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A new family, Daohugoidae fam. n., of siricomorph hymenopteran (Hymenoptera = Vespida) from the Middle Jurassic of Daohugou in Inner Mongolia (China)

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Daohugoidae fam. n. — новое семейство перепончатокрылых насекомых инфраотряда Siricomorpha (Hymenoptera = Vespida) из средней юры Даохугоу во Внутренней Монголии (Китай)

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Abstract. Daohugoidae fam. n. with a single genus and species *Daohugoa tobiasi* gen. et sp. n. is described from the Middle Jurassic of Daohugou in China. Daohugoidae is hypothesised to be a sister group of the clade comprising Siricidae, Myrmiciidae, Xiphydriidae and Apocrita.

Key words. Insecta, Hymenoptera, Vespida, Daohugou, Middle Jurassic, fossils, new taxa.

Резюме. Из среднеюрских отложений Даохугоу в Китае описано семейство Daohugoidae fam. n. с единственным родом и видом *Daohugoa tobiasi* gen. et sp. n. Новое семейство предположительно занимает сестринское положение по отношению к монофилетической группе, включающей Siricidae, Myrmiciidae, Xiphydriidae и Apocrita.

Ключевые слова. Insecta, Hymenoptera, Vespida, Даохугоу, средняя юра, ископаемые остатки, новые таксоны.

Introduction

The Jurassic hymenopteran fauna is known mainly from Eurasia. It can be attested as of rather limited diversity during the Early Jurassic (probably including earlier Middle Jurassic) and very rich in the Late Jurassic (Rasnitsyn, 1980, 2002; Rasnitsyn et al., 2003). Until very recently, the mid-Jurassic fauna of the order Hymenoptera was unknown. This makes particularly important the recently discovered Daohugou biota from the Mesozoic deposits near Daohugou Village, Ningcheng, Neimonggol (Inner Mongolia), China (Wang et al., 2000; Ji, Yuan, 2002; Zhang, 2002; Ren et al. 2002; Rasnitsyn, Zhang, in press). The significance of this discovery is particularly high because of richness and diversity of the biota and good preservation state of the fossils, including hymenopterans (Rasnitsyn, Zhang, in press). The outstanding features of the Daohugou fossil site make it one of the most important insect Lagerstaette.

Daohugou deposits consist of grey tuff, tuffaceous siltstones and mudstones which contain yields insects, conchostracans, plants, salamanders, a kind of theropod and two kinds of pterosaur (Wang, 2000; Wang et al., 2002; Ji, Yuan, 2002; Zhang, 2002; Tan, Ren, 2002; Ren et al., 2002; Zhang et al., 2002; Gao, Shubin, 2003). The age of the biota is discussed in the range of the Middle Jurassic through Early Cretaceous (Wang et al., 2000; Ji, Yuan, 2002; Ren et al., 2002; Zhang, 2002). Based on the composition of the hymenopteran fossil assemblage which is clearly intermediate between the Early Jurassic and Late Jurassic assemblages, Rasnitsyn and Zhang (in press) identify the Daohugou assemblage as the Middle Jurassic in age.

Systematic part

Superfamily Siricoidea Billbergh, 1820 (Latreille, 1802)

Family Daohugoidae Rasnitsyn et Zhang, fam. n.

Type genus: *Daohugoa* gen. n. (from the Middle Jurassic of Daohugou, Inner Mongolia, China).

