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DIPTERANS (MESOSCIOPHILIDAE) FROM THE LOWER CRETACEOUS OF TRANSBAYKAL

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Abstract: *Mesosciophilopsis* gen. nov. and three new species of family Mesosciophilidae from the Lower Cretaceous (Neocomian) of Baysa are described. A new diagnosis of the family Mesosciophilidae is given.

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The earliest members of the family Mesosciophilidae were described by Rohdendorf [8] as a special subfamily Mesosciophilinae within the family Allactoneuridae. Later, this family was named Fungivoritidae [9]. Kovalev [5] considered Fungivoritidae as a junior synonym of Pleciofungivoridae, but he proposed a family rank for the subfamily Mesosciophilinae [5].

All Mesosciophilidae described previously are from the Middle and Upper Jurassic. This family became very rare already in Early Cretaceous, apparently replaced by Mycetophilidae. Accordingly, there are 480 gnats of family Mycetophilidae and only three of Mesosciophilidae in the Paleontological Institute of the Russian Academy of Sciences collection from the Neocomian Lower Cretaceous of Transbaykal, Baysa (V. V. Zherikhin, pers. comm).

Body structures were not known before. The complete specimen of the gnat is described here, and allows completion of the original family diagnosis [8].

Mesosciophilopsis gen. nov., described below, belongs to advanced Mesosciophilidae. All species of the genus have crossvein R_4 shifted to a wing base, so that the length of the small cell is about 1/7 the length of the wing; Sc_2 is near the base of RS, M1 is completely reduced, and bases of M2 and M_4 are drawn together subarcuately, and proximally displaced. Venation of *Mesosciophilopsis* is more specialized than any of the Jurassic genera of Mesosciophilidae. But *Mesosciophilopsis* is a typical Mesosciophilidae although it resembles some genera of subfamily Sciophilinae, family Mycetophilidae. Relationships between Mesosciophilidae and Mycetophilidae are not completely clear now. Fungus gnats (Mycetophilidae) are considered as direct descen-

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dants of Mesosciophilidae [8, 3], but if representatives of the latter family truly had their own apical tibia spur formula (see description below) these families would be considered as sister groups.

All specimens are from Baysa: Russia, Transbaykal, Buryat, Vitim, left bank of River Baysa; Lower Cretaceous, Zaza Formation. Some well-preserved Mesosciophilidae from the Upper Jurassic of Karatau were also studied.

The following designations are used in descriptions: main, middle and end sections of RS are respectively RS1, RS2, and RS3 (RS3 = R_5); main, middle, and end sections of M_{1+2} are M_1, M_2, and M_3 (fig. 1).

FAMILY MESOSCIOPHILIDAE ROHDENDORF, 1946

Mesosciophilidae: Rohdendorf, 1946, p. 76

Mesosciophilidae: Kovalev, 1985, p. 172

Description. Medium-sized insects are 4-9 mm long. Head is small, rounded or slightly oval. Eyes are large, compound with very small facets. Antennae are on middle or upper part of head, no longer than 1/2 body length, usually with 15-16 segments. Flagellum tapering toward apex. Scapus and pedicellus are wider than flagellomeres, round or cylindrical, their width no longer than their length. Flagellomeres are rounded or cylindrical. Palpus has 4-5 segments, their length about length of head or scarcely longer. First and second segments are rounded, others cylindrical. Proboscis is much shorter than head height, malacoid.

Thorax is rounded. Mesonotum often carries setae, scutellum and pleurotergite possibly have setae. Mediotergite is usually bare. Katepisternum is much larger than anepisternum.

Wings are rather wide, oval, with rounded apical angle and small alula, 3-6 mm long. Wing membrane is transparent, with microtrichia irregularly arranged. Costal vein has 3 rows of small setae. R_1, RS2 and RS3 have setae also. Costa ends just after RS termination. Sc length is less than half of wing, Sc converges with C near level of RS. Sc_2 is in front of RS base. Length of R_1 is about 0.8-0.9 of wing length. RS branches near end of basal 1/3 of wings, with bend or fracture in place of connection with ta, curving back arch-like. The only fore RS branch entering R_1, R_4,[1] forms the small cell, which is not more than 1/5 of wing length. Vein r-m can be longer than RS1, but not more than twice its length.

