First report in Belgium of *Brachycyrtus ornatus* Kriechbaumer, 1880, with remarks on the phenology, sex distribution and ecology (Hymenoptera: Ichneumonidae: Brachycyrtinae)

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Abstract

The ichneumonid species *Brachycyrtus ornatus* and its subfamily Brachycyrtinae are reported for the first time in Belgium. A female was found in Mechelen, on the 5th August of 2018. By highlighting the context of this finding and by comparing it with existing literature we offer information about the species' phenology, sex distribution and ecology.

Keywords: *Brachycyrtus ornatus*, Brachycyrtinae, distribution, phenology, Belgium

Samenvatting

De sluipwesp *Brachycyrtus ornatus* en de subfamilie Brachycyrtinae worden voor het eerst gemeld in België. Nabij Mechelen werd een vrouwtje gevonden, op 5 augustus 2018. Door de context van de vondst te bespreken en deze met de bestaande literatuur te vergelijken, kunnen we meer over de fenologie, geslachtsverhoudingen en ecologie van de soort te weten komen.

Résumé

L'ichneumon *Brachycyrtus ornatus* et sa sous-famille Brachycyrtinae sont signalés pour la première fois de Belgique. Une femelle a été trouvée à Malines, le 5 août 2018. En mettant en évidence le contexte de cette découverte et en la comparant avec la littérature existante, nous donnons des informations sur la phénologie, le sex-ratio et l'écologie de l'espèce.

Introduction

The subfamily Brachycyrtinae contains only one genus, *Brachycyrtus* Kriechbaumer and within this genus, only one species has been found in Europe so far: *Brachycyrtus ornatus* Kriechbaumer, 1880. However, worldwide at least 22 species are known and more can probably be found in the future. It is important to note that the subfamily used to be a tribe, the *Brachycyrtini*, within the subfamily of the Labeninae. Furthermore, other genera within the same tribe were transferred to other subfamilies, i.e. the Pedunculinae (QUICKE, 2015; BROAD *et al.*, 2018). The subfamily can be distinguished from the closely related subfamily of Cryptinae trough the postfurcal intersection of the forewing vein *1cu-a*, and the pipe-shaped petiolus without a visible seam (KARLSSON & MAGNUSSON, 2011).

Material and methods

Morphologically the species is very distinctive. The areolet is elongate triangular, though not closed by vein *3rs-m*, and the abscissa of hind wing vein *RS* between *RA* and *rs-m* is conspicuously shorter than *rs-m* (BROAD *et al*., 2018). The length is around 5 to 6 mm and the species has 25 flagellomeres or 27 antennal segments (KRIECHBAUMER, 1880). Due to additional characteristics it can also be identified in the field and on pictures. The pattern on the thorax with yellow markings is quite exceptional in European Ichneumonidae. The mesosoma is sharply curved, while on the abdomen the first metasomal segment is rather elongated, with sternite and tergite fused. Sexual differentiation is

limited. Next to obvious genital differences (i.e. an ovipositor related to ecology, see below) the female pattern has more orange tincture. More importantly, some colored spots can be found that are missing or less noticeable on the males, the most obvious one on the propodeum. Differences can also be found on the coxae and in the coloration of the tergites (KARLSSON & MAGNUSSON, 2011).

Distribution outside Belgium

The distribution of the species is very fascinating. While it is called widespread and remarkable in the field, reports are very scarce, even on citizen science portals. The northern border reaches southern Sweden (KARLSSON & MAGNUSSON, 2011). Additionally, within Europe it is reported from Austria (ANONYMOUS, 1990), Bulgaria, Macedonia and Turkey (KOLAROV, 2009), Croatia (HENSCH, 1928), Czech Republic (SEDIVY, 1995), Greece (GBIF), Hungary (VAS, 2013), Italy (Fauna Europaea), Poland (SAWONIEWICZ, 1982), Romania (PISICA, 2005), Spain (Fauna Europaea) and three countries adjacent to Belgium; Germany (KRIECHBAUMER, 1880), France (GBIF) and The Netherlands (not yet publicized, pers. comm. Kees Zwakhals).

Results

On the 5th august of 2018 a female *B. ornatus* was caught (see Figs 1-2) in the province of Antwerp. The observation was done in the Mechelen city park 'Tivoli', situated at the edge of the town in a suburban area (GPS 51.046, 4.473; Lambert 1972 157294, 192902). The garden used to be the rose garden of the park but it was transformed in 2014 into an organic permaculture garden with an increasing rich variety on herbs, vegetables and flowers (wild and cultivated). The soil is very sandy and the wide gravel paths of the rose garden make it a rather hot spot. The park itself has large grass fields, a playground, fruit trees, a petting zoo and a forest with deciduous trees and limited undergrowth due to the existing traffic of walkers.

