

New Blattinopsidae (Insecta: Blattinopsida) from the Middle Permian of European Russia

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Abstract—*Glaphyrophlebia vaga* sp. nov., *G. rara* sp. nov., and *G. kamaensis* sp. nov. (Insecta: Blattinopsida, Blattinopsidae) are described from the Middle Permian locality Tyulkino in European Russia (Ufimian Stage of Perm Region).

Keywords: Insecta, Blattinopsida, Blattinopsidae, Middle Permian, Russia

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INTRODUCTION

This article continues a series of papers concerned with blattinopsid insects (Insecta: Blattinopsida) from the Permian of Russia. Previously described insects include Blattinopsida from the Kungurian Fokina locality in the Krasnoyarsk Region (Aristov and Rasnitsyn, 2021b), Ufimian localities of Vorkuta deposits in the Komi Republic (Aristov et al., 2021), and the Kazanian Soyana locality in the Arkhangelsk Region (Aristov and Rasnitsyn, 2021a). Descriptions of new Blattinopsidae from the Middle Permian Tyulkino locality in the Perm Region, Russia, namely, *Glaphyrophlebia vaga* sp. nov., *G. rara* sp. nov., and *G. kamaensis* sp. nov. are reported below.

The Tyulkino locality is situated on the right bank of the Kama River 1 km upstream of the village of Tyulkino in the Solikamsk District of Perm Region, Russia. The deposits belong to the Upper Solikamsk Subformation of the Solikamsk Formation in the Solikamskian Regional Substage. We adopted the latter as part of the composition of the Middle Permian Ufimian Stage (Aristov et al., 2021a). The deposits were in lagoonal settings of middle latitudes (paleocoordinates: 31.9° C, 42.7° B: http://fossilworks.org/bridge.pl?a=collectionSearch&collection_no=103639) with a semi-arid climate (Shcherbakov, 2008).

Blattinopsids are among the dominant groups of insects in Tyulkino and account for 22% of insect fossils. In the Tyulkino locality, 109 remains of Blattinopsidae were collected and identified as three species of the genus *Glaphyrophlebia*. In addition to Tyulkino, a relatively high proportion of blattinopsids among

insects is typical of the Niedermoschel locality (Asselian Stage, Lower Permian; Rhineland-Palatinate, Germany) and Inta Formation of Vorkuta Deposit (Ufimian Stage, Middle Permian; Komi Republic, Russia). Blattinopsids account for 11 and 12% in these localities, respectively (Aristov et al., 2021a; Hörschemeyer, 1999). An in-depth review of the blattinopsid fauna of Russia will be presented later in the final publication on the topic.

SYSTEMATIC PALEONTOLOGY

Order Blattinopsida

Family Blattinopsidae Bolton, 1925

Genus *Glaphyrophlebia* Handlirsch, 1906

Glaphyrophlebia vaga Aristov et Rasnitsyn, sp. nov.

Plate 11, figs. 1–6; Plate 12, figs. 1–3

Etymology. Species name derived from the Latin *vaga* meaning “roving, wandering”.

Holotype. PIN, no. 3474/231, counterpart imprint of forewing; Russia, Perm Region, Solikamsk District, right bank of the Kama River 1 km upstream of Tyulkino village, Tyulkino locality; Middle Permian, Ufimian Stage, Solikamsk Horizon, Solikamsk Formation, Upper Solikamsk Subformation.