Description (Fig. 1). Antenna as in *Blasticotoma* Klug (Blasticotomidae): with 3rd segment long and thick and rest flagellum rudimentary. Head not distinctive as seen from above. Pronotum short, with fore and hind margins near straight. Mesonotum with straight transscutal suture (possibly incomplete centrally), otherwise of plesiomorphic structure. Metanotum with cenchri present, transversely elongate oval. Forewing venation only slightly reduced as preserved (apical third missing) but modified as following. *SC* complete. Pterostigma large, fusiform. Costal (plus subcostal) space moderately wide. *R* straight before *RS* base, slightly bent at *RS* base. 1st abscissa of *RS* moderately short (subequal to that of *M*), somewhat inclined posteroapical, meeting *M* at obtuse angle. *RS*+*M* very short although both cells *1r* and *1mcu* long. Crossveins *1r-rs*, *1m-cu*, *cu-a*, and *1a-2a* present (Fig. 1), *2r-rs* and *2r-m* possibly missing; no signs of supernumerary (basal) *cu-a*. Cell *3r* short. (*M*+)*Cu* straight before *cu-a* and with only incipient bent at *cu-a* placed beyond midlength of cell *1mcu*. Anal veins plesiomorphic. No apparent corrugation of wing membrane Hindwing with long free *SC*. Crossveins *1r-m*, *3r-m*, and *cu-a* present, *2r-m* and *m-cu* probably lost, *1a-2a* smoothly aligned with *2A*. *1r-m* meeting *RS* near its base. Free *Cu* base (retained, e.g., in Xyelidae) not present. Abdomen with paraterga delimited sublaterally and double folded (as in Xyelidae), with tergum 1 divided in two half-terga, tergum 2 entire. Ovipositor short, sheath about as long as head in dorsal view and half as long as ovipositor. Cercus long and finger-like.

Composition. Type genus only known.

Taxonomic position. The unique fossil under description, however incomplete, displays the intriguingly contradictory array of characters. The transscutal suture, a unique synapomorphy of the clade comprising higher Siricoidea (Siricidae + Myrmiciidae + Xiphydriidae) and Apocrita s. l. (that is, including Orussidae, Paroryssidae, Karatavitidae, and Ephialtitidae) unequivocally indicates a position at the base of that clade. At the same time, the equally long and wide 3rd antennal segment is known in various more basal hymenopteran taxa like Xyelidae, basal Tenthredinoidea (Xyelotomidae, Blasticotomidae, Argidae), Pamphilioidea (Xyelydidae, Praesiricidae) and Cephoidea (some Sepulcidae). Large 3rd antennal segment (most probably composite of several primary segments), coupled with the flagellar reduction, is particularly characteristic of Tenthredinoidea (up to the practically identical form in Blasticotoma). However, other tenthredinoid apomorphies are rather opposite to those seen in the fossil at hand, viz. pronotum deeply emarginate from behind, 1st abscissa of *RS* very short to absent and *RS*+*M* long, ovipositor and particularly its sheath short. This provides no reason to relate the fossil to the tenthredinoids.

The double-folded abdominal paraterga are characteristic for Xyelidae and particularly for Xyelinae and so may represent their synapomorphy (apparently absent from the Triassic Archexyelinae, the same apparently holds true for Macroxyelinae also, although data are inconclusive yet for some extinct subtaxa). The poor preservation of the wing apex coupled with the short *3r* cell does not allow to exclude presence of the forked *RS* characteristic of Xyelidae. But again, both 1st abscissa of *RS* and *RS*+*M* being short while both cells *1r* and *1mcu* long is quite opposite to the venational modifications known in Xyelidae. The same holds still more true for the transscutal suture and almost complete reduction of the anten-

nal flagellum beyond its 1st segment. It does not seem probable that such an insect might belong to Xyelidae.

These considerations leave us with Siricoidea as the only taxon to classify the fossil at hand. The differences outlined are well enough to keep it separated at the family level. It worth mentioning, however, that the above mentioned unusual interrelations between the basal *RS* and *M* veins and adjacent cells may find a parallel in some siricoids, viz. in extant Siricidae (subfamily Siricinae as opposed to the Meso-

