

Fungus Gnats of the Tribe Gnoristini (Diptera, Mycetophilidae) from the Lower Cretaceous of Transbaikalia

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Abstract—Three new genera and ten new species of fungus gnats belonging to the tribe Gnoristini are described from the Lower Cretaceous of Transbaikalia.

INTRODUCTION

This paper continues the study of the fauna from the richest Lower Cretaceous insect locality (Blagoderov, 1995). All the mycetophilid specimens described below were collected in the Baisa locality: Buryatia, Eravnen-skii District, left bank of the Vitim River downstream of the mouth of the Baisa River; Lower Cretaceous, Zaza Formation. The material is housed in the Paleontological Institute, Russian Academy of Sciences (PIN). The veins and their sections are designated after Blagoderov (1993). Numeration of the layers of the locality is given after Martinson (1961).

SYSTEMATIC PALEONTOLOGY

Family Mycetophilidae Newman, 1834

Subfamily Sciophilinae Winnertz, 1863

Tribe Gnoristini Edwards, 1925

Genus *Paradzickia* Blagoderov, gen. nov.

Etymology. From Greek *para* (near) and the genus *Dziedzickia*.

Type species. *P. hurin* sp. nov.

Diagnosis. Middle-sized gnats. Wing moderately broad, 2–2.5 times as long as wide. Costal vein with two rows of small setae, whereas R_1 and RS with one row each. Sc entering R_1 . C extended beyond R_5 for 1/4–1/5 of the distance between R_5 and M_1 . M_3 section somewhat longer, equal, or shorter than RS2 section. Base of $M_{3+4} + CuA$ fork close to wing base. Abdomen covered with quite long hairs.

Composition. Four new species from the Lower Cretaceous of Transbaikalia.

Comparison. Distinct from *Hadroneura* Lundstrom, 1906 and *Dziedzickia* Johansen, 1909 in the long $M_{3+4} + CuA$ fork.

Paradzickia hurin Blagoderov, sp. nov.

Plate 3, fig. 1

Etymology. After the character from the writings of J.R.R. Tolkien.

Holotype. PIN, no. 3064/9779, part and counterpart of the insect; Baisa; Zaza Formation, bed 31.

Description (Fig. 1a). Sc enters R at the level or somewhat proximad of the RS origin. The length ratio of the RS1, RS2, and RS3 sections is 1 : 1.5 : 11. The length ratio of r-m crossvein to the M_3 section is 1 : 2–2.2. M_3 is somewhat longer than the RS₂. The length ratio of the M_3 section to M_{1+2} fork is 1 : 5. The section of wing margin between the R_1 and R_5 apices is 1.3–1.4 times longer than that between the R_5 and M_1 apices.

Measurements (mm): body length 4.8; wing length 4.2.

Material. Besides the holotype, paratype PIN, no. 4210/2870, wing from bed 2.

Paradzickia huor Blagoderov, sp. nov.

Plate 3, fig. 2

Etymology. After the character from the writings of J.R.R. Tolkien.

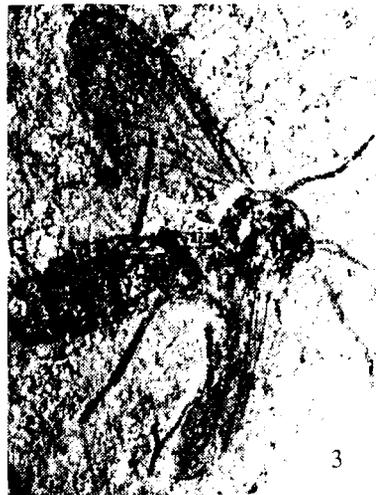
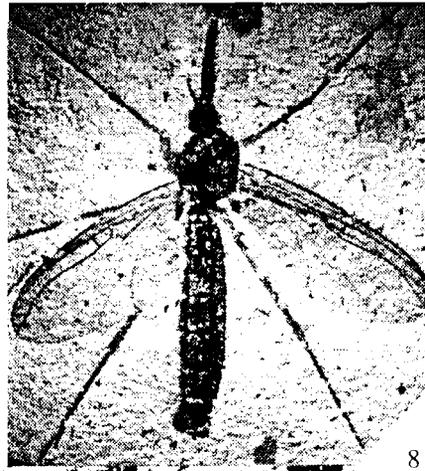
Holotype. PIN, no. 4210/2960, part and counterpart of two wings; Baisa; Zaza Formation, bed 31.

