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THE PHYLOGENETIC AFFINITIES OF *MESOCOELUS* SCHULZ (AGATHIDINAE: BRACONIDAE: HYMENOPTERA)

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Abstract

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Based on synapomorphic character states in the parastigmal area of the fore wing, the genus *Mesocoelus* is transferred from the Orgilinae to the Agathidinae. Placement in the Orgilinae is rejected because of the presence of these synapomorphies and the absence of a subapical notch on the ovipositor, a derived character state found in all known members of the Orgilinae.

Résumé

L'auteur montre, à partir de caractères synapomorphiques tirés de la région du parastigma sur l'aile antérieure, que le genre *Mesocoelus* appartient à la sous-famille des Agathidinae. Les affinités phylogénétiques du genre avec les Orgilinae sont réfutées à cause de la présence de ces synapomorphies et de l'absence d'une entaille subapicale sur l'ovipositeur, un caractère dérivé qui se trouve chez tous les représentants connus des Orgilinae.

Since being described by Ashmead (1898) under the preoccupied name *Coelothorax*, *Mesocoelus* has been placed in 3 different subfamilies of the Braconidae, i.e. Agathidinae, Microgastrinae, and most recently Orgilinae. It is the purpose of this paper to establish that *Mesocoelus* belongs in the Agathidinae.

Ashmead (1900) noted that *Mesocoelus* looked like an Agathidinae in many respects, but because of the lack of a RS1 cell he thought it was more closely related to the Microgastrinae. Clearly, *Mesocoelus* is not a Microgastrine as originally thought. Its only apparent similarity with members of the Microgastrinae is the reduction of the wing venation and this character has occurred independently in a number of different braconid subfamilies. *Mesocoelus* also lacks the most obvious microgastrine synapomorphy, i.e. the spiracles of the first metasomal segment are not located on the laterotergites.

Muesebeck (1932), in an excellent paper, placed *Mesocoelus* in the Agathidinae on the basis of "the characteristic form of the stigma, what little remains of the venation, the shape and sculpture of the abdominal tergites and structure of the thorax". Most recently van Achterberg (1984) placed *Mesocoelus* in the Orgilinae in the new tribe Mesocoelini, which he erected to contain *Mesocoelus* Schulz and *Aneurobracon* Brues. *Aneurobracon* was synonymized under *Mesocoelus* by Muesebeck (1935). Van Achterberg either overlooks this or considers them to be separate genera. In my view they are congeneric and, as van Achterberg has not provided data to make a contrary argument, I will consider his separation of the 2 genera as an oversight. In any case arguments presented in this paper apply equally to both nominal genera.

Van Achterberg (1984) presents 2 synapomorphies to define the Orgilinae including *Mesocoelus*, "1-SR [= IRS] of fore wing absent" and "marginal cell of fore wing slender and rather narrow or absent". In the same paper he reports both of these characters to also be synapomorphies of the Agathidinae though he states that 1-SR [= IRS] of the fore wing is only reduced instead of absent in the Agathidinae. In fact, in most members of the

Table 1. Character states of Agathidinae and Orgilinae

Agathidinae	Orgilinae
1a*. 1 M of fore wing separated from parastigma by a bulla (Figs. 1, 2).	1b. 1 M of fore wing fused to parastigma (Fig. 3).
2a*. Radius separated from parastigma (Figs. 1, 2).	2b. Radius fused with parastigma (Fig. 3).
3a. Ovipositor without dorsal subapical notch, smooth.	3b*. Ovipositor with dorsal subapical notch
4a*. Cuspis separated from volsella by a narrow linear region	4b. Cuspis absent

*Apomorphic condition.

Agathidinae this vein is absent. Van Achterberg uses various other character states at more inclusive levels to separate Orgilinae from Agathidinae. These orgiline character states are as follows: 1, larvae without fleshy appendages; 2, dorsal carinae of 1st tergite (of metasoma) often reduced; 3, cuspidal process not separated; 4, 2-cu of hind wing absent.

Larvae of *Mesocoelus* are unavailable; therefore character state number 1 does not help resolve the phylogenetic affinities of this genus. Character states 2 and 4, the only 2 listed as synapomorphies by van Achterberg, are present in Orgilinae, in *Mesocoelus*, and in the great majority of the Agathidinae. Therefore, these characters do not help us to distinguish Orgilinae from Agathidinae, nor do they help one place *Mesocoelus* in either subfamily.

