

NOTES ON THE GENERA *BASSUS* FABRICIUS AND *AGATHIS* LATREILLE,
WITH A DESCRIPTION OF *BASSUS* *ARTHURELLUS* N. SP.
(HYMENOPTERA: BRACONIDAE)

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Abstract

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Bassus arthurellus n. sp. is described making the name available for studies currently underway on the parasitoids of pests of sunflower (*Helianthus*). Reasons are given for including this species in *Bassus* F., a genus often considered a synonym of *Agathis* Latr.

Résumé

Nous décrivons *Bassus arthurellus* n. sp., un parasitoïde d'insectes nuisibles du tournesol (*Helianthus*). Nous discutons l'inclusion de cette espèce dans le genre *Bassus* F., un genre souvent considéré comme synonyme d'*Agathis* Latr.

Introduction

Two works are currently in preparation in Canada dealing with the hymenopterous parasitoids of pests of sunflower (*Helianthus*). Dr. A.P. Arthur of the Agriculture Canada Research Station in Saskatoon is investigating the rates of parasitism and the distribution of parasitoids in Saskatchewan, and the staff of the Hymenoptera Section at the Biosystematics Research Institute in Ottawa is preparing a key to the hymenopterous parasitoids of sunflower pests.

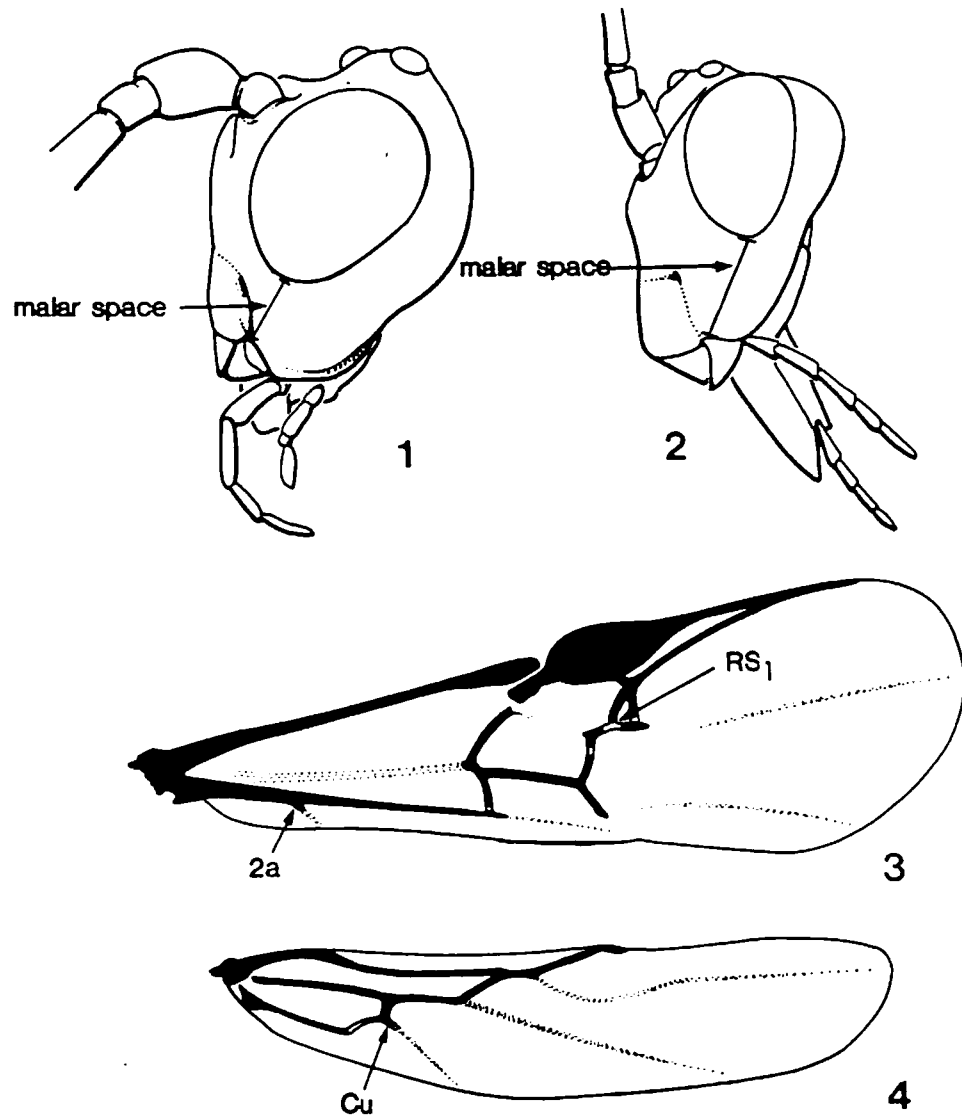
The description of *Bassus arthurellus* n. sp. could be included in the general work on the parasitoids of sunflower pests but I prefer to publish it separately for 2 reasons. First, the sunflower paper is being written for a readership of non-systematists and it shouldn't be unduly complicated by taxonomic descriptions and phylogenetic analysis. Second, I wanted to reestablish the genus *Bassus* in time for inclusion in a new key to the genera of Braconidae in North America north of Mexico (Marsh, Wharton, and Shaw, in preparation).