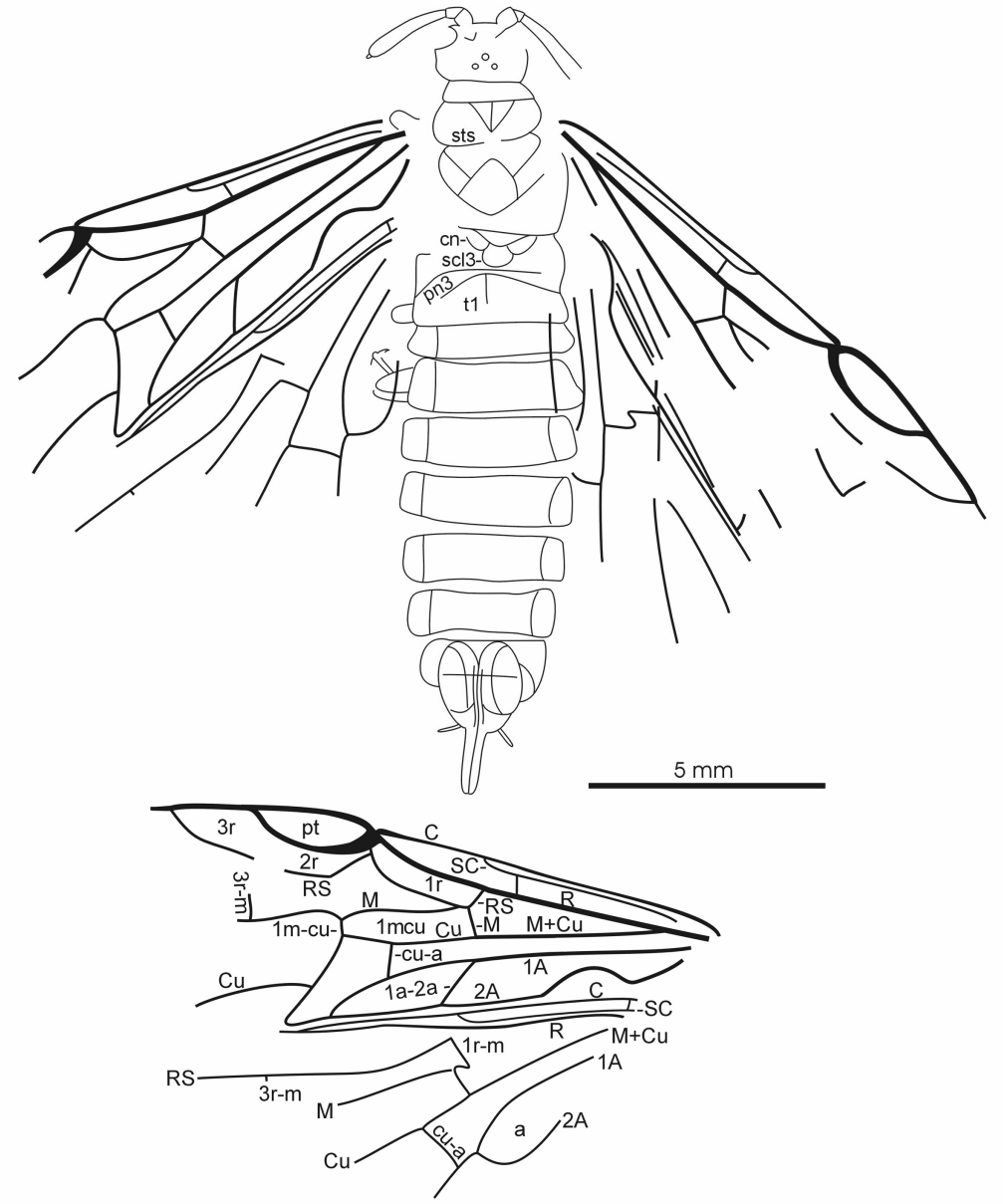

Fig. 1. *Daohugoa tobiasi* sp. n., fossil as preserved and wing venation combined from right and left wings. Vein nomenclature customary. Other symbols: *1mcu* — 1st mediocubital cell; *1r*, *2r*, *3r* — radial cells; *a* — anal cell; *cn* — cenchrus; *pn3* — metapostnotum; *scl3* — metascutellum; *sts* — trans scutal suture.

zoic Siricidae) and particularly in Myrmiciidae. These horntails have 1st abscissae of *RS* and *M* rather short and *RS*+*M* short, very short, or lost, and *1mcu* fairly long, but Siricidae, unlike Myrmiciidae, have 1st abscissa of *RS* reclined (directed posterobasal instead of posteroapical). In majority of their characters (ordinary antenna, narrow costal space, short *1r* and long *3r* cells, long ovipositor, etc.) these taxa are different and hence appear to be only distantly related.