Description (Figs. 1; 2a and 2b). Small insects. R with less than 20 branches on anterior wing margin, with simple and dichotomizing anterior branches and curved in S-shape behind the SC apex. RS branches off of R with one stem in the distal third of the wing, with six or seven main branches and 14 to

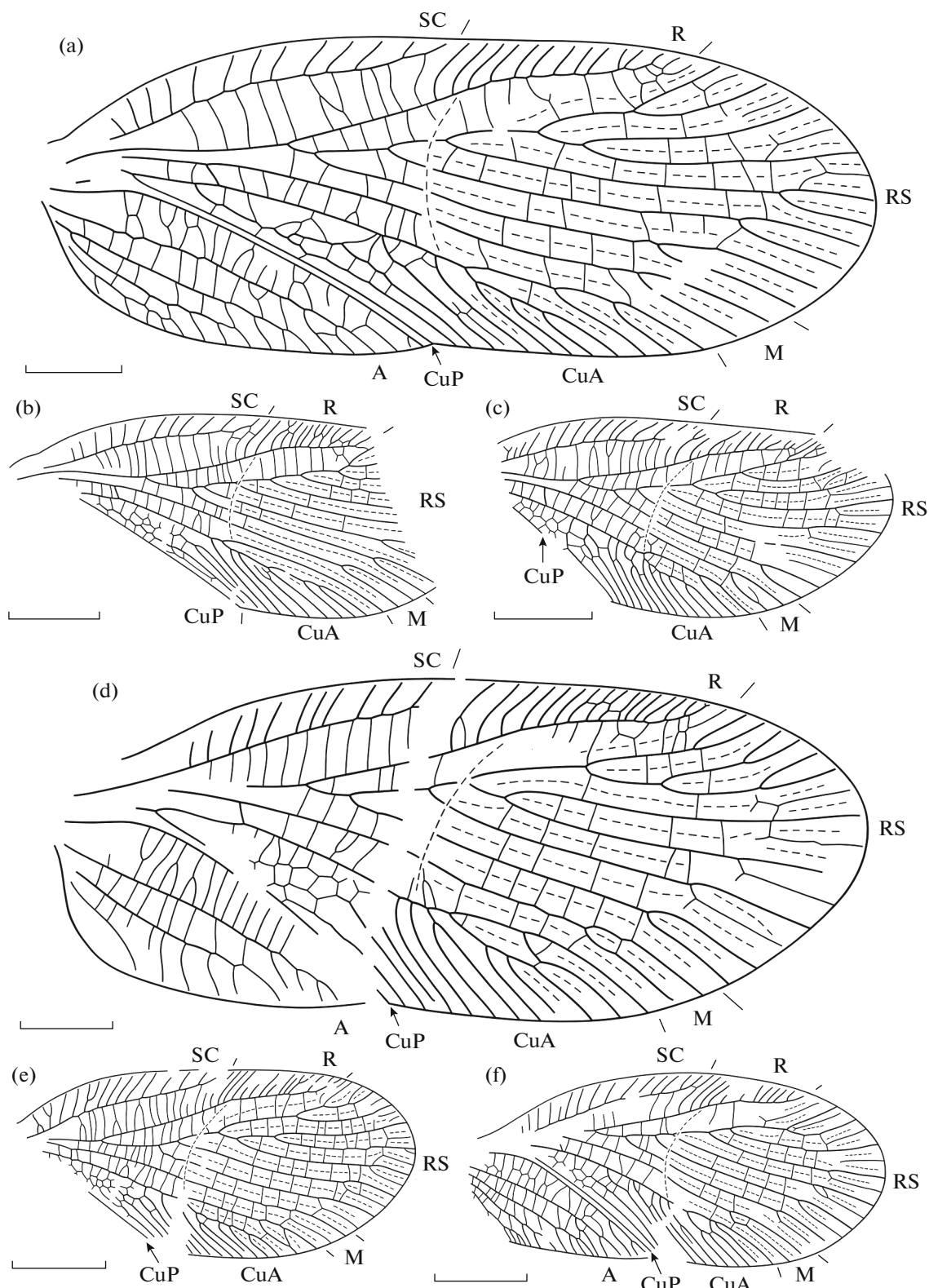


Fig. 1. *Glaphyrophlebia vaga* sp. nov. from Tyulkin locality (Middle Permian of Perm Region, Russia), forewing: (a) holotype PIN, no. 3474/231, (b) paratype PIN, no. 3474/232, (c) paratype PIN, no. 3474/245, (d) paratype PIN, no. 3474/243, (e) paratype PIN, no. 3474/221, (f) paratype PIN, no. 3474/220. Scale bar 1 mm (b, c, e, f), 2 mm (a, d).