The choice of a generic name for the species described herein is rather problematic involving a selection from among 3 names: *Agathis* Latr., *Bassus* F., and *Microdus* Nees. In this paper I establish the monophyly of *Agathis* and demonstrate that *Bassus* is the senior synonym of *Microdus*. Further, I describe *Bassus arthurellus* n. sp. and list some of the derived characters that it shares with *Bassus calculator* (F.), the type-species of the genus.

Taxonomic and Phylogenetic Discussion

Prior to Muesebeck's 1927 revision of the Agathidinae (he called them Braconinae), species now included in *Agathis* were placed in 2 genera. *Microdus* (= *Bassus*) was applied to those species with a relatively short malar space (Fig. 1) and *Agathis* was the generic name given to those with the malar space relatively long (Fig. 2). Muesebeck (1927) noted that this character was not sufficient to separate the 2 groups due to a number of intermediate forms. Because he lacked other characters, he synonymized the 2 groups under the generic name *Bassus*. At this time Muesebeck thought that *Bassus* was a senior synonym of *Agathis*. Later Muesebeck *et al.* (1951) discovered an earlier reference to the genus *Agathis* and the whole assemblage was referred to as *Agathis*.

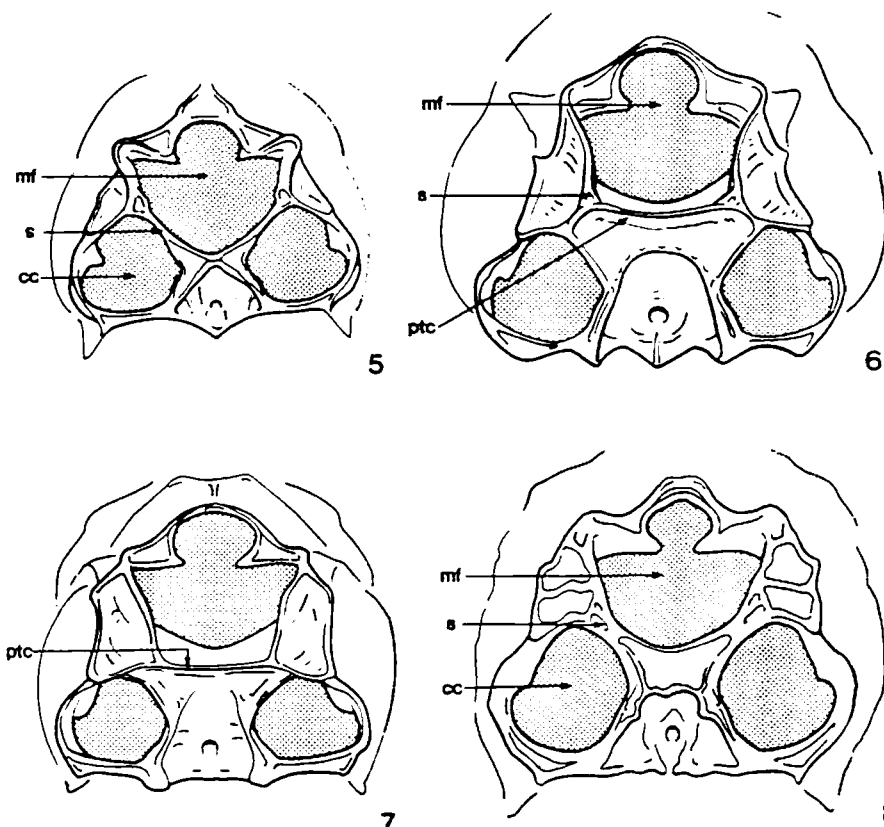
North American researchers followed Muesebeck's synonymy, as did many other taxonomists world-wide. European researchers remained unconvinced and continued to separate *Microdus* (= *Bassus*) from *Agathis*. Because *Bassus* Fabricius 1804, and *Microdus* Nees von E. 1814 share the same type-species (*Ichneumon calculator* F.), they are objective synonyms with *Bassus* being the older available name.