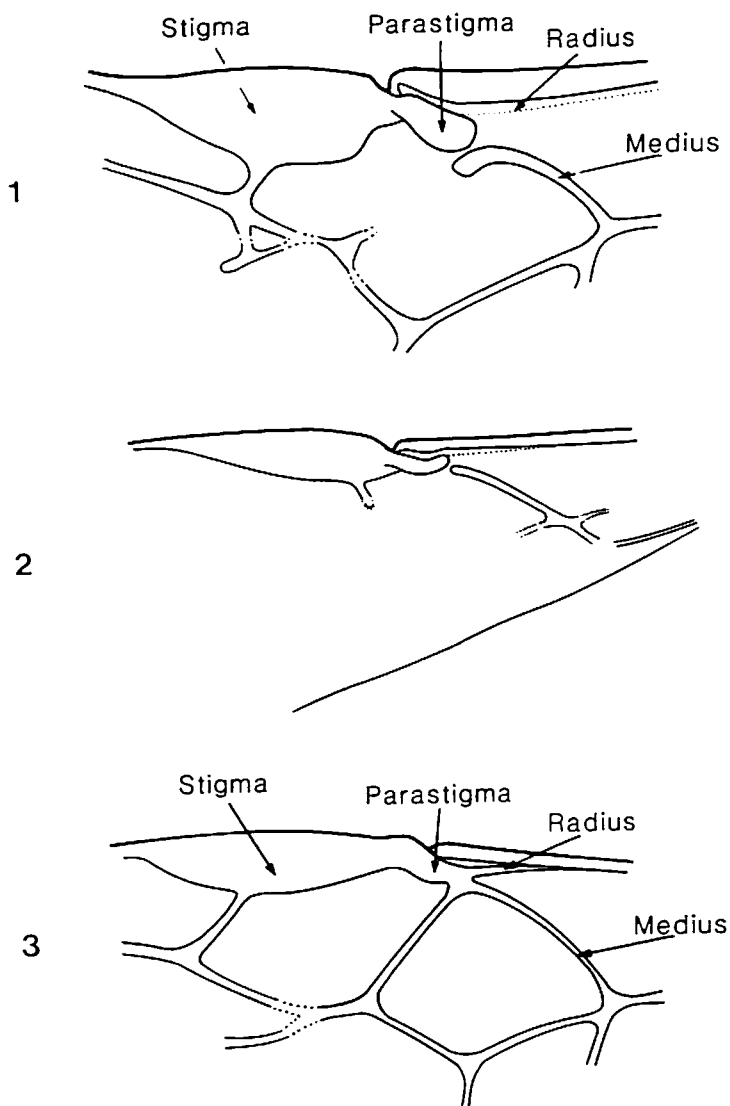
Character state 3 is present in the Orgilinae. I verified this with a dissection of *Orgilus obscurator* (Nees). Another dissection demonstrated that *Mesocoelus* has the "cuspidal processes separated", as do all Agathidinae. In all the Agathidinae the volsella is divided into 2 distinct lobes, the cuspis and the volsella proper. I verified this by dissecting the following species: *Agathis malvacearum* Latr., *Bassus cinctus* (Cress.), *Cremnops desertor* (Linn.), *Earinus limitaris* (Say), and *Zelomorpha arizonensis* Ashmead. All have the cuspis present as a distinct lobe not completely separated from the volsella.

Four character states distinguish the Agathidinae from the Orgilinae. These are presented in Table 1.

Character states 1a and 2a (from Table 1) are synapomorphies defining the Agathidinae. The argument that these 2 character states are synapomorphic for the Agathidinae is strengthened by the fact that they are unknown outside of the Agathidinae and all members of the Agathidinae share them. In other words, there are no examples of convergence or reversal in character states 1a and 2a.

Character state 4a is also derived and I believe it to be unique to the Agathidinae though I have not made an exhaustive search within the Braconidae. Tobias (1967), in his study of Braconid phylogeny, seems to lump many character states under the broad category "separation of the cusps in the male genitalia". Unlike those of many of the other braconids that Tobias includes in this group, the cuspis of agathidine genitalia is firmly and widely attached to the volsella though it is delimited from the volsella by a constriction or narrowed linear region.

The Orgilinae are a difficult group to define; however, all known members of the subfamily have a subapical dorsal notch on the ovipositor. All members of *Mesocoelus* lack this notch (as do all Agathidinae); therefore their placement in the Orgilinae is anomalous. Although the subapical notch is present in other ichneumonoid taxa, it seems to have been derived *de novo* in several different phylogenetic lines. Within the Braconidae it is the lack of a subapical notch that is the most widespread character; lacking a reliable phylogeny, I presume that is the most widespread character; lacking a reliable phylogeny, I presume this to be the plesiomorphic character state within the Braconidae. Therefore, I hypothesize that the subapical notch of the Orgilines is a derived character shared by the



FIGS. 1-3. Stigmatal areas of fore wings. 1, *Agathis malvacearum* Latreille; 2, *Mesocoelus philippinensis* Muesebeck; 3, *Orgilus obscurator* (Nees).

Orgilinae or some more inclusive group. The other character states that typify the Orgilinae are listed in Table 1.

I have seen the types of the type species of *Mesocoelus* and *Aneurobracon* and find them to be congeneric. Although the holotype of *Mesocoelus laeviceps* Ashmead lacks both fore wings, conspecific specimens with fore wings have 2 of the Agathidinae synapomorphies listed in Table 1, as does *Aneurobracon bequaerti* Brues. I did not dissect the male genitalia of these species for want of specimens.

Because members of *Mesocoelus* have all of the agathidine synapomorphies known to me, its phylogenetic affinities lie with this subfamily. This argument is strengthened by the lack of characters shared by *Mesocoelus* and members of the Orgilinae.

Van Achterberg (1984) placed *Mesocoelus* in the Orgilinae rather tentatively and gave it tribal status. He believed that it may represent a separate subfamily because "the scutellum possesses a hemi-circular depression medio-posteriorly". It is not clear why this character may be so important. I found that not all *Mesocoelus* have a "hemi-circular" depression on the scutellum posteromedially; often the area is flat with surface sculpture and this later condition is widespread in the Agathidinae. Besides several species of *Mesocoelus*, some agathidines also have a hemi-circular depression, e.g. *Bassus binominata* (Mues.). These data lead me to believe that this character state is not one that can be interpreted as a synapomorphy for *Mesocoelus*.

It is beyond the scope of this paper to deal with the affinities of *Mesocoelus* within the Agathidinae. Their rather aberrant appearance is mostly due to derived reductional characters, and at this stage of our knowledge there is no justification for this taxon to have tribal status within the Agathidinae.

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