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FUNGUS GNATS OF THE TRIBE SCIOPHILINI (DIPTERA, MYCETOPHILIDAE) FROM THE EARLY CRETACEOUS OF TRANSBAIKALIA

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Abstract: Five new genera and eight new species of fungus gnats of the tribe Sciophilini from the Lower Cretaceous of Transbaikalia are described.

Key Words: Mycetophilidae; Sciophilini; Transbaikalia; Early Cretaceous; new taxa.

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The oldest fossils of the Mycetophilidae family are from the Lower Cretaceous. Shortly after they first appeared, the fungus gnats became the dominant group among the bibionomorphous dipterans. At the Transbaikalian Baissa locality, for example, according to Zherikhin (pers. comm.) out of 990 nonaquatic dipterans, about 400—almost 40%—are fungus gnats. This is the largest Mesozoic fauna of mycetophilids known today. This locality is of special interest because it shows a clear distribution of thermo- and cryophilic forms in different beds in the section, which can be explained by changes in climatic conditions [1, 2, 4-6]. Thus, Beds 13-22, in the middle part of the section, correspond to a warmer climate, whereas Beds 2-9 and 25-35 represent a colder climate (beds numbered after Martinson [3]). This indicates that species found in different parts of the section represent different temperature conditions.

All the mycetophilids described below are from the Baissa locality (Buryatiya, Yerav-ninskiy district, left bank of Vitim River below mouth of Baissa River), and are now housed at the Paleontological Institute, Russian Academy of Sciences, in Moscow. Figure 1b shows the designations of the veins and their segments used here.

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Fig. 1. Species of genera Syntemna and Baisodicrana: a-c - S. mesozoica sp. nov., Holotype PIN No. 3064/9857 (9895): a - overall view, b - wing, c - end of abdomen; d - B. incompleta sp. nov., Holotype PIN No. 4210/2889, wing; e - B. secunda sp. nov., Holotype PIN No. 4210/2880, wing.

FAMILY MYCETOPHILIDAE NEWMAN, 1834

SUBFAMILY SCIOPHILINAE WINNERTZ, 1863

TRIBE SCIOPHILINI WINNERTZ, 1863

Genus Syntemna Winnertz, 1863

Syntemna mesozoica Blagoderov, sp. nov.

Holotype. PIN Nos. 3064/9857 and 3064/9895, positive and negative impressions of female insect (antennae and legs not preserved); Baissa locality, Bed 31; Lower Cretaceous, Zaza Formation.



PLATE VII

Description (fig. 1*a-c*). Female. Mesonotum bears thick hairs, at least in area of humeral calli. Laterotergite probably had hairs. Wings are very wide, their length being 2.1 times their width (fig. 1*b*). Wing membrane is light-colored and bears micro- and macrotrichia. Latter are chiefly in apical part of wing, distally of R_4 . Longitudinal veins (except for basal part of stem of M) have bristles. C extends beyond R_5 for 1/4 of distance between R_5 and M_1 . Sc abuts on R_1 , not quite reaching middle of anterior margin of small cell. Length of Sc is about 1/2 that of wing. Segments RS1, RS2 and RS3 are in ratio of 1:2:5.5. R_5 bends backward. Ratios of segments r-m and M3 are 1:1.4 and of segments M2 and M3 5:1 respectively. Base of fork of M_1 and M_2 lies between levels of bases of RS and end of Sc. R_5 and M_1 are almost parallel in apical part of wing. M_1, M_2 and M_4 diverge slightly. Base of fork of M_4 and CuA is in middle between levels of base of RS and end of Sc. R₅ and M₁ are almost parallel in apical part of wing. M₁, M₂ and M₄ diverge slightly. Base of fork of M₄ and CuA is in middle between levels of base of RS and wing base. Abdomen is densely covered with hairs (except for seventh segment, which has hairs only along lateral margin of tergite), and cylindrical. Eighth and tenth segments are approximately three time shorter than seventh; eighth segment is twice, and ninth is four times narrower than seventh segment. Basal segment is cylindrical, conical at end, and first is slightly longer than second (fig. 1*c*)

Dimensions in mm. Body length - 5.3, wing length - 4.