FIGS. 1-4. 1, *Bassus arthurellus* n. sp., lateral view of head, illustrating short malar space; 2, *Agathis malvacearum* Latr., lateral view of head, illustrating long malar space; 3, *Bassus arthurellus* n. sp., fore wing illustrating partly sclerotized 2a vein and 3-sided RS₁ cell; 4, *Bassus arthurellus* n. sp., hind wing illustrating well sclerotized "tubular" Cu vein.

After studying the Agathidinae for several years, I discovered a more reliable character to distinguish *Bassus* from *Agathis*, a character that convinces me that they are separate genera. The coxal cavities of members of the genus *Bassus* are widely separated from the metasomal foramen (Fig. 6-8).

Another character that is useful in distinguishing *Bassus* from *Agathis* is that most species of *Agathis* are melanic with only a few legs and/or abdominal terga pale. There are exceptions to this generalization in the Palearctic region, for example, *Agathis arida*



FIGS. 5-8. Posterior views of mesosomata, with legs and metasomata removed. 5, *Agathis malvaceorum* Latr., illustrating narrow sclerite (s) between coxal cavity (cc) and metasomal foramen (mf); 6, *Bassus atripes* (Cress.), illustrating wide sclerite (s) between coxal cavity (cc) and metasomal foramen (mf), and strong posterior transverse carinae (ptc) of propodeal pseudosternite; 7, *Bassus calcaratus* (Cress.), illustrating strong posterior transverse carina (ptc) of propodeal pseudosternite; 8, *Bassus arthurellus* n. sp., illustrating wide sclerite (s) between coxal cavity (cc) and metasomal foramen (mf).

Tobias, which is pale orange, but the exceptions are few. Members of the genus *Bassus* often have the metasoma or the entire body pale orange to red.

A phylogenetic analysis of the entire subfamily is needed to determine the relationships of these genera. This project I am currently engaged in. At this point *Earinus* Wesmael seems to be a suitable genus to use as an outgroup for *Agathis* and *Bassus*. *Earinus* is a rather generalized agathidine, one that has retained many pleisiomorphic character states. It is also closely related to *Bassus* and *Agathis* based on at least one synapomorphy, i.e. spines positioned outwardly along the mid-length of the middle tibia. Based on *Earinus* as the outgroup, the elongate malar space is a synapomorphy for members of *Agathis* and the closed coxal cavities are a synapomorphy for members of *Bassus*. (Members of *Earinus* have a short malar space and open coxal cavities.)

Dr. G.E.J. Nixon is nearing completion of a revisionary work on the Agathidinae of Europe. He also recognizes the importance of the coxal character to distinguish *Bassus* from *Agathis* (pers. comm.), and he will continue the European tradition of recognizing these 2 groups as separate genera.