The veins of the medial system are weaker than those of the radial system. The general pattern of structure of M and Cu stems is similar to that of Pleciofungivoridae [3], but vein tb is absent and common base of vein M_4 and fragment M2 is moved proximally. Recurrent crossvein m-cu is often almost horizontal. Halteres are rather large, with fairly long stem.

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[1]W. Hennig [1] and Kovalev [5, 6] have shown that so-called vein R_4 of Mycetophiloidea is really R_{2+3} and the real R_4 is reduced; however, the old and more customary designation is used here.

Legs are long, running type, simple. Third legs are longer than second, and second longer than first. Coxae are elongate, thick covered with setae. Tibiae are about 1.5 times as long as femora. Formula of spurs apparently 1:1:1. Spur is thick, covered with setae, its length more than diameter of tibia. Tibiae and tarsi are covered with short setae. Also, tibiae and sometimes basal segment of tarsi have setae, whose diameter can reach that of tibia. Setae are rows, and dorsal, anterodorsal, posterodorsal, ventral, anteroventral and posteroventral rows are seen. Tarsi are same length as tibiae, first tarsomere equals length of all others.

Abdomen is broadest at midlength, in females narrowing from 5th segment to apex, males are cylindrical, densely haired. Males have 8 observable segments, the last one very small. In males, genital complex is wider than abdomen, transverse, of simple structure, with gonocoxites massive and rounded, and gonostylus cylindrical, terminating with small teeth. In females 8th segment is smaller than preceding segments slightly, narrow apically. Cerci with 2 segments, malacoid, is generally not longer than 8th segment. Basal segment of cerci is longer than terminal one.

Composition. Genera: *Mesosciophila* Rohdendorf and *Mesosciophilodes* Rohdendorf, Upper Jurassic of Kazakhstan; *Mesosciophilina* Kovalev, Middle Jurassic of Siberia; *Mesosciophilopsis* gen. nov., Lower Cretaceous of Transbaykal. Extensive undescribed material is from Upper Jurassic of Kazakhstan and Upper Jurassic-Lower Cretaceous of Mongolia.

Comparison. Mesosciophilidae differ from Mycetophilidae in connection between basal parts of fragment M2 and vein M_4 (mycetophilid M_4 loses contact with medial stem). Mesosciophilidae differ from Pleciofungivoridae in short R_4, converging with R_1 and larger sizes.

Remarks. It is possible that *Eoboletina gracilis* Rohdendorf, 1946 [8] belongs to the family Mesosciophilidae because of its large sizes, typical body form, and abundant chaetotaxy. Meanwhile, poor preservation of venation (veins weak, wings in superposition) does not allow definite classification of this species. Jell and Duncan [2] described specimen NMVP 103290 from the Australian Lower Cretaceous locality Koonwarra and referred it to living genus *Pseudalysiinia* Tonnoir of family Mycetophilidae. Judging from the photograph, which shows well the characteristic structure of M-stem base [2, p. 170, fig. 49k], this insect is referred to the family Mesosciophilidae. Apparently, the figure, which does not show the connection between M_4 and M2, is wrong. It is necessary to redescribe this species, which obviously belongs to a new genus of Mesosciophilidae because of differences in small sizes (wing length - 2.5 mm) and venation details. Formal genus *Sciophilites* Kovalev [6] from the Lower Cretaceous of East Transbaykal may belong to either Mesosciophilidae or Mycetophilidae. Formal genus *Mesosciophilites* Kovalev [4] from the Lower Cretaceous of Mongolia probably should be referred to Mycetophilidae, because of absence of R_4. Structures of M-stem bases of these two genera are unknown.

Genus ***Mesosciophilopsis*** Blagoderov gen. nov.

Genus name. From *Mesosciophila.*

Type species. *M. expletus* sp. nov.