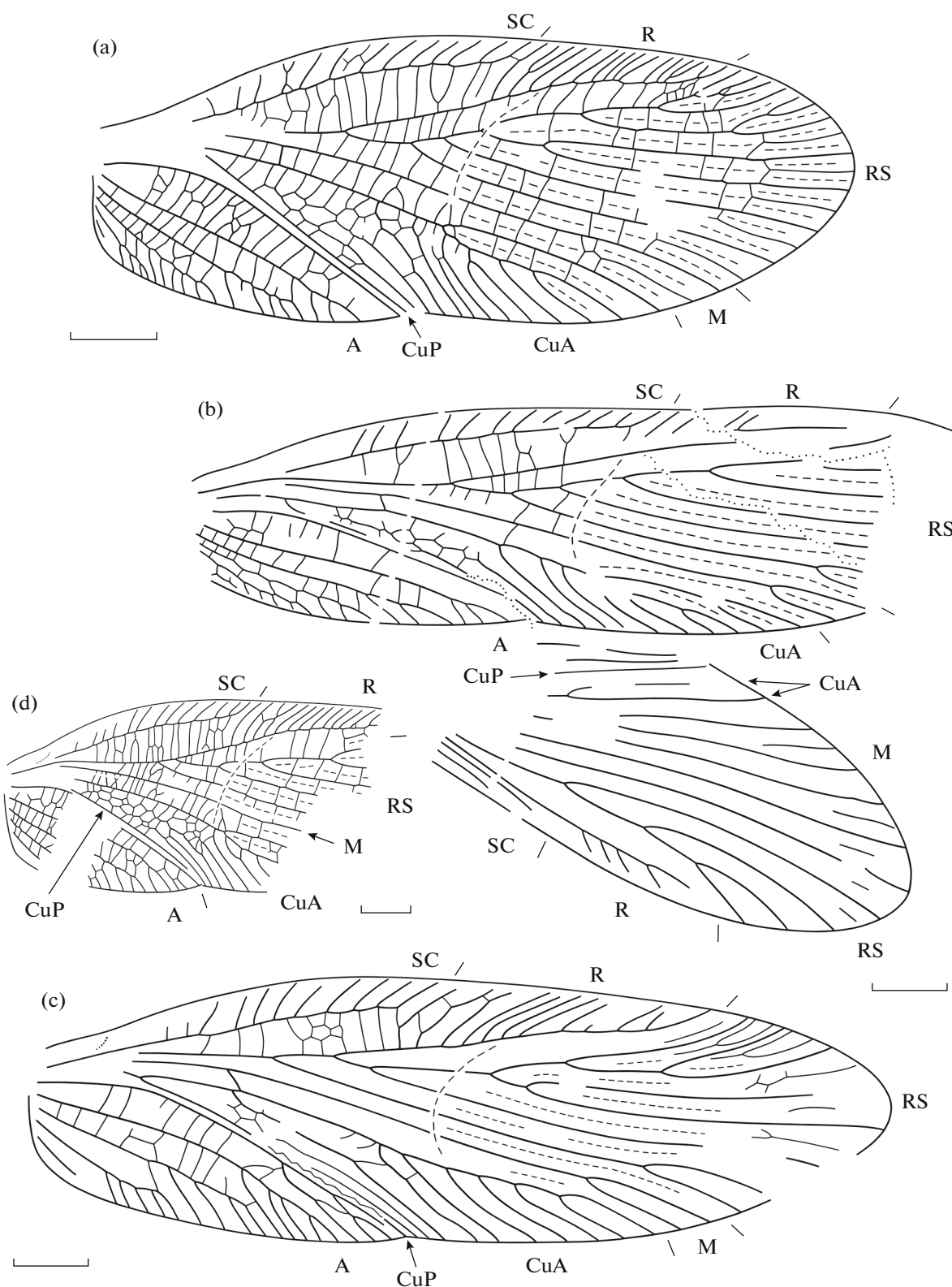
