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New Damselflies (Odonata: Synlestidae, Hemiphlebiidae) from the Mesozoic Transbaikalian Locality of Chernovskie Kopi

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Abstract—Two new genera and two new species, *Gaurimacia sophiae* gen. et sp. nov. (Synlestidae) and *Mersituria ludmilae* gen. et sp. nov. (Hemiphlebiidae), are described from the Mesozoic locality of Chernovskie Kopi in eastern Transbaikalia. The Odonata assemblage of Chernovskie Kopi is analyzed.

Key words: new species and genera, damselflies, Insecta, Odonata, Synlestidae, Hemiphlebiidae, Mesozoic, Transbaikalia, Chernovskie Kopi.

INTRODUCTION

The assemblage of Late Mesozoic Odonata from eastern Transbaikalia is rather poor in both higher and lower taxa, unlike assemblages of a similar age in Germany (Solnhofen) and England, where Odonata remains are abundant and diverse. There are four large stratigraphic units recognized in the Mesozoic continental section of eastern Transbaikalia: Shadoron Group ($J_{2–3}$), Unda-Daya Group (J_3), Turga Formation (J_3–K_1), and Kuti Formation (K_1). Odonata remains are known only from volcanic sedimentary rocks of the Unda-Daya Group and the Turga Formation. The Odonata assemblages of these stratigraphic units are strikingly different at the subordinal level.

Odonata of the suborder Anisozygoptera, three species in three genera of the extinct family Isophlebiidae, are characteristic of the Unda-Daya Group. Organic remains often form single-taxon oryctocenoses in the volcanic sedimentary rocks of the Unda-Daya Group. These are, for example, oryctocenoses formed by horsetails (*Equisetites* sp.), moss (*Muscites* sp.), lycopods (*Lycopodites* sp.), and body fragments and carapaces of tadpole shrimps *Prolepidurus* sp. In some oryctocenoses, larvae and imagoes of isophlebiid Odonata form either sheet single-taxon assemblages or dispersed assemblages, which contain remains of horsetails or tadpole shrimps. Other animals or plants do not form separate assemblages. According to accepted reconstructions, deposits of the Unda-Daya Group were accumulated in high-mountain caldera lakes with sporadic inhabitants, horsetail marshes along the beaches and beds of water mosses (Sinitza, 1993).

The volcanic sedimentary rocks of the Turga Formation, which are widespread in Transbaikalia, are poor (except for the Semen locality) in remains of Odonata, which are represented by wing fragments or, less commonly, by larvae of Anisoptera, dominated mostly by members of the family Aeschnidiidae or, in much rarer cases, by Aeschnidae. The Odonata of the Turga Formation are still poorly known; however, preliminary results show that Aeschnidiidae are represented by at least three genera in the Turga oryctocenoses. Various lakes that experienced periodic change of regime have been reconstructed for the Turga Formation (Sinitza, 1975).

The first organic remains from insect-bearing beds of the Chernovskie Kopi locality were collected by Sinitza in the mid-1980s. The largest collection of insect remains from this locality (over 500 specimens, representing 13 insect orders) was collected between 1993 and 1995. Although Orthoptera dominate numerically in this collection, the remains of aquatic insects generally outnumber those of terrestrial insects (Sinitshenkova, 2000). Odonata are of sporadic occurrence.

Identification of the collection has shown that oryctocenoses of this locality cannot be assigned to any of the stratigraphic levels recognized in eastern Transbaikalia, contain a mixed assemblage of fossil insects (Sinitza, 1995; Sinitshenkova, 2000), and are considered to be transitional between the Unda-Daya Group and the Turga Formation (Sinitza, 1995).

Subsequent collections have shown the same pattern of domination despite an increased relative abundance of beetles and cockroaches.

In 2004, a total of 15 Odonata remains were known from the locality of Chernovskie Kopi, most of them represented by wing fragments buried along with leaf flora (conifer and ginkgophyte leaves). Only one poorly preserved anisopteran-like larva has been found in a bed with plant debris.