Diagnosis. Large mycetophiloids with dark body. Head slightly transverse. Scapus and pedicellus round. Thorax convex. Scutellum distinctly projecting. Wings moderately wide (length

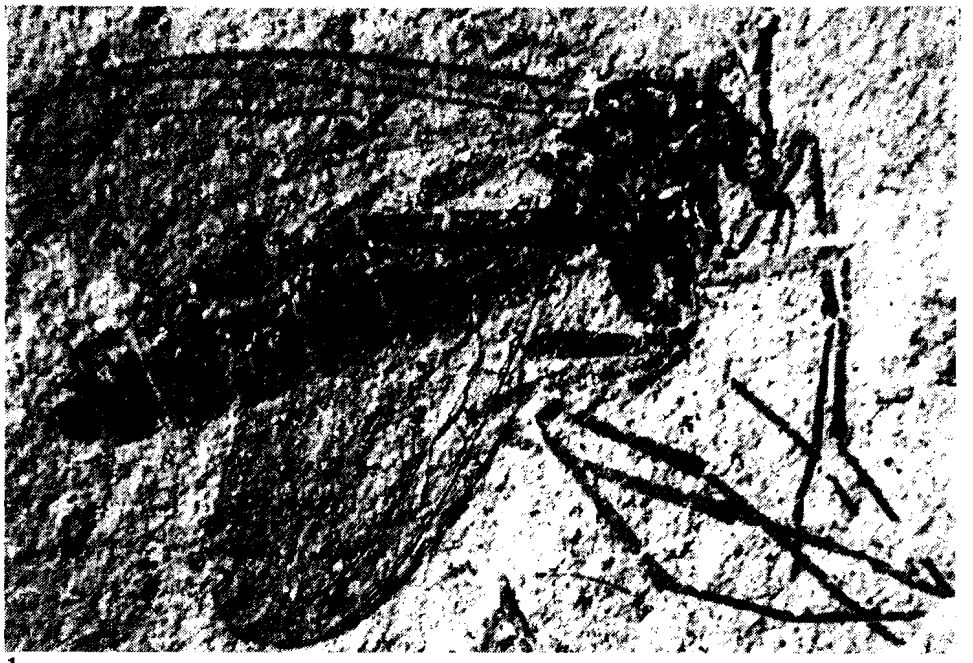

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PLATE VII

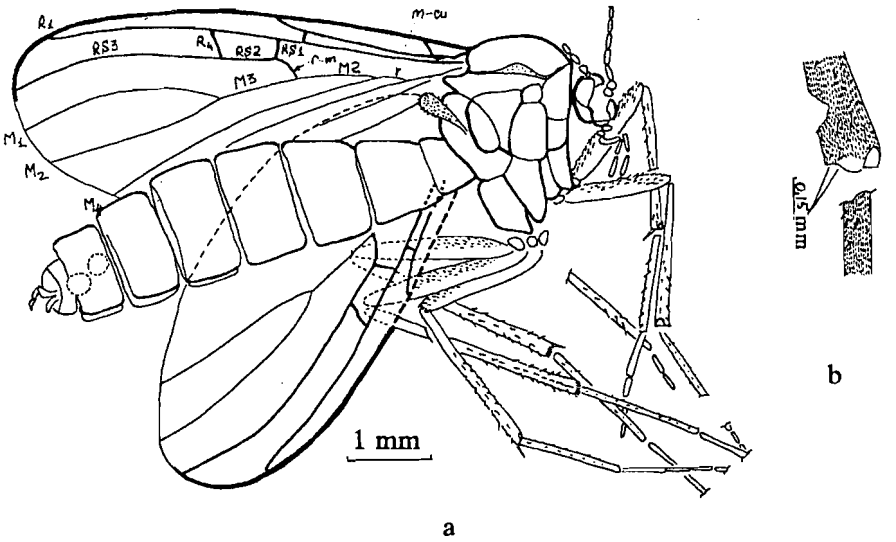

Fig. 1. *Mesosciophilopsis expletus* sp. nov., holotype PIN, No. 3064/9752, Transbaykal, Baysa, Lower Cretaceous: *a* - overall view, *b* - tibia apex.