Comparison. Differs from recent representatives of genus in which structure of female genitalia is known [7] in basal segment of cerci, which is only a little longer than terminal segment (although in specimen just described, basal segment may not be fully visible).

Remarks. Comparison with recent species is difficult, since the species are diagnosed on the basis of details of the structure of the male genitalia. The preservation of the paleontological material prevents study of such important features as the structure of the basal segment of the palps and the arrangement of the sutures on the abdominal sternites. Thus, *S. mesozoica* is only tentatively assigned to the genus *Syntemna*.

Material. Holotype.

Genus Baisodicrana Blagoderov, gen. nov.

Generic name. From Baissa locality and genus Eudicrana.

KEY TO PLATE VII

Fig. 1. Syntemna mesozoica Blagoderov, sp. nov., Holotype No. 3064/9857 (×12).
Fig. 2. Baisodicrana incompleta Blagoderov, sp. nov., Holotype No. 4210/2889 (×5).
Fig. 3. Baisodicrana secunda Blagoderov, sp. nov., Holotype No. 4210/2880 (×9).
Fig. 4. Ekhiritus disannuus Blagoderov, sp. nov, Holotype No. 3064/9787 (×7.2).
Fig. 5. Prospeolepta trapezia Blagoderov, sp. nov., Holotype No. 4210/2940 (×6).
Fig. 6. Prospeolepta simplex Blagoderov, sp. nov., Holotype No. 3064/9805 (×8).
Fig. 7. Pollicitator baisae Blagoderov, sp. nov., Holotype No. 3064/9831 (×7.5).
Fig. 8. Zazicia innuba Blagoderov, sp. nov., Holotype No. 3064/9753 (×8.2).

Type species. B. incompleta sp. nov.

Diagnosis. Wing membrane bearing micro- and macrotrichia over entire wing. C abundantly covered with hairs. Contacting on C beyond base of RS. Sc_2 absent, R_5 with pronounced S-curve, base of fork of M_1 and M_2 located distally from R_4 . Base of fork of M_4 and CuA located proximally from r-m and converging with base of stem of M.

Specific composition. Two species, described below.

Comparison. New genus *Baisodicrana* is close to *Eudicrana* Loew, differing from it in absence of Sc_2 and long fork of M_4 and CuA.

Baisodicrana incompleta Blagoderov, sp. nov.

Specific name. Latin incompletus (incomplete).

Holotype. PIN No. 4210/2889, positive and negative impressions of wing without distal part of medial veins and anal lobe; Baissa locality, Beds 18-20; Lower Cretaceous, Zaza Formation.

Description (fig. 1d). Sc, R_1 , RS2 and RS3 each have row of bristles. Sc contacts on C at level of R_4 . R_4 has S-curve. Point of contact of R_4 on R_1 is closer to base of wing than point of its divergence from RS. Segments RS1, RS2 and RS3 are in ratio of 1:2.7:9. Ratio of segment RS₁ to crossvein r-m is 1:1.7. Length of M3 is six times that of r-m. Fork of M_1 and M_2 begins beyond level of end of Sc. M_4 and CuA at base of fork are closely spaced for considerable distance and almost parallel (perhaps as result of deformation). A_1 is quite long, and possibly reaches wing margin.

Dimension in mm. Wing length - 6-9 (in holotype - 9).

Material. Holotype, and Spec. No. 3064/8780, impression of part of wing without apex or anal region; Bed 15.

Baisodicrana secunda Blagoderov, sp. nov.

Specific name. Latin secundus (second).

Holotype. PIN No. 4210/2880, positive and negative impressions of wing without apex or anal region; Baissa locality, Bed 15; Lower Cretaceous, Zaza Formation.

Description (fig. 1e). Sc, R_1 , RS, M_1 , M_4 and CuA each have row of bristles. Sc contacts on C somewhat forward of R_4 . R_4 is arcuately curved outward. Segments RS1, RS2 and RS3 are in ratio of 1:3:18. Ratio of RS1 and r-m is 1:1.7. Length of segment M3 exceeds by 3.7 times that of crossvein r-m. R_5 , M_1 and M_2 are parallel in apical part; M_2 M_4 and CuA diverge.