Description (Fig. 1b). Sc enters R beyond the RS origin. The length ratio of the RS1, RS2, and RS3 sections is 1 : 1.5 : 10–11. The length ratio of r-m crossvein to the M_3 section is 1 : 1.5. M_3 is somewhat longer than or equal to RS2. The length ratio of M_3 section to M_{1+2} fork is 1 : 6–7. The section of wing margin between the R_1 and R_5 apices is 1.1–1.2 times longer than that between the R_5 and M_1 apices.

Measurements (mm): body length 5; wing length 4.2–5 (5 in holotype).

Comparison. Distinct from *P. hurin* in Sc entering R beyond RS level, and the comparatively shorter M_3 section.

Material. Besides the holotype, paratypes PIN, nos. 3064/9861, positive impression of the insect from bed 31, and 4210/2937, part and counterpart of the wing from bed 22.



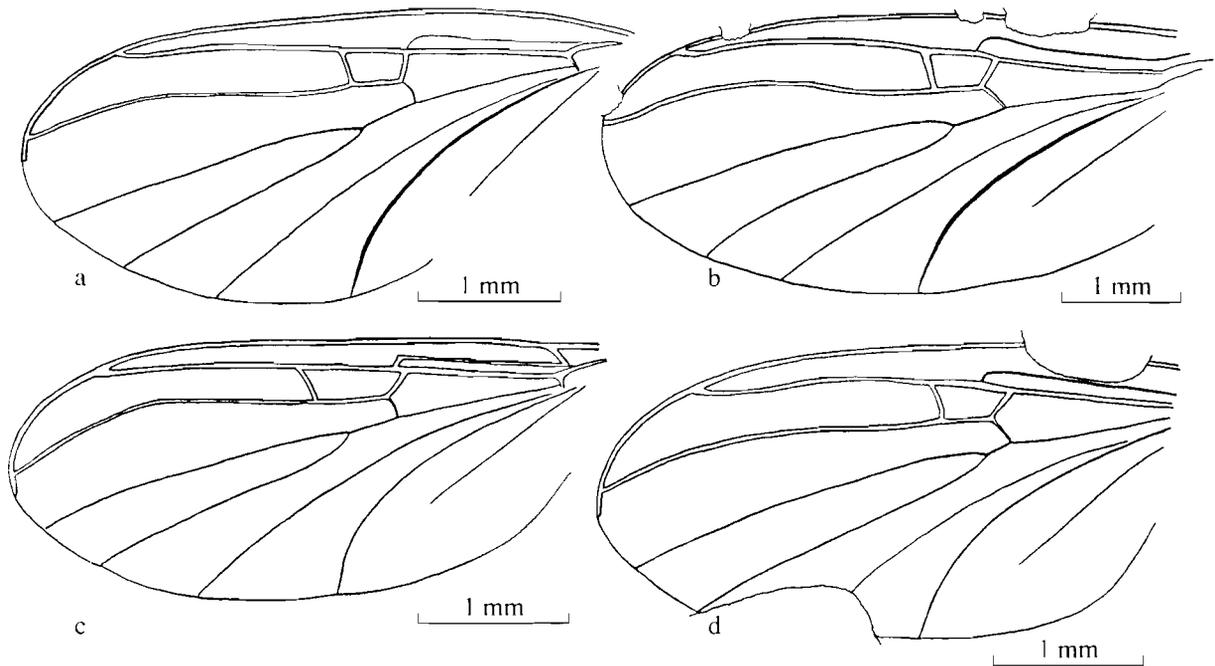


Fig. 1. Species of the genus *Paradzickia*: (a) *P. hurin* sp. nov., holotype PIN, no. 3064/9779, wing; (b) *P. huor* sp. nov., holotype PIN, no. 4210/2960, wing; (c) *P. turin* sp. nov., holotype PIN, no. 3064/1773, wing; (d) *P. tuor* sp. nov., holotype PIN, no. 3064/9800, wing.

Paradzickia turin Blagoderov, sp. nov.

Plate 3, fig. 3

Etymology. After the character from the writings of J.R.R. Tolkien.

Holotype. PIN, no. 3064/1773, part and counterpart of the insect; Baisa; Zaza Formation, bed 31.