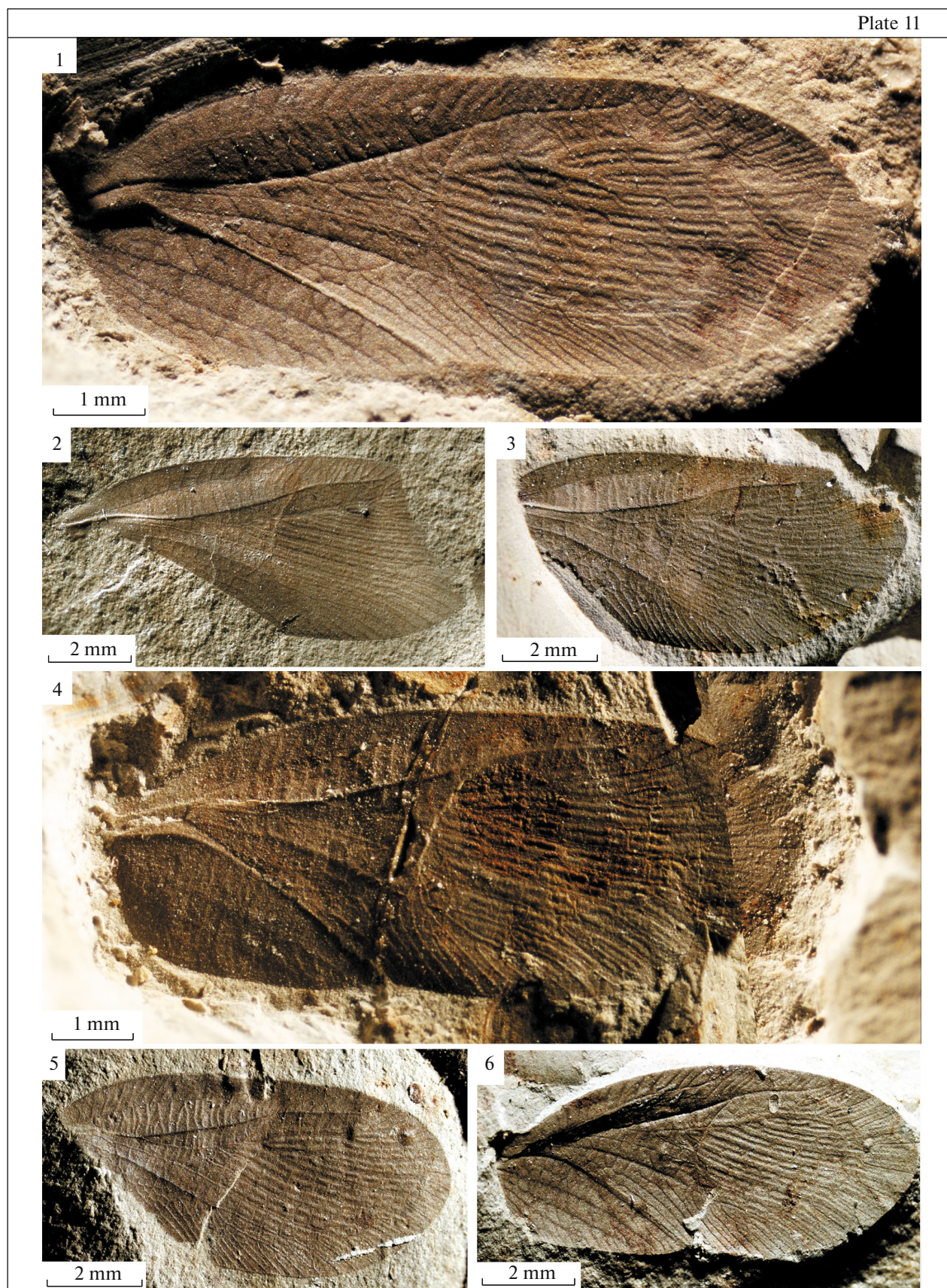