As Muesebeck (1927) noted, the relative length of the malar space or head is not a reliable character to separate all *Bassus* from *Agathis*, though it will work about 90% of the time. One species group of *Bassus* has the malar space long, as in *A. malvacearum* Latr. (Fig. 2). *Bassus atripes* (Cresson), *B. bakeri* Muesebeck, and *B. nigripes* (Cresson), hereafter collectively referred to as the *atripes* group, all have the malar space elongate and the coxal cavities closed (Fig. 6). I believe that the elongate malar space found in the *atripes* group is convergent with that of *Agathis*; they are not homologous character states. The *atripes* species group appears to be closely related to *Bassus calcaratus* (Cresson) and several other species near *B. calcaratus*, e.g. *B. acrobasis* Cush. and *B. buttricki* Vier. The 2 groups share 3 characters. The first of these is the peculiar form of the propodeal pseudosternite. The propodeal pseudosternite takes many forms in the Agathidinae (compare Figs. 5–8). A character unique to the *atripes* and *calcaratus* species groups is the presence of a strong posterior transverse carinae (Figs. 6, 7). In other species of *Bassus*, the posterior carina of the propodeal pseudosternite is reduced or absent (e.g. Fig. 8).

The second derived character shared by the 2 species groups above is the shape of the first metasomal tergum. In both groups there are sharp longitudinal carinae. Members of the genus *Agathis* lack these strong carinae; rarely they have converging carinae of a different shape.

The metasoma of the *atripes* group is orange, a characteristic of the *calcaratus* group and a condition that occurs only very rarely in *Agathis*. As previously mentioned, this metasomal coloration is not found in any known Nearctic *Agathis*.

In summary, 3 derived characters (using *Earinus* as the outgroup), i.e. coloration, shape of propodeal pseudosternite, and closed coxal cavities, indicate that the *atripes* group belongs in the genus *Bassus*. The long malar space found in this group is therefore considered convergent with that of members of the genus *Agathis*.

At least 1 species of *Agathis* found in North America has a short malar space. *Agathis pumilus* Ratz. was introduced from Europe to help control the larch casebearer, *Coleophora laricella* Hbn. It has open coxal cavities and shares several other character states with members of *Agathis*. These character states are presence of a pair of parallel, longitudinal carina on the propodeum, the shape of the first metasomal tergum, and the vertex hollowed or "excavated" posteriorly. All known members of *Agathis* have an excavated vertex. It is thought that the long head and mouthparts evolved in *Agathis* to enable them to exploit the deep nectaries of some species of flowers. The excavated vertex allows the head to tilt back to a prognathous position so that the long head and mouthparts are angled properly for feeding. Although *Agathis pumilus* has had the head length reduced secondarily, evidence of its former long length is retained in the presence of an excavated vertex. In general, when one characteristic fails to place a species in *Agathis* or *Bassus* correctly there are several other characters that remain reliable.

Bassus arthurellus n. sp.

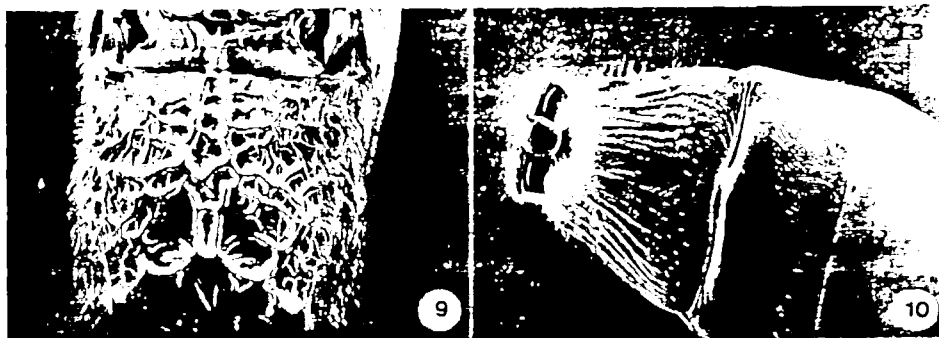
Etymology. Named after Dr. A.P. Arthur, the collector of the type series.