Description (Fig. 1c). Sc enters R beyond the RS origin. The length ratio of the RS1, RS2, and RS3 sections is 1 : 2.3 : 10. The length ratio of the *r-m* crossvein to the M3 section is 1 : 2. M3 is 1.5 times shorter than RS2. The length ratio of the M3 section to M_{1+2} fork is 1 : 6. The section of the wing margin between the R_1 and R_5 apices is more than twice longer than that between the R_5 and M_1 apices. The mesonotum is covered with short hairs.

Measurements (mm): body length 5; wing length 4.

Comparison. Distinct from *P. hurin* and *P. huor* in the longer RS₂ section and the longer distance between the R_1 and R_5 apices.

Material. Holotype.

Paradzickia tuor Blagoderov, sp. nov.

Plate 3, fig. 4

Etymology. After the character from the writings of J.R.R. Tolkien.

Holotype. PIN, no. 3064/9800, positive impression of the insect; Baisa; Zaza Formation, bed 31.

Description (Fig. 1d). Antennae 13-segmented. Sc enters R beyond the RS origin. The length ratio of the RS1, RS2, and RS3 sections is 1 : 1.4 : 10. The length ratio of the *r-m* crossvein to M3 section is 1 : 0.8. M3 is twice shorter than RS2. The length ratio of the

Explanation of Plate 3

- Fig. 1.** *Paradzickia hurin* Blagoderov, sp. nov.; holotype PIN, no. 3064/9779, $\times 9$.
Fig. 2. *Paradzickia huor* Blagoderov, sp. nov.; holotype PIN, no. 4210/2960, $\times 13$.
Fig. 3. *Paradzickia turin* Blagoderov, sp. nov.; holotype PIN, no. 3064/1773, $\times 9$.
Fig. 4. *Paradzickia tuor* Blagoderov, sp. nov.; holotype PIN, no. 3064/9800, $\times 12$.
Fig. 5. *Palaecomoptera shcherbakovi* Blagoderov, sp. nov.; holotype PIN, no. 3064/9874, $\times 7.5$.
Fig. 6. *Palaecomoptera lukashevichae* Blagoderov, sp. nov.; holotype PIN, no. 3064/9778, $\times 8$.
Fig. 7. *Palaecomoptera longimedia* Blagoderov, sp. nov.; holotype PIN, no. 3064/9749, $\times 11$.
Fig. 8. *Drepanorzeckia plana* Blagoderov, sp. nov.; holotype PIN, no. 1989/3283, $\times 5.7$.
Fig. 9. *Drepanorzeckia extrunculipennis* Blagoderov, sp. nov.; holotype PIN, no. 4210/2864, $\times 11$.
Fig. 10. *Drepanorzeckia setifemoralis* Blagoderov, sp. nov.; holotype PIN, no. 4210/2861, $\times 9$.