2.3-2.6 times width). Sc converging with C at level of RS or beyond. Sc_2 starting in front of RS, after beginning of last 1/3 of Sc. R_1 after junction with R_4, deflected slightly. R_1 straight, r-m curved, r-m longer than RS1. R_5 almost parallel with R_1, excluding apex, where deflecting stronger. Small cell no longer than 1/6 of wing length. Base of M_1 and M_2 fork near R_4 level. Halteres light, covered with dense pubescence. Femora covered with numerous setae dorsally. Femora apices with row of small setae. Tibiae and tarsi covered with dense pubescence. Tibia apex, in addition to spurs, with row of black setae and with sensory depression.

Composition. Three species from Lower Cretaceous of Transbaykal.

Comparison. It differs from genera described earlier in much shorter small cell (length no longer than 1/6 of wing length), and in RS1/r-m length ratio.

KEY TO PLATE VII

Representatives of *Mesosciophilopsis* gen. nov.

All specimens are from Baysa, Transbaykal, Lower Cretaceous

Fig. 1. *M. expletus* sp. nov., holotype PIN, No. 3064/9752 (×13.7).
Fig. 2. *M. curtus* sp. nov., holotype PIN, No. 3064/9795 (×13.8).
Fig. 3. *M. minor* sp. nov., holotype PIN, No. 1989/3149 (×24).

Mesosciophilopsis expletus Blagoderov, sp. nov.

Species name. From Latin *expletus* (complete).

Holotype. PIN, No. 3064/9752, mold and cast of gnat, well-preserved; Buryat, Vitim River, Baysa; Lower Cretaceous, Zaza Formation, bed 31 [7].

Description. (fig. 1*a, b*; Pl. VII, fig. 1). Female. Body is dark, legs from femora light. Scapus and pedicellus are rounded, their width twice that of flagellomere. Length of middle flagellomere is about twice its width. Palpus has 5 segments. Third to 5th segments are lengthened, third segment curves forward. Wing length exceeds width 2.4. Sc converges with C just beyond RS base. Distance between Sc_2 and RS is length of RS1. RS1, RS2 and RS3 length ratio is 1:2.7:10. RS1 is almost perpendicular to R_1. Crossvein r-m length is 1.75 times that of RS1 length. M_1 and M_2 fork length is 2.5 times M3 length. M2 and M3 ratio is 1.1:1. Distance between wing margin and A_1 end is 1/3 its length. Fore, mid and hind coxae length ratio is 1:1:1.4; fore, mid and hind tibiae length ratio is 1:1.1:1.4 Abdomen is dark, cerci are light. Second and 3rd tergites of abdomen are wider than 4th to 7th ones. Spermathecae are poorly seen because of dark body, their diameter is about 0.25 mm. Cerci length is same as 8th sclerite, 2nd segment is slightly shorter than 1st, pointed.

Dimensions, in mm. Length of body - 7.2; length of wing - 5.5.

Material. Holotype.

Mesosciophilopsis curtus Blagoderov, sp. nov.

Species name. From Latin *curtus* (shortened).

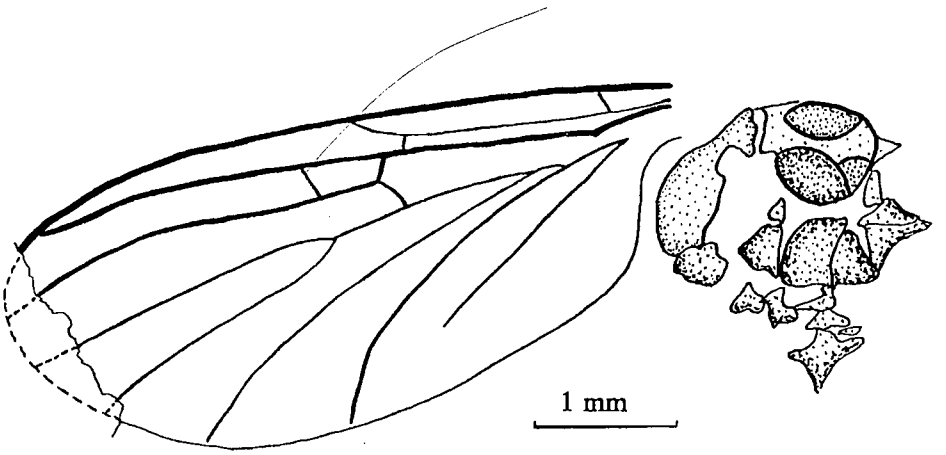

Fig. 2. *M. curtus* sp. nov., holotype PIN, No. 3064/9795, Transbaykal, Baysa, Lower Cretaceous.