In the direct vicinity, there is a small, natural, dry meadow with a lot of *Jasione montana* L. (1753) and open sandy spots, which are interesting for solitary bees, Pompilidae, Mutillidae and Crabronidae. The specimen of *B. ornatus* was found in a small plastic greenhouse. This is a good place to find insects, flown in the partly open greenhouse and not capable to get out (see Fig. 3). Examples are common species such as *Philanthus triangulum* Fabricius, 1775, *Cerceris rybyensis* (Linnaeus, 1771) , but also species such as *Brachymeria* ssp., *Tipula (Savtshenkia) staegeri* Nielsen, 1922, *Leopoldius signatus* (Wiedemann in Meigen, 1824), *Mirificarma lentiginosella* (Zeller, 1839) and the quickly spreading hoverfly *Paragus quadrifasciatus* Meigen, 1822.

More importantly a possible host, *Pseudomallada prasinus* (Burmeister, 1839), was seen in the same greenhouse, only two months and a half before our observation.

On January the 15th (2019) another female was photographed indoors by Joannes Vindevoghel in Dorent (East Flanders). The specimen possibly followed hibernating lacewings, and was triggered to hatch, influenced by the artificial environment. According to our historical records (see Table 1) this has not been reported before.

Fig. 1. *Brachycyrtus ornatus* ♀ 5.VIII.2018 (© Jan Soors).

Fig. 2. *Brachycyrtus ornatus* ♀ 5.VIII.2018, dorsal view (© Jan Soors).

Fig. 3. View on the garden with the greenhouse (© Jan Soors).

Discussion

Analyzing existing literature and available open data, 41 validated and certain records could be traced. Grouping these accounts, tendencies became visible and interesting hypotheses can be made about (a) the phenology of the species, (b) the sex distribution and (c) the habitat and ecology.

(a) Phenology (Fig. 4)

From the 41 records, 33 had exact information about the month in which they were caught. In May only 4 specimens were caught (12%), in June 3 (9%), in July 17 (52%), 6 in August (18%) and finally 3 in September (9%). The diagram clearly shows the species has at least one robust summer generation throughout Europe. Only in Germany and Hungary specimens were caught early in the year. It is uncertain whether this means the species only has one generation in these other countries. Due to the scarcity of the material we should be really careful about this. In any case, the supposed first or spring generation appears to be mostly trivial.

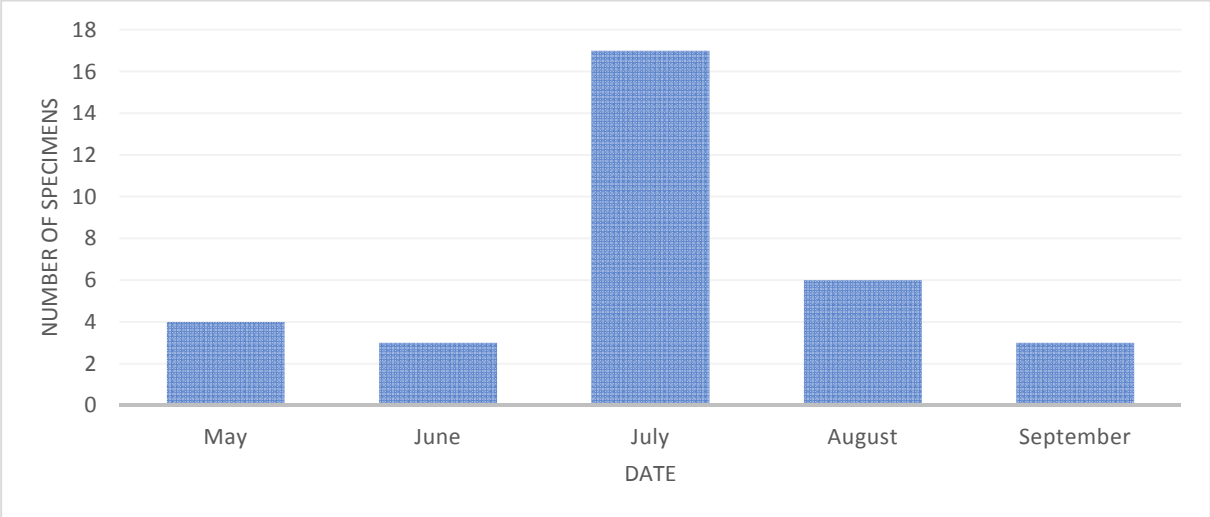

Fig. 4. Phenology derived from known historical records (see Table 1) in Europe (1928-2018).