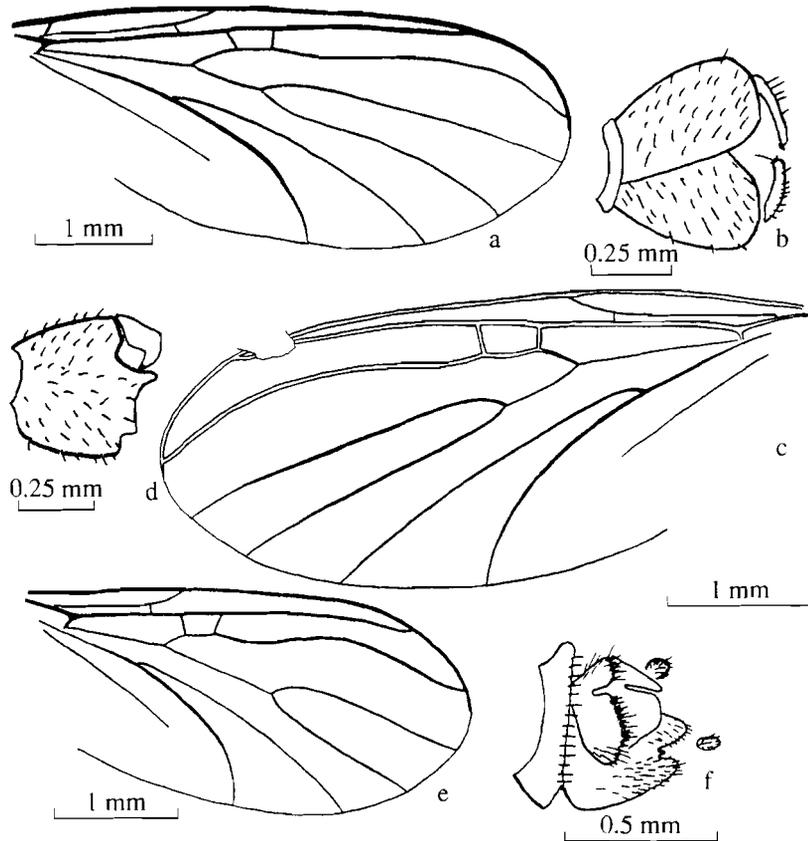


Fig. 2. Species of the genus *Palaecomoptera*: (a, b) *P. shcherbakovi* sp. nov., holotype PIN, no. 3064/9874: (a) wing, (b) genital complex; (c, d) *P. lukashevichae* sp. nov.: (c) holotype PIN, no. 3064/9778, wing, (d) paratype PIN, no. 3064/9751, genital complex; (e, f) *P. longimedia* sp. nov., holotype PIN, no. 3064/9749: (e) wing, (f) genital complex.

M3 section to M_{1+2} fork is 1 : 13. The section of the wing margin between the R_1 and R_5 apices is 1.4 times longer than that between the R_5 and M_1 apices.

Measurements (mm): body length 5.7; wing length 4.

Comparison. Distinct from other *Paradzickia* species in the very short M3 section.

Material. Holotype.

Paradzickia indet.

Specimens nos. 3064/9764, part and counterpart of the insect (bed 31), 4210/2903, part and counterpart of the wings with fragments of the thorax (bed 22), and 4210/2964, positive impression of the insect (bed 31), could not be attributed to a specific *Paradzickia* species due to insufficient preservation.

Genus *Palaecomoptera* Blagoderov, gen. nov.

Etymology. From the genus *Acomoptera*.

Type species. *P. shcherbakovi* sp. nov.

Diagnosis. Sc entering C near RS base. Sc_2 set in the beginning of terminal quarter of Sc. Small cell no

more than twice as long as wide. R_5 curved backwards. Base of M_{3+4} + CuA fork set proximad of base of M_1 + M_2 fork. Laterotergites and mediotergite devoid of setae. Abdominal segments covered with numerous hairs.

Composition. Three species from the Lower Cretaceous of Transbaikalia.

Comparison. Distinct from *Acomoptera* Vockeroth, 1980 in the base of the M_{3+4} + CuA fork set proximad of that of the M_{1+2} fork, and the small cell no more than twice as long as wide; from *Dziedzickia* and *Paradzickia* in Sc entering C.

Palaecomoptera shcherbakovi Blagoderov, sp. nov.

Plate 3, fig. 5

Etymology. After D.E. Shcherbakov.

Holotype. PIN, no. 3064/9874, impression of the male; Baisa; Zaza Formation, bed 31.

Description (Figs. 2a, 2b). Middle-sized gnats. The head is rounded. The length of antennal flagellum in the male is about 3/4 of the body length. The scape and pedicel are rounded; the flagellomeres are cylindrical, 3–5 times longer than wide. The mesonotum is covered with numerous hairs. The costal vein bears two rows of setae which are as long as the vein width; R_1 and R_5 bear

a row of setae each. C is extended beyond R_5 up to 1/3 of the distance between R_5 and M_1 . The length ratio of the RS1, RS2, and RS3 sections is 1 : 1–2 : 11–20. The length ratio of the section RS2 to r-m crossvein is 1 : 1.1–1.4. The length ratio of the r-m crossvein to the M3 section is 1 : 1.5–2. The length ratio of the M3 section to the $M_1 + M_2$ fork is 1:4–5.5. The veins R_5 and M_1 converge, the medial veins diverge, so that the ratio of the wing margin sections between the apices of R_1 , R_5 , M_1 , M_2 , M_{3+4} and CuA is 2.7–3.2 : 1 : 1.7 : 2 : 2.5–3. The male genitalia are dark. The gonocoxae are fused, heart-shaped. The gonostyli are stick-shaped, straight, with the small black spines at the base and the long terminal seta directed inwards.

Measurements (mm): body length, 4–5.7 (5.7 in the holotype); wing length, 3.7–4.7 (4.7 in the holotype).