Diagnosis. The following combination of characters will separate *B. arthurellus* from all other Nearctic species of *Bassus*: notauli punctate; legs and metasoma pale, remainder of body black; first metasomal tergum granulo-striate lacking 2 predominant longitudinal carinae (Fig. 10); first metasomal tergum almost as wide apically as long; Cu vein of hind wing well sclerotized "tubular" at least in part (Fig. 4).

Description. Holotype ♀.

Note. If a character is variable within the type series, the variation is given in square brackets.

Head. Antennae 29 segmented [29–30]; malar space/eye height ratio 0.52 [0.52–0.57].



FIGS. 9–10. 9, *Bassus arthurellus* n. sp., dorsal view of propodeum illustrating areolate-rugose sculpture; 10, *Bassus arthurellus* n. sp., dorsal view of metasoma, illustrating granulo-striate sculpture and dimensions of the first metasomal tergum (T₁).

Mesosoma. Notauli punctate; scutellar groove crenulate; sternaulus deeply impressed, punctate [$0.5\text{--}0.8 \times$ length of mesopleuron]; metapleuron and propodeum (Fig. 9) both areolate-rugose; propodeal pseudosternite rugose (Fig. 8); middle tibia with 3 [2–5] preapical spines outwardly; hind tibia with 11 [8–14] apical spines; RS, cell of fore wing triangular, slightly petiolate (Fig. 3); 2a vein of fore wing partly sclerotized, tubular (Fig. 3); Cu vein of hind wing sclerotized, tubular (Fig. 4).

Metasoma. First tergum longitudinally granulo-striate (Fig. 10); first tergum about as wide apically as long, length/width ratio, 65/63; tergum 2 mostly smooth, partly coriaceous (Fig. 10) [tergum 2 varies from smooth to coriaceous to weakly granulate]; tergum 3 smooth [rarely with a hint of coriaceous or granulate sculpture]; ovipositor as long as body when fully exerted.

Coloration. Black and orange; orange as follows: palpi, all legs, tegula, and metasoma except ovipositor sheaths; [mesoscutum and pleura sometimes partly pale; metasoma distally, hind tibia distally, and some tarsal segments sometimes black]; fore wing evenly infusate except for small clear patches posterior to stigma.

Length. 4.4 mm [3.7–4.6].

Allotype ♂. Essentially as in holotype ♀ except as follows: antennal flagellomeres partly pale; terminal segments of metasoma black; length 3.9 mm.

Remarks. Some derived character states that *B. arthurellus* shares with *B. calculator* (F.) and that demonstrate a close affinity of the 2 species are as follows: hind coxal cavities closed, malar space short, first metasomal tergum longitudinally striate, and propodeum areolate-rugose.

Host. Reared from *Cochylis* (Cochylidae) larvae on sunflower head where both *C. arthuri* Dang and *C. hospes* (Wals.) occur.

Material examined. (CNC = Canadian National Collection, Ottawa; USNM = United States National Museum, Washington; ACRS = Agriculture Canada Research Station, Saskatoon.) Holotype ♀, CANADA, Saskatchewan, Drinkwater, collected (from seed head of *Helianthus petiolaris* Nutt.) 4.VII.1983, emerged before 11.X.1983 from *Cochylis* sp., A. Arthur (CNC, type No. 18683).

Allotype ♂, same data as holotype except collection date 21.VIII.1983. Paratypes: all localities in Saskatchewan: 5♀, 4♂, same data as holotype (ACRS, CNC, USNM); 2♀, same data as holotype except collection date 17.VIII.1983 (CNC); 1♀, same data as holotype except collection date 21.VIII.1983 (CNC); 1♀, 1♂, Bienfait, coll. 21.VIII.1980, A. Arthur (CNC); 1♂, Briercrest, 20.VIII.1980, A. Arthur (CNC); 2♀, Estevan, VIII.1982, A. Arthur (CNC); 1♀, Lacadena, 27.VIII, year?, A. Arthur. All of

the above paratypes were reared from *Cochylis* sp. collected on the heads of *Helianthus petiolaris* in August from 1980 to 1983. 1 ♀ Torquay, 14.VIII.1955. C.D. Miller (CNC).

Acknowledgments

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