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The First Brachycerous Flies (Diptera: Rhagionidae) from the Lower Jurassic of Gondwana

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Abstract—Two species of the snipe-flies are described in the genus *Taschigatra* gen. nov. The taxonomic position of the genus is discussed.

INTRODUCTION

Fossil brachycerous flies are recorded in sedimentary rocks from all continents except Antarctica. However, fossil records are not evenly distributed, and are concentrated mainly in the old Laurasian continent. The discovery of brachycerous flies in the Lower Jurassic of India reported herein is the oldest record from Gondwanaland. The geological history of brachycerous flies begins in the Middle Triassic (Krzemiński, 1998), but it is only in the Early Jurassic that they become more diverse (Mostovski, 1998). By the Late Jurassic, all orthorrhaphous lineages had appeared and various cyclorrhaphan flies entered the paleontological record during the Cretaceous (Mostovski, 1999). The remains of brachycerous flies in Gondwanan deposits are scarce and were previously only known from the Cretaceous. A single snipe-fly has been found in the Lower Cretaceous Koonwarra Beds of Australia (Jell and Duncan, 1986); various brachycerans are recorded from the Lower Cretaceous Santana Formation, northeastern Brazil (Grimaldi, 1990; Martins-Neto and Kucera-Santos, 1994; Evenhuis, 1994); and two empidids have been described from the Upper Cretaceous Orapa Beds of South Africa (Waters, 1989a, b).

In India, brachycerous flies have been found in sediments of the Kotá Formation (Upper Gondwana Group) exposed in the Pranhita–Godavari Basin, Andhra Pradesh (Deccan). A detailed description of the strata was given by Tasch (1987): he also reported conchostracans, Blattodea, Coleoptera, Heteroptera, Homoptera, Neuroptera, and Ephemeroptera from the same formation. In addition, Orthoptera, Raphidioptera and Hymenoptera are also represented in the Indian Jurassic–but Ephemeroptera are actually absent (E.A.J. pers. observ.).

The genus *Taschigatra* gen. nov. described below almost certainly belongs to the family Rhagionidae, although it should be borne in mind that isolated wings of brachycerous flies ought to be referred to this family with caution. For example, Rohdendorf (1964) placed *Rhagiophryne bianalis* (described by him from an isolated wing from the Middle–Upper Jurassic (Callovian–Kimmeridgian) of Kazakhstan (Kirichkova and Doludenko, 1996) in the Rhagionidae. Additional material, including numerous nearly complete specimens from the type locality, allowed the taxonomic position of this species to be clearly determined. In fact, it was shown to be a therevid, or stiletto-fly (Mostovski, 1998).

The wing venation of the newly described material shows a combination of such primitive characters as a nearly straight R_{2+3}, very long fork of R_{4+5}, and derived features including a closed (but not stalked) anal cell, curved M_3, and a more or less narrowly opening fourth posterior cell. Only two undoubted snipe-flies have been described elsewhere from the Lower Jurassic, viz. *Palaeobrachyceron willmanni* Ansorge, 1996 and *Grimmyia baltica* Ansorge, 1996. Both are from the Toarcian of Germany (Ansorge, 1996), although the genus *Palaeobrachyceron* Kovalev, 1981 includes five additional species from the Lower–Middle Jurassic of Siberia. The genus *Taschigatra* gen. nov. differs from *Palaeobrachyceron* in R_{2+3} being straight and the discoidal cell nearly parallel sided. It should be noted that the form of R_{2+3} is quite stable within a genus in rhagionids, and it is therefore a good feature for distinguishing genera (Mostovski, 1998). In this respect, the new genus seems to be close to *Grimmyia* Ansorge, 1996, differing in the fork of R_{4+5} being considerably longer, the hind basal cell longer, and the absence of a free portion of M_4 before *mcu*. Both *Palaeobrachyceron* and *Grimmyia* lack a pterostigma. There are some fossil snipe-flies with a long fork of R_{4+5} resembling *Taschigatra* gen. nov. These include *Kubekovia accessoria* Kovalev, 1985 from the Middle Jurassic Itat Formation of Siberia (Kalugina and Kovalev, 1985). This has a medium-size wing with a long R_{4+5} fork, dark pterostigma, parallel-sided discoidal cell, and M stem not tanned; also, it has a straight R_4, a longer anterior basal cell, and sinuate R_{2+3} which lies close to R_4 and terminates closer to R_4 than R_1. All these characters separate *K. accessoria* from *T. bharataja* sp. nov. and *T. tulyabhijana* sp. nov. below. Other unde-