Material. Besides the holotype, 17 paratypes from bed 31: PIN, nos. 3064/9769, 3064/9791, 3064/9796, 3064/9819, 4210/2972, males; 3064/1772(1776), 3064/9746, 3064/9747, 3064/9767, 3064/9777, 3064/9785, males (parts with counterparts); 3064/9756, 3064/9783, 3064/9829, 4210/2968, females (parts with counterparts); 3064/9761, sex unknown (part and counterpart); 3064/9853, wings and thorax; and one paratype PIN, no. 4210/2855, sex unknown, from bed 2.

Palaeocomoptera lukashevichae Blagoderov, sp. nov.

Plate 3, fig. 6

Etymology. After E.D. Lukashevich.

Holotype. PIN, no. 3064/9778, part and counterpart of the insect: Baisa; Zaza Formation, bed 31.

Description (Figs. 2c, 2d). The head is rounded. The flagellomeres are rounded in the female, cylindrical (4–5 times longer than wide) in the male. The mesonotum bears sparse hairs. Sc enters C before the base of RS. The costal vein bears two rows of small setae, R_1 and RS a row each. C is extended beyond R_5 up to 1/4 of the distance between R_5 and M_1 . The length ratio of the RS1, RS2, and RS3 sections is 1 : 1.5–2 : 11–16. The section RS2 is not shorter than the r-m crossvein. The length ratio of the r-m crossvein to the M3 section is 1 : 1.5–2. The length ratio of the M3 section to the $M_1 + M_2$ fork is 1 : 4–5. The veins R_5 and M_1 are almost parallel near the wing margin, so that the ratio of the wing margin sections between the apices of R_1 , R_5 , M_1 , M_2 , M_{3+4} and CuA is 1.8–2.2 : 1 : 1–1.2 : 1.4–1.7 : 2–2.5. The male genitalia are dark. The gonostyli are curved inwards.

Measurements (mm): body length, 3.5–4.5 (4.2 in holotype); wing length, 3.5–5 (4.5 in holotype).

Comparison. Distinct from *P. shcherbakovi* in that the RS2 section is not shorter than the r-m crossvein, and in that R_5 and M_1 do not converge.

Material. Besides the holotype, 9 paratypes from bed 31: PIN, nos. 3064/9751, 3064/9801 (3064/9810), males (parts with counterparts); 3064/9859, 4210/2974,

females; 3064/9763, 4210/2965, females (parts with counterparts); 3064/9891, 4210/2973, wings; 3064/9834, wings and thorax; and one paratype PIN, no. 4210/2871, the insect from bed 2.

Palaeocomoptera longimedia Blagoderov, sp. nov.

Plate 3, fig. 7

Etymology. From Latin *longus* (long).

Holotype. PIN, no. 3064/9749, part and counterpart of the male; Baisa; Zaza Formation, bed 31.

Description (Figs. 2e, 2f). The head is rounded. The flagellomeres are barrel-shaped in the female, cylindrical in the male. The mesonotum is devoid of hairs. Sc enters C at the level of or a little beyond the base of RS. The costal vein bears two rows of small setae, R_1 , RS, M_1 , M_2 , M_{3+4} and CuA bear a row of setae each. C is extended beyond R_5 up to 1/3–1/4 of the distance between R_5 and M_1 . The length ratio of the RS1, RS2, and RS3 sections is 1 : 1–1.5 : 11–16. The section RS2 is subequal to the r-m crossvein. The length ratio of the r-m crossvein to the M3 section is 1 : 3–4. The length ratio of the M3 section to the $M_1 + M_2$ fork is 1 : 1.5–2.5. The ratio of the wing margin sections between the apices of R_1 , R_5 , M_1 , M_2 , M_{3+4} and CuA is 1.5 : 1 : 1–1.2 : 1–1.3 : 2–2.3. The female cerci are pale, two-segmented, as long as the seventh abdominal segment; the distal segment of the cercus is conical, 2.5 times shorter than the basal one. The male genitalia are pale. The gonocoxae are fused, with an incision of complex shape, covered with numerous hairs.

Measurements (mm): body length, 3.5–4 (4 in the holotype); wing length, 3–3.5 (3.5 in the holotype).

Comparison. Distinct from other *Palaeocomoptera* species in the very long M3 section.

Material. Besides the holotype, 4 paratypes PIN, nos. 3064/1304(1309) (bed 15), 3064/9768 (bed 31), 4210/2863 (bed 2), females (parts with counterparts); and 4210/2977, sex unknown (bed 35).

Palaeocomoptera indet.