Dimensions in mm. Length of wing - 5.1.

Comparison. New species differ from *B*. *incompleta* in details of wing venation (shorter Sc, form of R_4) and more frequent macrotrichia in wing membrane.

Material. Holotype.

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Ekhiritus Blagoderov, gen. nov.

Specific name. From Buryatiyan tribe of Ekhirites.

Type species. E. disannuus sp. nov.

Diagnosis. Wing bearing micro- and macrotrichia, located on costal and subcostal areas and closer to wing apex beyond level of R_4 . Sc with free termination. Sc₂ present, opposite small cell. Length of segment M3 considerably less than that of segment of RS2 and approximately equal to length of r-m. Fork of M_4 and CuA close to wing base.

Specific composition. Type species.

Comparison. New fossil differs from closest recent genera *Sciophila* Meigen and *Stenophragma* Scuse in long fork of M_4 and CuA. Differs from *Loicia* Vockeroth in free termination of Sc and short stem of M_1 and M_2 .

Pl. VII, fig. 4

Specific name. dis, and Latin annuus (annual).

Holotype. PIN Nos. 3064/9787 and 4210/5055, positive and negative impressions of insect, antennae not preserved; Baissa locality, Bed 31; Lower Cretaceous, Zaza Formation.

Description (fig. 2*a*-*c*). Female has round head. Scutellum is fairly small. Hairs on mediotergite and pleurotergites are not visible. Wing is moderately wide, its length 2.3 times exceeding width. C has two rows of bristles and extends only slightly beyond R_5 . Sc ends in free termination between levels of RS and R_4 . Sc₂ is forward of end of Sc. Ratio of segments RS1, RS2 and RS3 is 1:2.5:8.5. Length of r-m is equal to that of crossvein r-m. Ratio of segments M3 and vein M_1 is 1:15. Veins R_5 and M_1 are parallel in apical part; M_1 , M_2 and M_4 diverge slightly. Abdomen is dark, its third and fourth segments widest. Cerci are bisegmented and no longer than eighth abdominal segment. Second segment is longer and narrower than first (fig. 2*c*).

Dimensions in mm. Length of body 6.5, of wing 5.3.

Material. Holotype, and Spec. No. 4210/2856, positive and negative impressions of part of wing; Bed 2.



Fig. 2. Species of genera *Ekhiritus* and *Prospeolepta*: a - c - E. disannuus sp. nov., Holotype PIN No. 3064/9787 (4210/5055): a overall view, b - wing, c - end of abdomen; d - f - P. trapezia sp. nov., Holotype PIN No. 4210/2940: d - overall view, e - wing, f gonocoxite, side view; g - P. simplex sp. nov. Holotype PIN No. 3064/9805, reconstruction of wing.

Genus Prospeolepta Blagoderov, gen. nov.

Generic name. From genus Speolepta.

Type species. P. trapezia sp. nov.

Diagnosis. Wing membrane covered with macrotrichia, at least in front of median stem. C bearing three rows of bristles. Sc short, and on C before level of base of RS. Sc₂ present. Small cell, if present, in shape of trapezium with large base lying on R_1 . R_5 forming pronounced S-curve. Lengths of crossvein r-m and segment M3 approximately equal. Base of fork of M_4 and CuA located proximally from base of fork of M_1 and M_2 .

Specific composition. Two species, described below.

Comparison. Differs from closely similar genera Speolepta Edwards and Polylepta Winnertz in shorter segment M3, and from Speolepta also in Sc contracting on C and presence of macrotrichia on wing membrane.

Prospeolepta trapezia Blagoderov, sp. nov.

Pl. VII, fig. 5

Specific name. Latin trapezium (trapezium).

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Holotype. PIN No. 4210/2940, positive and negative impressions of male insect with one wing; Baissa locality, Bed 22; Lower Cretaceous, Zaza Formation.

