in het Turks verscheen, bevat 756 kleurenfoto's van bijna 350 dagvlindersoorten, alle genomen in de natuur. Het is in de eerste plaats bedoeld als veldgids en daarom werd het formaat ook klein gehouden. Dat houdt natuurlijk ook beperkingen in; het is in zo'n gids onmogelijk om alle soorten zodanig voor te stellen en te beschrijven dat een zekere determinatie mogelijk is, zeker als men slechts één kant van de vlinder te zien krijgt. De auteur is zich daar terdege van bewust en in de inleiding waarschuwt hij de lezer dat het bij de moeilijke genera, zoals *Polyommatus*, *Hyponephele* of *Pseudochazara*, in vele gevallen onmogelijk zal zijn om een juiste naam op een exemplaar te plakken.

De foto's van de vlinders staan telkens op de rechterbladzijde, gemiddeld acht foto's, en die zijn van goede tot redelijk goede kwaliteit. Sommige zijn echter te donker om de onderscheidende kenmerken te kunnen waarnemen. De auteur moet echter ongelooflijk actief zijn geweest in het veld; van de 756 kleurenfoto's zijn er slechts 153 door andere fotografen geleverd. En zelfs met de hulp van die andere fotografen blijven er nog heel wat soorten niet afgebeeld. Die worden wel in de tekst vermeld. De tekst is erg kort maar geeft toch heel wat informatie over het uiterlijk, de vliegtijd, de biologie en de verspreiding van de afzonderlijke soorten.

Hoewel met deze veldgids een hele reeks dagvlinders uit Turkije in de natuur kunnen gedetermineerd worden, blijft het oppassen geblazen voor meldingen van zeldzame en lokale soorten door minder ervaren lepidopterologen. Men zal in vele gevallen toch een beroep moeten doen op de driedelige, uitgebreide publicatie "*Tagfalter der Türkei*".

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