Specimens nos. 3064/9788, 3064/9798, 3064/9802, 3064/9836, 3064/9846, 3064/9893, females; 3064/9757, female (part and counterpart); 3064/9873, male; 3064/9762, male (part and counterpart), all from bed 31; and no. 4210/2957 from bed 25 could not be attributed to a specific *Palaeocomoptera* species due to insufficient preservation.

Genus *Drepanorzeckia* Blagoderov, gen. nov.

Etymology. From the genera *Grzegorzzeckia* and *Drepanocercus*.

Type species. *D. plana* sp. nov.

Diagnosis. Sc entering C beyond RS base. Sc_2 set terminally or subterminally. R_5 S-shaped, reaching

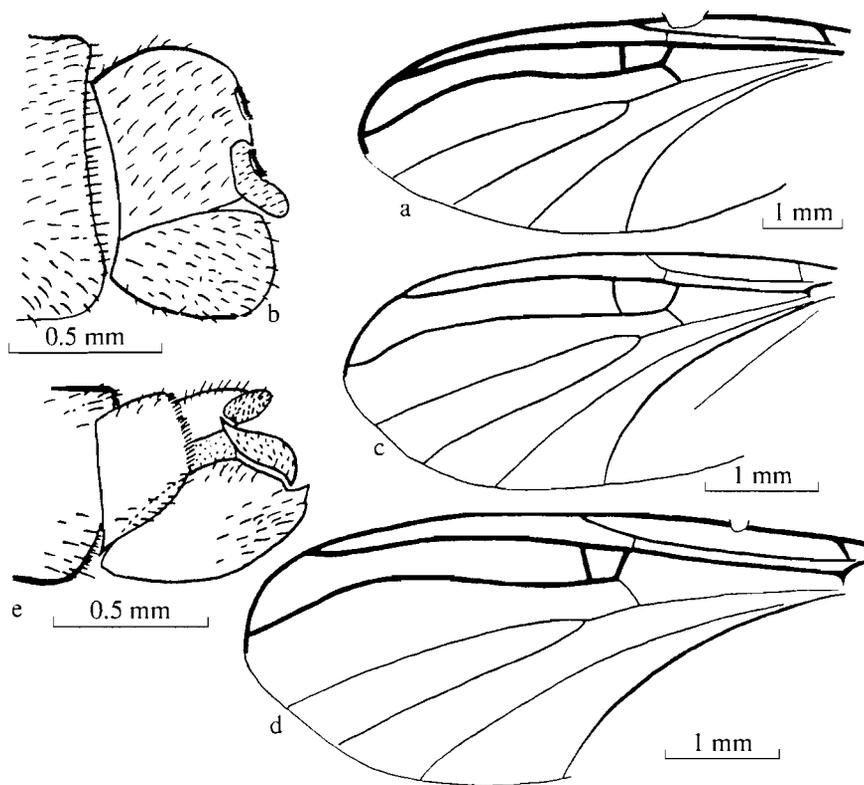


Fig. 3. Species of the genus *Drepanorzeckia*: (a, b) *D. plana* sp. nov., holotype PIN, no. 1989/3283: (a) wing, (b) genital complex; (c) *D. extrunculipennis* sp. nov., holotype PIN, no. 4210/2864, wing; (d, e) *D. setifemoralis* sp. nov., holotype PIN, no. 4210/2861: (d) wing, (e) genital complex.

wing tip. Base of $M_1 + M_2$ fork set before, under, or a little beyond R_4 . Base of $M_{3+4} + CuA$ fork set proximally, so that its common stalk is very short. Female cerci short, two-segmented.

Composition. Three new species from the Lower Cretaceous of Transbaikalia.

Comparison. Distinct from *Grzegorzzeckia* Edwards, 1941 and *Palaeocomoptera* in the very short stalk of the $M_{3+4} + CuA$ fork; from *Drepanocercus* Vockeroth, 1980 in the more distal position of Sc_2 , S-shaped R_5 reaching wing tip, and structure of female cerci; from *Paradzickia* in Sc entering C .

Drepanorzeckia plana Blagoderov, sp. nov.

Plate 3, fig. 8

Etymology. From Latin *planus* (flat).

Holotype. PIN, no. 1989/3283, part and counterpart of the male; Baisa; Zaza Formation, bed 31.