Although this collection of Odonata is small, it shows an unusual diversity (uncommon in eastern Transbaikalian oryctocenoses) and includes members of the dominant suborder Anisoptera: Gomphaeschnidae (*Gomphaeschna sibirica*: Bechly *et al.*, 2001)

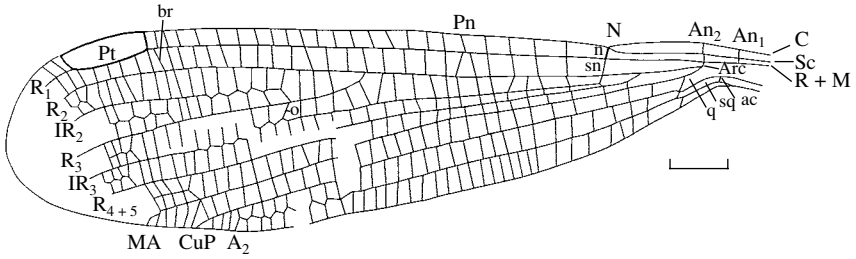


Fig. 1. *Gaurimacia sophiae* sp. nov., holotype PIN, no. 4626/461. Scale bar 2 mm in Figs. 1 and 2.

and as yet undescribed Aeschnidiidae and Aeshnidae. New members of the families Synlestidae and Hemiphlebiidae (suborder Zygoptera) are described below. Representatives of these families are extremely rare in the fossil record and are known mainly from modern faunas, hence, the significance of the Odonata assemblage of Chernovskie Kopi.

SYSTEMATIC PALEONTOLOGY

Family Synlestidae Tillyard, 1917

(=Chlorolestidae Fraser, 1960)

Representatives of this extant family have low abundance and limited distributions; they occur in South Africa, Australia, and South America. The assignment of the specimen under description to the family Synlestidae is based on the shape of the pterostigma and on the number of cells under it. Eight extant genera with few species are recognized in this family.

Genus *Gaurimacia* Vasilenko, gen. nov.

Etymology. From the planet Gaurimacia in *The Star Diaries of Ijon Tichy* by S. Lem.

Type species. *G. sophiae* sp. nov.

Diagnosis. IR_3 base level with N; anterior margin of q less than 0.5 times as long as its posterior margin; A originating slightly proximad of ac.

Species composition. Type species.

Comparison. This genus most closely resembles the genus *Megalestes* Selys, 1862 but differs in the position of the base of IR_3, which is situated at the same level as N; it differs from the genus *Orolestes* McLachlan, 1895, in addition to the above character, in the A base being in a position proximal to ac, and from the genus *Phylolestes* Christiansen, 1947 in the shape of the discoidal cell.

Gaurimacia sophiae Vasilenko sp. nov.

Plate 5, fig. 1

Etymology. In honor of the geologist and paleontologist S.M. Sinitza.