Description (fig. 2*d-f*). Antennal flagella have 11 segments each, their length is just slightly more than that of head and thorax together. Segments of flagella are cylindrical in males, round in females. Thorax is dark; no hairs are visible on laterotergites and mediotergite. Wing membrane has both micro- and macrotrichia dispersed all over it. Veins are dark. C extends beyond R_5 by 1/4 of distance between R_5 and M_1 . Sc contacts on C at level of contact of r-m with medial stem. R_4 is present. Lengths of segments RS1, RS2 and RS3 are in ratio of 1:0.4-0.7:12-16. Crossvein r-m is approximately twice length of RS1. Base of fork of M_4 and CuA is proximally from level of Sc₂. Veins R_5 , M_1 and M_2 are parallel in apical part; M_2 , M_4 and CuA diverge. Abdomen is dark and densely covered with very long hairs. Genitalia of male are dark.

Gonocoxites are round in side view and densely covered in apical part by very small black spicules (fig. 2f). Gonostyli are probably small, and directed into interior of genital complex.

Dimensions in mm. Length of body 6.5-8.0 (7 in holotype), length of wing 4.5-5.7 (5.2 mm in holotype).

Remarks. Spec. No. 4210/2881 perhaps does not belong to this species, since it has a considerably longer Sc ending opposite the base of RS, but the incompleteness of this remnant does not permit its description as a new species.

Material. Holotype and 7 specimens: positive and negative impressions of wing No. 3064/8748 (Bed 15) and No. 3064/9750 (Bed 31); parts of wing No. 4210/2881 (Bed 15); wing and body No. 4210/2878 (Bed 15); wing and parts of body No. 4210/2917 (Bed 22); insect without head No. 4210/2866 (Bed 2); and also negative impression of wing No. 3064/9837 (Bed 31).

Prospeolepta simplex Blagoderov, sp. nov.

Pl. VII, fig. 6

Specific name. Latin simplex (simple, plain).

Holotype. PIN No. 3064/9805, positive impression of insect with partly preserved body; Baissa locality, Bed 31; Lower Cretaceous, Zaza Formation.

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Description (fig. 2g). Wing membrane has macrotrichia only in anterior part (to stem of M). Sc contacts on C proximally from base of RS at distance from it equal to length of r-m. At same distance from end of Sc is Sc₂. Ratio of lengths of RS1 and RS2 is 1:12. No R_4 is present. Length of crossvein r-m is equal to 1.8 length of segment of RS1. Veins R_5 and M_1 converge somewhat in apical part; M_1 , M_2 , M_4 and CuA diverge.

Dimensions in mm. Wing length 5.2.

Comparison. Differs from *P. trapezia* in absence of R_4 and macrotrichia in posterior part of wing.

Material. Holotype.

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Genus Pollicitator Blagoderov, gen. nov.

Generic name. Latin pollicitator (maker of promises).

Type species. P. baisae sp. nov.

Diagnosis. Mosquitoes, medium-sized and small. Sc contacting on C beyond level of R_4 . Sc₂ present, between RS and R_4 . RS₂ at least three times shorter than segment M3. Base of fork of M_1 and M_2 at level of merging of r-m with stem of M.

Specific composition. Type species.

Comparison. Differs from genus *Polylepta* in more proximal position of base of fork of M_4 and CuA, from *Leptomorphus* Curtis in S-curved R_5 , and from *Neuratelia* Rondani in distinct base of M_1 .

Pollicitator baisae Blagoderov, sp. nov.

Pl. VII, fig. 7

Specific name. From Baissa locality.

Holotype. PIN No. 3064/9831, positive and negative impressions of insect; Baissa locality, Bed 31; Lower Cretaceous, Zaza Formation.

Description (fig. 3*a-e*). Head is covered with very small hairs. Scapus and pedicellus are round. Flagella of antennae have 14 segments and are narrow at apices. First segment is twice as long as second. Remaining segments are barrel-shaped, their width equal to or very slightly less than length. Thorax is round. Scutum is covered with very small bristles. Wing membrane bears macro- and microtrichia. C is evenly covered with very small hairs. Sc, R_1 , R_5 , M_1 , M_4 and CuA each have a row of small bristles. Sc₂ is beyond base of RS. Ratio of RS1, RS2 and RS3 is 1:1-1.4:10-11. Base of fork of M_1 and M_2 is distal from level of R_4 . Ratio of lengths of crossvein r-m and segment M3 is 1:3-3.5.