Description (Figs. 3a, 3b). The flagellum is 14-segmented; the scape and pedicel are dark, trapezoidal; the flagellomeres are barrel-shaped (1.5–2 times longer than wide). The mesonotum bears several rows of short hairs. The laterotergites and mediotergite are bare. The costal vein bears three rows of small setae, the R_1 , RS , M_1 , M_2 and M_{3+4} one row each. C is extended beyond R_5 up to no more than 1/5 of the dis-

tance between R_5 and M_1 . Sc enters C a little before or beyond R_4 . Sc_2 is set a little beyond the origin of RS . The length ratio of the $RS1$, $RS2$, and $RS3$ sections is 1 : 1.3–2.2 : 12.5–15. The length ratio of the $RS2$ and $M3$ sections is 1 : 1.5–2.5. The length ratio of the $M3$ section to the $M_1 + M_2$ fork is 1 : 3–4. The abdomen is covered with hairs. The male genitalia are dark, rounded. The gonocoxae are fused. The cerci bear one row of small black obtuse spinules.

Measurements (mm): body length, 6.5–8 (8 in the holotype); wing length, 4.7–7 (6 in the holotype).

Material. Besides the holotype, 11 paratypes, PIN, nos. 3064/9771 (9772) (bed 31), 4210/2920 (bed 22), males (parts with counterparts); 4210/2962 (bed 31), 4210/2979 (bed 35), females (parts with counterparts): 3064/8716 (bed 13), 3064/8753 (bed 15), 3064/9817, 3064/9827 (bed 31), 4210/2886, wings; 3064/8743 (bed 15), wing (part and counterpart); 3064/9776, sex unknown (bed 31).

Drepanorzeckia extrunculipennis Blagoderov, sp. nov.

Plate 3, fig. 9

Etymology. From Latin *trunculus* (tip) and *penna* (wing).

Holotype. PIN, no. 4210/2864, part and counterpart of the female; Baisa; Zaza Formation, bed 2.

Description (Fig. 3c). The mesonotum is covered with hairs. The laterotergites bear several setae on their dorsal parts. The costal vein bears three rows of small setae, the R_1 and RS one row each. Sc enters C at the midlength of the small cell. Sc_2 is set a little beyond the origin of RS. The length ratio of the RS1, RS2, and RS3 sections is 1 : 1.1–2.5 : 8–11.5. The RS2 section is equal to or longer than M3. The length ratio of the M3 section to the $M_1 + M_2$ fork is 1 : 5–8.

Measurements (mm): body length, 4.5–6 (4.5 in holotype); wing length, 4.2–6.5 (4.2 in holotype).

Comparison. Distinct from *D. plana* in the shorter M3, so that the base of the $M_1 + M_2$ fork is set before R_4 , and in the shorter Sc .

Material. Besides the holotype, 3 paratypes, PIN, nos. 3064/8818, wing and thorax (bed 15), 3064/9880, female (bed 31), 4210/2923, wing (part and counterpart, bed 22).

Drepanorzeckia setifemoralis Blagoderov, sp. nov.

Plate 3, fig. 10

Etymology. From Latin *seta* (bristle) and *femur* (thigh).

Holotype. PIN, no. 4210/2861, part and counterpart of the male; Baisa; Zaza Formation, bed 2.

Description (Figs. 3d, 3e). The flagellomeres in the female are rounded, no more than 1.3 times longer than wide. The mesonotum is covered with small hairs. The laterotergites bear several setae in their dorsal parts. The hind coxae bear a row of hairs which are as long as the width of the coxa. The costal vein bears three rows of

small setae, the R_1 and RS one row each. The Sc enters the C at the level of or a little before R_4 . The Sc_2 is set a little before the origin of RS. The length ratio of the RS1, RS2, and RS3 sections is 1 : 0.8–1.2 : 10–12. The length ratio of the RS2 and M3 sections is 1 : 1.5–2.5. The length ratio of the M3 section to the $M_1 + M_2$ fork is 1 : 5–6. The abdomen is covered with hairs. The male genitalia are dark. The 10th tergum has the posterior margin straight. The gonocoxae are not fused. The gonostyli are tapered apically, S-shaped, with several dark spinules at the apex.

Measurements (mm): body length, 7–7.3 (7.3 in the holotype); wing length, 5–5.5 (5.5 in the holotype).

Comparison. Distinct from other *Drepanorzeckia* species in the small, short cell and in the position of Sc_2 .

Material. Besides the holotype, 2 paratypes, PIN, nos. 3064/8795, female (bed 15), and 3064/8631, female (bed 2).

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