(b) Sex distribution

Less dubious is the distribution of the registered sexes in the known specimens. From the 41 species, 32 have an identifiable sex. Only 6 (19%) of them are male, 26 (81%) of the caught ichneumonids are females. If we ignore the nine specimens from malaise traps (KARLSSON & MAGNUSSON, 2011), the difference is even larger. Explaining this is far from easy and generally relates to many different aspects.

Many parameters have been identified influencing haplodiploid sex determination, for example catching methods, date and climate, host size, flying behavior and nectar availability (QUICKE, 2015). The scarce information we have on the species' ecology (see below) suggests host and host size are less important, while nectar availability may be a possible influencer. Hypothetically, the colonization-grade and dispersion of the species were stimulated by the distorted sex distribution. Conclusively however, specific explanations will only be possible when more is known about the species' behavior and ecology.

(c) Habitat and ecology

Information on the habitat of the recorded specimens was not easy to find, but the species seems to be quite opportunistic due to (1) the irrelevance of altitude (i.e. Turkey c. our finding) and (2) the presence of the species in gardens or parks (i.e. Croatia, Sweden and Poland), often in suburban areas. Furthermore, it is interesting to note the species was mentioned twice on plants from the Leguminosae-subfamily (HENSCH, 1928; ÇORUH *et al*., 2016). In Tivoli community garden, there are plenty of crops of this subfamily: especially peas (*Pisum* sp.) and beans of all sorts.

Regarding the catching methods, one of the specimens was caught with a net on the roof of a car (VAS, 2013) and nine specimens were caught with a malaise trap (KARLSSON & MAGNUSSON, 2011).

The ecology is obscure. Several reports from *Brachycyrtus*-species are known from cocoons of green lacewings (Neuroptera: Chrysopidae), more specifically one on a species from the genus *Chrysoperla* (WALKLEY, 1956) or *Mallada* (KABISSA *et al.*, 1996) and at least two from a species of the genus *Chryosopa* (KUSIGEMATI, 1981; GAULD & WARD, 2000). Generally they are believed to be ectoparasitic idobionts due to their taxonomical position and morphological features in the larval stadium (QUICKE, 2015), however so far this was never clearly demonstrated.

Our first observation in a greenhouse, where at least *Pseudomallada prasinus* is certainly present, and the second observation indoors, underscore the possible connection with the lacewings and its often suburban context.

Table 1. Overview of specimens from *B. ornatus* in Europe (1928-2018), mentioned in literature and data portals.

Country	**Source**	**Gender**	**Date**
Austria	ANONYMOUS, 1990	1 ?	2.VII.1987
Bulgaria	KOLAROV 2009	1 ♀	26.VII.1996
Croatia	HENSCH 1928	4 ♀♀ 2 ♂♂	VI + VIII
Czech Republic	Arthropoda-pavouci (web)	1 ♀♀	18.IX.2011
France	GBIF AUBERT 1971 GBIF	2 ? 5 ♀♀ 1 ?	VIII.1959 VII.1967 VIII.1981
Germany	BAUER 1958	1 ? 3 ♀♀	24.VIII.1952 17.V.1953
Greece	GBIF	1 ?	VII.1979
Hungary	VAS 2013	1 ♀	20.V.2013
Macedonia	KOLAROV 2009	1 ♀ 1 ♀	17.VI.1994 18.VI.1994
Poland	SAWONIEWICZ 1982	2 ?	?
Slovakia	Forum Entomologi Italiani (web)	1 ♀	4.IX.2016
Sweden	KARLSSON & MAGNUSSON 2011 GBIF	4 ♀ ♀ 2 ♂♂ 2 ♂♂ 1 ♀ 1 ?	VII.2010 VIII.2010 IX.2010 VII.2015
Turkey	KOLAROV 2009 GÜRBÜZ *et al.* 2011 CORUH *et al.* 2016	1 ♀ 1 ♀ 1 ♀	24.VI.1998 3-8.VII.2008 26.VII.2015

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Bibliography

Arthropoda-pavouci, at < http://arthropoda.pavouci-cz.eu/ > [23/12/2018]

AUBERT, J-F., 1971. - Première liste d'Ichneumonides des Basses-Alpes. *Bulletin Mensuel de la Société Linnéenne de Lyon*, 40 (2): 29-38.