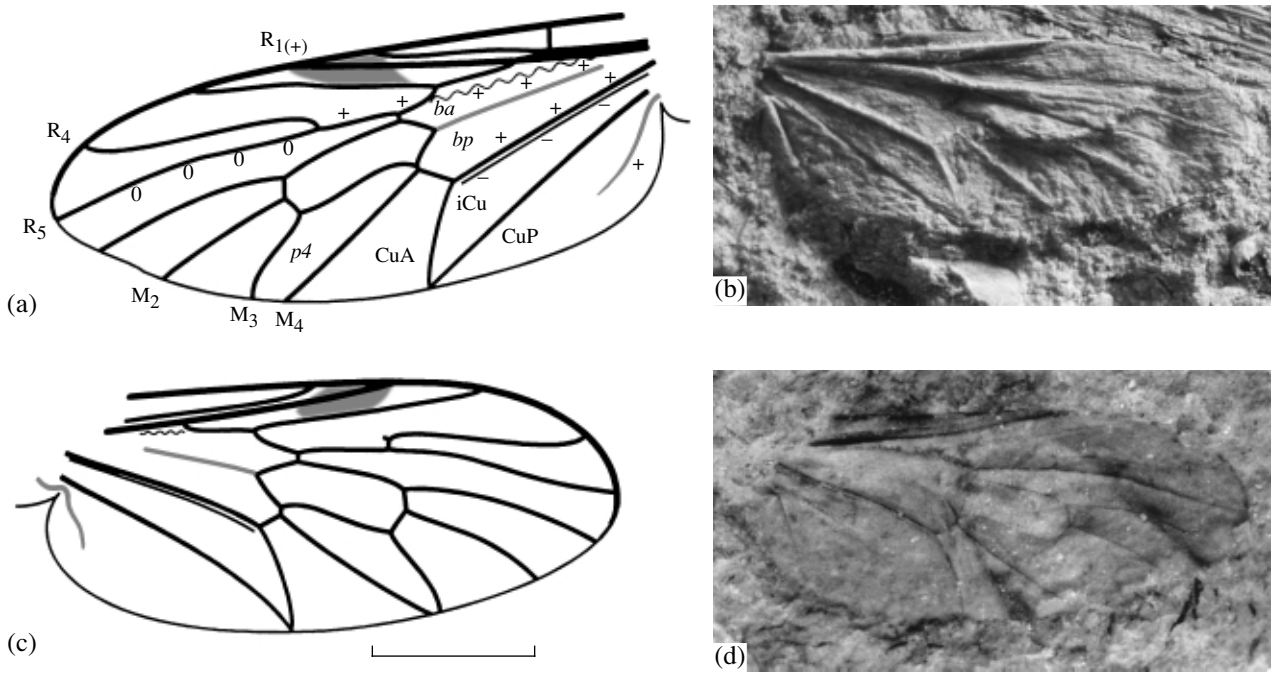

Fig. 1. Represantatives of the genus *Taschigatra* gen. nov. from the Lower Jurassic of India: (a, b) *Taschigatra bharataja* sp. nov., holotype no. 2013(3013): (a) wing venation, (b) specimen as it appears; (c, d) *Taschigatra tulyabhijana* sp. nov., holotype no. 5034: (c) wing venation, (d) specimen as it appears. Scale bar 1 mm.

scribed rhagionids from the Middle–Upper Jurassic (Callovian–Kimmeridgian) Karabastau Formation, Kazakhstan, in the collection of the Paleontological Institute, Moscow, also show a long R_{4+5} fork in combination with a sinuous R_{2+3}. However, we consider the latter character more significant taxonomically, in which case the new genus from India is not allied to them.

Besides rhagionids, there are some other brachycerous flies found in the Lower Jurassic. There are representatives of Empidoidea, Nemestrinoidea, and Xylophagoidea in the Toarcian of Germany (J. Ansorge, pers. comm.), and Oligophrynidae from the Sinemurian of England (Ansorge and Krzemiński, 1994) and Lower Jurassic of Kirgiziya (Rohdendorf, 1962). These Empidoidea and Nemestrinoidea have a distinctive and quite specialized wing venation. Xylophagoidea are represented by *Protobrachyceron liasinum* Handlirsch, 1920 and another undescribed species (Ansorge coll.), both of which have a short fork of R_{4+5} and an open anal cell. Oligophrynidae, with a comparatively derived wing venation, appear to be close to Stratiomyomorpha.