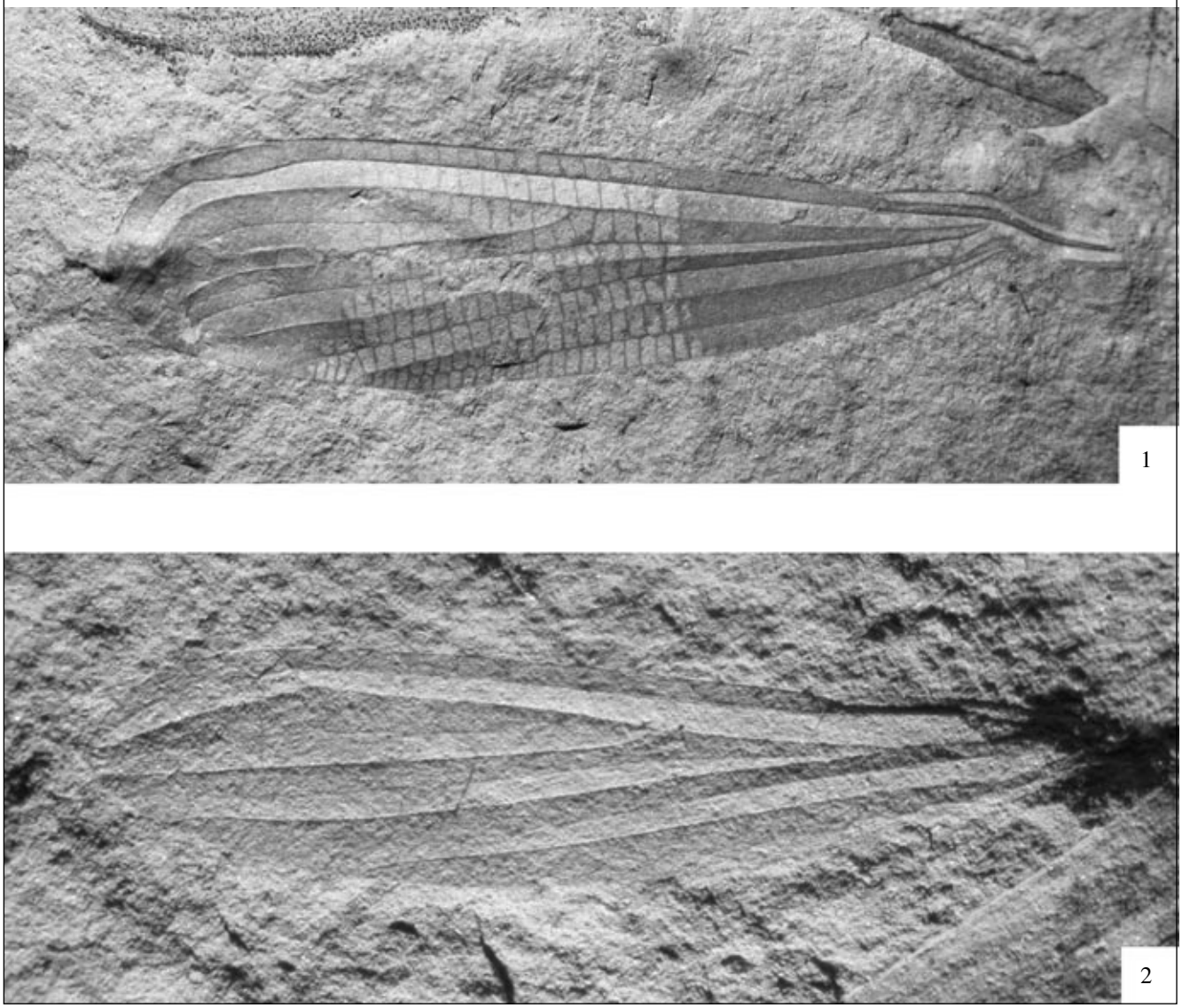
Holotype. PIN, no. 4626/461, part and counterpart of a well-preserved complete wing; Chita Region, Chita District, left bank of the Ingoda River; Upper Jurassic–Lower Cretaceous, Doronino Formation, Chernovskaya transitional sequence.

Description (Fig. 1). The node (N) is situated at the end of the proximal fifth of the wing; the antenodal complex includes two main antenodal veins crossing both marginal fields; An_2 is situated at the level of the arch (arc); vein ac (anal crossing) lies midway between An_1 and An_2; there are 23 postnodal veins, some of them coincide with crossveins of the radial field; the discoidal cell (q) is irregularly shaped, its anterior distal corner is acute; the subdiscoidal cell (sq) is narrow, tapering distally and forming an acute angle; the pterostigma (Pt) is moderately long and broad, 3 times as long as broad and 0.2 times as long as the distance between its proximal margin and N; there are six crossveins below the pterostigma; the supporting vein of the pterostigma (br) is situated proximad of Pt; the R_3 base is slightly distad of the midlength between Pt and N; there are four cells between IR_2 and R_3; the IR_3 base coincides with sn, the R_{4+5} is distad of the midlength between N and ac; the MA apex is at the Pt midlength, the CuP apex is at the level of the proximal margin of Pt; vein A_1 zigzagged in its distal third. Duplication of cells between R_2 and IR_2 starts below the distal margin of Pt; between IR_2 and R_3, at the level of br; between R_3 and IR_3, at the Pt midlength; between IR_3 and R_{4+5}, it starts one cell distad of the level of cell duplication between R_3 and IR_3; and between R_{4+5} and MA, duplication starts slightly proximad of the proximal margin of Pt. Vein o (*vena obliqua*) is situated between R_3 and IR_3 below the IR_2 base; IR_3 zigzagged distad of vein o; there is only one row of cells across the discoidal, cubital, and anal fields. The color pattern of the wing is uneven. In its basal portion, the wing is pigmented from the R_{4+5} base to the midlength between the R_{4+5} and R_3 bases; the apical portion of the wing is pigmented from the level proximad of Pt.