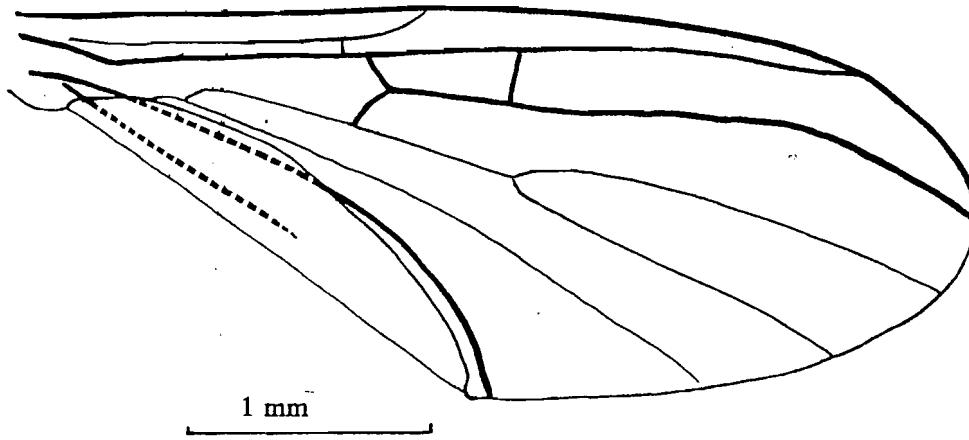

Fig. 3. *M. minor* sp. nov., holotype PIN, No. 1989/3149, Transbaykal, Baysa, Lower Cretaceous.

Holotype. PIN, No. 3064/9795; mold of wing (without apex) and part of thorax; Buryat, Vitim River, Baysa; Lower Cretaceous, Zaza Formation.

Description (fig. 2; Pl. VII, fig. 2). Wing length exceeds by 2.5 times its width. Sc converges with C at level of middle of small cell. Distance between Sc_2 and Rs base shorter than RS1 length. RS1, RS2 and RS3 length ratio is 1:1.75:11. Angle between RS1 and R_1 is about 60°. Crossvein r-m converges with M stem almost at right angle. Crossvein r-m length is 1.25 times that of RS1. M_1 and M_2 fork length is 1/4 that of M3. M_1 slightly draws near R_5 and slightly diverges from M_2. M2 and M3 length ratio is 1.75:1. Distance between wing margin and A_1 ending is 1/4 its length.

Dimensions, in mm. Length of wing - 5.2, of thorax - 2.0.

Comparison. It differs from *M. expletus* sp. nov. in much longer M_1 and M_2 fork, and in different M2 and M3 length ratio.

Material. Holotype.

Mesosciophilopsis minor Blagoderov sp. nov.

Species name. From Latin *minor* (smaller).

Holotype. PIN, No. 1989/3149, cast of wing, Buryat, Vitim River, Baysa; Lower Cretaceous, Zaza Formation, bed 31 [7].

Description (fig. 3; Pl. VII, fig. 3). Wing length is 2.5 times width. Sc converges with C beyond RS base level. Distance between Sc_2 and RS less than half of RS1 length. R_5 is parallel with M_1. RS1, RS2 and RS3 length ratio is 1:3.5:12. R_4 is at level of M_1 and M_2 fork, straight,

almost perpendicular to R_5. Crossvein r-m converges with M at right angle. M_1 and M_2 fork length is 3 times M3 length. M2 and M3 length ratio is 1.1:1. M_2 and M_4 slightly diverge. Distance between wing margin and A_1 ending is half its length.

Dimensions, in mm. Length of wing - 3.8.

Comparison. It differs from *M. expletus* sp. nov. in R_4, being almost perpendicular to R_5, in different RS1, RS2 and RS3 length ratio and in smaller sizes. It differs from *M. curtus* sp. nov. in much shorter M_1 and M_2 fork, and M2 and M3 length ratio.

Material. Holotype.

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