Abdomen is densely covered with small hairs.



Fig. 3. Species of genera Pollicitator and Zazicia: a-e - P. baisae sp. nov., Holotype PIN No. 3064/9831: a - overall view, b - reconstruction of wing; c - Spec. PIN No. 4210/2925, genital complex in laterodorsal view; d - Spec. No. 3064/9845, genital complex in ventral view; e - Spec. No. 3064/9821, end of abdomen; f-h - Z. innuba sp. nov.: f, g - Holotype PIN No. 3064/9753: f - overall view, g - wing; h - Spec. No. 3064/9840, end of abdomen.

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Male. Abdomen has seven visible segments: seventh segment is somewhat narrower and twice shorter than sixth. Genital complex of male (fig. 3c, d) is round (gonocoxites intergrown) and equal in width to sixth segment. Gonostyli are clawlike and somewhat shorter than genital complex (gonocoxites).

Female. Abdomen has eight segments: eighth segment is twice shorter than seventh and lacks hairs (retractable?). Cerci are light in color, consist of two segments, and are shorter than eighth abdominal segment (fig. 3e).

Dimension in mm. Length of body 3.5-7.1 (holotype - 7.1), of wing 3.5-5.7 (holotype - 5.7).

Material. Holotype, and 6 specimens: positive and negative impressions of wing Nos. 3064/9741 (Bed 31), 4210/2883 (Bed 15); of male Nos. 4210/2925 (Bed 22) and 3064/9845 and 3064/9871 (Bed 31); of insect without head No. 4210/2879 (Bed 15); and also impression of female without head No. 3064/9821 (Bed 31).

Zazicia Blagoderov, gen. nov.

Generic name. From Zaza River.

Type species. Z. innuba sp. nov.

Diagnosis. Wing membrane bearing macro- and microtrichia, distributed over whole wing. C having three rows of bristles. Sc contacting on C beyond base of RS. Sc_2 present at level of small cell. M3 no more than three times r-m. Base of vein M_4 and CuA close to base of stem of M.

Specific composition. Type species.

Comparison. Differs from closely similar recent genus *Loicia* Vockeroth in distribution of macrotrichia on wing membrane, and in position of Sc_2 .

Zazicia innuba Blagoderov, sp. nov.

Specific name. Latin innuba (unmarried).

Holotype. PIN No. 3064/9753, positive and negative impressions of female without head; Baissa locality, Bed 31; Lower Cretaceous; Zaza Formation.

Description (fig. 3*f*-*h*). Antennae have 15 segments each. Scapus and pedicellus are round. Segments of flagella are barrel-shaped, their width a little less than their length. Terminal segment is pointed. Mesonotum is covered with hairs. Wing bears macro- and microtrichia, dispersed more or less evenly over entire wing. R_1 and R_5 each have a row of bristles. C extends beyond r_5 for 1/3 of distance between R_5 and M_1 . R_5 is somewhat curved backward. Ratio of segments RS1, RS2 and RS3 is 1:1.2-2.0:8-12. Base of fork of M_1 and M_2 is somewhat forward, below or beyond level of R_4 . Abdomen is densely covered with quite long hairs. Cerci of female are somewhat longer than ninth tergite, and have two segments each, first of which is longer than second (fig. *3h*).

Dimensions in mm: Length of body 3.7-7.0 (holotype 6.8), of wing 3.6-6.0 (holotype 5.3).

Material. Holotype, and 18 specimens: impressions of whole insect Nos. 3064/9811, 3064/9813, 3064/9878, 3064/9899; same in negative impression Nos. 3064/9782, 3064/9900, 4210/2961, 3064/9840 (with wings folded), all from Bed 31, and also impressions of female No. 3064/8740 (Bed 15); of insect without head No. 3064/9828 (Bed 31); of insect with partly preserved body No. 3064/8819 (Bed 15); and of wing and part of thorax Nos. 1989/3271,

3064/9879 (Bed 31), 3064/8803 (Bed 15); of wing Nos. 3064/8786 (Bed 15), 3064/9784, 3064/9833 (Bed 31), and 4210/2929 (Bed 22).

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