As a result, the new family can be considered as forming a sister group to the above defined clade composed of Siricidae, Myrmiciidae, Xiphydriidae, and Apocrita. Of its characters, synapomorphic for the entire clade is presence of the transscutal suture, and autplesiomorphic in comparison to the rest clade are large 3rd antennal segment, comparatively wide costal space, and short ovipositor. Symplesiomorphic with Myrmiciidae and Xiphydriidae are proclined 1st abscissa of *RS* and possibly straight transscutal suture (unknown for Myrmiciidae), symplesiomorphic with Myrmiciidae — unmodified pronotum, symplesiomorphic with Myrmiciidae and Siricidae — present *SC*. Possibly synapomorphic with Siricidae and Myrmiciidae are the short 1st abscissa of *RS* and *RS*+*M*, and with Myrmiciidae — lost *2r-m* crossvein; symplesiomorphic with Myrmiciidae as opposed to Siricidae is the proclined 1st abscissa of *RS*. Autapomorphic for the new family are the rudimentary flagellum beyond 3rd antennal segment, long cell *1r*, and folded abdominal paraterga. The mentioned possible synapomorphies to Myrmiciidae with or without Siricidae are prone to homoplasy, and they fall into contradiction with the synapomorphies of the other three siricoid families plus Apocrita (those alternative to the autapomorphies listed above for the new family). That is why the new family is considered here as the sister group to the clade comprised of Siricidae, Myrmiciidae, Xiphydriidae, and Apocrita.

Daohugoa **Rasnitsyn et Zhang, gen. n.**

Type species: *D. tobiasi* sp. n. (from the Middle Jurassic of Daohugou, Inner Mongolia, China).

Description (Fig. 1). Antenna with scape and pedicel short, subquadrate, 3rd segment slightly clavate, almost as long as head wide, 4th segment peg-like. Head capsule moderately transversal, rounded in dorsal view, with eyes small, temples longer than eye, ocelli normal. Pronotum widening backward. Mesonotum with prescutum small comparing scutellum, transscutal suture somewhat more close to prescutum. Legs short, claw well developed, apparently simple, other leg details unknown. Forewing with *SC* reaching *C* slightly distal of *RS* base, reaching *R* well before *RS* base. *C* and *R* hardly incrassate before pterostigma. Pterostigma longer than head wide, with only margins sclerotized (posterobasal margin particularly so). 1st abscissa of *RS* slightly shorter than that of *M* and about twice as long as *RS*+*M*. Cells *1r* and *1mcu* about as long as pterostigma (*1mcu* slightly longer). *1r-rs* very short (almost dot-like). Apex of cell *3r* at wing margin in distance from pterostigma for about 0.6–0.7 of pterostigma length. *3r-m* approximately at level of pterostigmal apex. *1m-cu* shorter than 1st abscissa of *M*. Crossvein *cu-a* almost reaching last third of cell *1mcu*. Hindwing *SC* reaching *RS* base. *RS* as preserved not bending toward wing margin apically, with *1r-m* distant from its base probably for near half *1r-m* length. *1r-m* near midway between wing base and *3r-m*. *M* and *Cu* forking well basal of *cu-a*. Anal cell distant from *cu-a* for about half *cu-a* length, *2A* lacking its own ending.

Species included. Type species only.

Etymology. Genus name is after the insect Lagerstaett Daohugou. Gender is feminine.

Daohugoa tobiasi **Rasnitsyn et Zhang, sp. n.**

Siricoidea fam. n.: Rasnitsyn, Zhang, in press (table 1; plate 2, fig. 1).

Material. Holotype: NND113/NIGP137014; near complete female fossil with apical wings poorly preserved and legs essentially hidden under body; Daohugou Village near Chifeng City in Inner Mongolia, China; Middle Jurassic.

Description (Fig. 1). Body with antenna medium dark, otherwise near pale except darkened pterostigmal margins, *C* and *R* before pterostigma, *R* beyond pterostigma, and, to a lesser extent, subcostal space subbasally and narrowly apically. Head closely punctate or rather rugose; no other surface sculpture found.

Measurements, mm: body length without ovipositor 15.2; 3rd antennal segment length 1.8, width 0.33; 4th segment length 0.13; head length 1.3, width 2.1; forewing length up to *3r* apex 11.9; ovipositor full length 3.35, exerted for 1.5; sheath length 1.8.

Etymology. The species named in honour of the eminent hymenopterist Vladimir I. Tobias.

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