BAUER R., 1958. - Ichneumoniden aus Franken (Hymenoptera: Ichneumonidae). *Beiträge zur Entomologie*, 8 (3/4): 438-477.

BROAD G.R., SHAW M.R. & FITTON M.G., 2018. - *Ichneumonid Wasps (Hymenoptera: Ichneumonidae) Their Classification and Biology*. Royal Entomological Society/Field Studies Council, London, 418 p.

ÇORUH S., KOLAROV J. & ÇORUH I., 2016. - A study of Ichneumonidae (Hymenoptera) from northeastern Anatolia II, with new records. *Turkish Journal of Entomology*, 40 (3): 265-280.

Fauna Europaea (Museum für Naturkunde), at < https://fauna-eu.org/ > [23/12/2018]

Forum Entomologi Italiani, at < http://www.entomologiitaliani.net/public/forum/phpBB3/ > [23/12/2018]

GAULD I.D. & WARD S., 2000. - Subfamily Brachycyrtinae. *In*: GAULD, I. (ed.) - *The Ichneumonidae of Costa Rica, 3*. Memoirs of the American Entomological Institute 63: 1-453.

Global Biodiversity Information Facility (GBIF) at < https://www.gbif.org/ > [23/12/2018]

GÜRBÜZ M.F., KOLAROV J., ÖZDAN A. & TABUR M.A., 2011. - Ichneumonidae (Hymenoptera) Fauna of Natural Protection Areas in East Mediteranean Region of Turkey, Part I. *Journal of the Entomological Research Society*, 13 (1): 23-29.

HENSCH A., 1928 - Beitrag zur Kenntnis der jugoslawischen Ichneumonidenfauna. *Konowia (Vienna)*, 7: 99-112.

ANONYMOUS, 1990 - *Jahrbuch des Oberösterreichischen Musealvereines Gesellschaft für Landeskunde* 135 (II): 115 pp.

KABISSA J.C.B., KAYUMBO H.Y. & YARRO G., 1996. - Seasonal abundance of chrysopids (Neuroptera: Chrysopidae) preying on Helicoverpa armigera (Hubner) (Lepidoptera: Noctuidae) and Aphis gossypii (Glover) (Homoptera: Aphididae) on cotton in eastern Tanzania. *Crop Protection*, 15 (1): 5-8.

KARLSSON D. & MAGNUSSON P., 2011. - Brachycyrtinae (Hymenoptera: Ichneumonidae), ny underfamilj brokparasitsteklar för Sverige. *Entomologisk Tidskrift*, 132 (1): 51-54.

KOLAROV J., 2009. - New and little known Ichneumonidae (Hymenoptera) from Bulgaria and related regions. *Bulletin of the Natural History Museum*, 2009 (2): 131-136.

KRIECHBAUMER J., 1880 - Genus Brachycyrtus. *C. R. Zool.-min. Ver. Regensburg*, 34: 161.

KUSIGEMATI K., 1981. - New Host Records of Ichneumonidae from Japan (IV). *Memoirs of the Faculty of Agriculture, Kagoshima University*, 17: 135-138.

PISICA C., 2005. - Lista Ichneumonidelor (Hym. Ichneum.) din Romania. *Studii Şi Comunicari*, 20: 135-157.

QUICKE D.L.J., 2015. - *The Braconid and Ichneumonid Parasitoid Wasps: Biology, Systematics, Evolution and Ecology*. Wiley-Blackwell, Hoboken, 704 p.

SAWONIEWICZ J., 1982. - Ichneumonidae (Hymenoptera) of Warsaw and Mazovia. *Memorabilia Zoologica*, 36: 5-39.

SEDIVY J., 1995. - Ichneumonoidea 3. *In*: ROZKOSNY R. & VANHARA J. (eds). - *Terrestrial Invertebrates of the Palava Biosphere Reserve of UNESCO*, II. *In*: Folia Fac. Sei. Nat.Uni. Masaryk. Brun., Biol. 93: 261-269.

VAS Z., 2013. – First records of three ichneumon wasp species in Hungary (Hymenoptera: Ichneumonidae). *Folia Entomologica Hungarica*, 74: 189-194.

WALKLEY L.M., 1956. - A tribal revision of the Brachycyrtine wasps of the world (Cryptinae – Ichneumonidae). *Proceedings of the United States National Museum*, 166 (3369): 315-329.