On balance, we consider that *Taschigatra* gen. nov. should be placed in the family Rhagionidae but differs from all known Jurassic snipe-flies by a unique combination of features. The material described below is housed in the Museum of Comparative Zoology, Harvard University.

SYSTEMATIC PALEONTOLOGY

Family Rhagionidae Latreille, 1802

Genus *Taschigatra* Mostovski et Jarzembowski, gen. nov.

Etymology. In honor of Prof. Emeritus Paul Tasch, and from Sanskr. *gatra* (a wing, a part of a body); neutral gender.

Type species. *T. bharataja* sp. nov.

Diagnosis. Costal vein circumambient, weakened at or immediately past wing apex. Vein R_1 straight or nearly so, not strongly sinuate. R_{4+5} fork long, widened distally. R_4 somewhat sinuate. Transverse *r-m* far before discoidal cell midlength. Vein M_3 more or less sinuate. Cells *ba* and *bp* of equal length. Medial stem somewhat weakened or poorly pigmented before discoidal cell. Fourth posterior cell somewhat narrowed apically. Anal cell closed, with point stalk. The wing corrugation as follows: R_1 strongly convex, fold running from R stem towards transverse *r-m* convex, R_{4+5} before its fork convex, R_5 neutral, CuA strongly convex, iCu concave, fold behind CuP convex (Fig. 1a).

Composition. *T. bharataja* sp. nov. and *T. tulyabhijana* sp. nov.

Taschigatra bharataja Mostovski et Jarzembowski, sp. nov.

Etymology. Specific name is derived from Sanskr. *bharata* (country of Bharatas, i.e., India) and Sanskr. *-ja* (born from, connected with).

H o l o t y p e. No. 2013(3013), part and counterpart of well preserved wing; India, Andhra Pradesh, Adilabad District, Sirpur Taluka, 2.5 km east-southeast of Kadamba Village; Lower Jurassic, Kotá Formation, Tasch's outcrop K-1, bed 3(A).

D e s c r i p t i o n (Figs. 1a, 1b). The wing membrane is finely microtrichose. The costal vein becomes thinner before R_5 tip. The stigma is brownish, slightly paler above R_1 and in its basal part. R_{4+5} fork is acutely angled at base. The base of R_{4+5} fork is shifted basad of the hind end of intermedial vein. The fourth posterior cell is opened broadly, the costal section between M_2 and M_3 is no more than three times as long as that between M_3 and M_4. The anal lobe is moderately developed. The alula appears to be moderately developed.

M e a s u r e m e n t s (mm): wing length, approx. 4.2, wing width, 1.5.

M a t e r i a l. Holotype.

***Taschigatra tulyabhijana* Mostovski et Jarzembowski, sp. nov.**

E t y m o l o g y. Specific name is derived from Sanskr. *tulya* (equal) and Sanskr. *abhijana* (origin), i.e., from the same place.

H o l o t y p e. No. 5034, well preserved wing; India, Andhra Pradesh, Adilabad District, Sirpur Taluka, 2.5 km east-southeast of Kadamba Village; Lower Jurassic, Kotá Formation, Tasch's outcrop K-1, bed 2(A).

D e s c r i p t i o n (Fig. 1c, 1d). The wing membrane is finely microtrichose. The costal vein becomes thinner beyond R_5 tip. The stigma is brownish, little paler above R_1 and in its basal part. R_{4+5} fork with a right angle at its base. R_4 with a stub. The base of R_{4+5} fork is at level of hind end of intermedial vein. The fourth posterior cell is narrowly opened, the costal section between M_2 and M_3 is over ten times as long as that between M_3 and M_4. The anal lobe is moderately developed. The alula appears to be moderately developed.

M e a s u r e m e n t s (mm): wing length, approx. 3.8, wing width, 1.5.

C o m p a r i s o n. Differs from *T. bharataja* sp. nov. in the right angle at the base of R_{4+5} fork, the latter shifted distad, and the fourth posterior cell considerably narrower at wing margin.

R e m a r k. Wing venation is rather unstable in rhagionids, so the short stub near the base of R_4 might be just a variation.

M a t e r i a l. Holotype.

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