Measurements, mm. Wing length, 25; wing maximum width, 7.

Material. Holotype.

Plate 5



Explanation of Plate 5

Fig. 1. *Gaurimacia sophiae* sp. nov., holotype PIN, no. 4626/461, wing impression, ×6.
Fig. 2. *Mersituria ludmilae* sp. nov., holotype PIN, no. 4626/462, wing impression, ×15.

Family Hemiphlebiidae Tillyard, 1926

This family is represented by one monotypic genus in the modern fauna of Australia and, probably, by two fossil genera, *Parahemiphlebia* and *Cretarchistigma*, from the Lower Cretaceous of England and Brazil that were provisionally attributed by their authors to the superfamily Hemiphlebioidea, without defining their familial assignment (Jarzembowski *et al.*, 1998). Bechly (1998) placed the genus *Parahemiphlebia* into the family Hemiphlebiidae and tentatively assigned the genus *Cretarchistigma* to the same family.

Representatives of the family are characterized by small wings, highly reduced venation, and by shifted crossveins in the first and second wing fields (Belyshev and Kharitonov, 1977; Jarzembowski *et al.*, 1998).

Genus *Mersituria* Vasilenko, gen. nov.

Etymology. From the planet Mersituria in *The Star Diaries of Ijon Tichy* by S. Lem.

Type species. *M. ludmilae* sp. nov.

Diagnosis. Node situated at border of basal third of wing; R_2 not sharply angular below pterostigma; IR_2 straight; A_1 base not zigzagged prior to RS fork; supporting vein of pterostigma (br) continuing inner margin of Pt; subnodal crossvein not coinciding with IR_3 base.

Species composition. Type species.

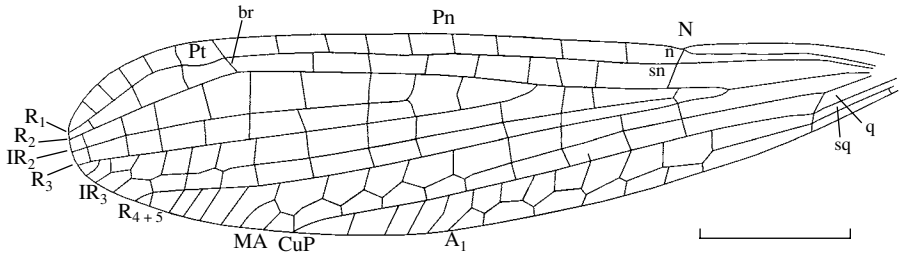


Fig. 2. *Mersituria ludmilae* sp. nov., holotype PIN, no. 4626/462.

C o m p a r i s o n. This genus differs from the fossil genera *Parahemiphlebia* and *Cretarchistigma* in R_2 not being sharply angular, in the basal position of the node, and in the coinciding of the supporting vein of Pt and the inner margin of Pt. It differs from the recent genus *Hemiphlebia* Selys, 1868 in IR_2 being straight.

***Mersituria ludmilae* Vasilenko, sp. nov.**

Plate 5, fig. 2

E t y m o l o g y. In honor of the paleoentomologist L.N. Pritykina.

H o l o t y p e. PIN, no. 4626/462, part and counterpart of incomplete wing; Chita Region, Chita District, left bank of the Ingoda River; Upper Jurassic–Lower Cretaceous, Doronino Formation, Chernovskaya transitional sequence.

D e s c r i p t i o n (Fig. 2). The R_3 base is at the level of the end of the proximal third between Pt and N; the IR_2 base is two cells after the R_3 base; R_{4+5} base is distad of the midlength between the node and the anterior margin of the discoidal cell; IR_3 zigzagged from the midlength of the pterostigma; the MA apex is slightly proximad of the pterostigma, the A_1 apex is between the R_3 and IR_2 bases. There are eight postnodal veins; the bases of RS crossveins often coincide.

R e m a r k s. The basal portion of the wing is missing; however, the shape of the discoidal cell is similar to that in the hind wings of representatives of the family.

M e a s u r e m e n t s, mm. Length of the fragment, 11; its maximum width, 2.5.

M a t e r i a l. Holotype.

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