Fig. 2. Representatives of *Glaphyrophlebia* from Tyulkino locality (Middle Permian of Perm Region, Russia), forewings: (a, b) *G. vaga* sp. nov.: (a) paratype PIN, no. 3474/270; (b) paratype PIN, no. 3474/222; (c) *G. rara* sp. nov., holotype PIN, no. 3474/219; (d) *G. kamaensis* sp. nov., holotype PIN, no. 3474/227. Scale bar 1 mm.



16 endings. M is simple with terminal bifurcation into two branches, each thinner than the stem. Before its distal third, CuA splits into two branches, the posterior with at least three branches. The base areas of the posterior CuA branches is disorganized with no confluence into distinct bifurcations. The wing is not darkened.

Measurements, mm. The length of forewing is 8 to 11.

Comparison. The new species has close similarity to *G. subcostalis* (Martynov, 1928) from the Middle Permian Soyana locality (Kazanian Stage; Arkhangelsk Region, Russia). Essentially, *G. vaga* sp. nov. only differs in the absence of pigmentation. The apex and posterior margin of the forewing and the apex of the hindwing are appreciably darker in *G. subcostalis* (Aristov and Rasnitsyn, 2021a).

Material. In addition to the holotype, paratypes PIN, nos. 3474/232 (Fig. 1b), 245 (Fig. 1c), 243 (Fig. 1d), 221 (Fig. 1e), 220 (Fig. 1f), 270 (Fig. 2a), 222 (Fig. 2b), and 21 spec. PIN, nos. 3474/219, 221, 224, 225, 226, 227, 228, 229, 233, 235, 239, 240, 243, 245, 247, 249, 252, 264, 265, 266, and 324 from the same locality.

Glaphyrophlebia rara Aristov et Rasnitsyn, sp. nov.

Plate 12, fig. 4

Etymology. Species name derived from the Latin *rara*, “rare”.

Holotype. PIN, no. 3474/219, part and counterpart imprints of forewing; Russia, Perm Region, Tyulkino locality; Middle Permian, Ufimian stage, Solikamskian Regional Substage, Solikamsk Formation, Upper Solikamsk Subformation.

Description (Fig. 2c). Small insects. The anterior margin of the forewing is convex in the basal half. Costal and subcostal areas are of equal width at RS bases. Short SC parallel to anterior margin of wing, barely reaches nodal fold line, with simple anterior branches. R behind the RS bases is slightly curved, with dense simple anterior branches. RS extends away from R with two stems, beginning in the basal third of the wing, its anterior stem branches irregularly into six main branches; the posterior of which has a terminal bifurcation. The posterior stem of RS is simple with a short terminal bifurcation. Simple or dichotomizing intercalary veins between the branch ending to the wing apex. M has only a short terminal bifurcation of branches thinner than the stem. CuA begins branching before the apex of M_5 , regularly pectinate, bases of posterior branches may disappear among crossveins. A_1 branches after its distal third, with three or four end-

ings; A_2 has four main branches and at least 16 endings. Crossveins are simple, Y and H-shaped, forming two or more rows of cells in the subcostal and at the base of the intercubital area and the area between the bases of A_1 and A_2 .

Measurements, mm. Length of forewing approximately 12.

Comparison. With double RS base, simple M, and regularly comb-like CuA, the new species is most similar to *G. parvavena* Hörschmeyer et Stapf, 2001 from the Lower Permian Niedermoschel locality (Asselian Stage; Rhineland-Palatinate, Germany), from which it differs in the short SC and slightly curved R. In *G. parvavena*, SC extends far beyond the nodal line level, R is distinctly curved (Hörschmeyer and Stapf, 2001).

Material. In addition to the holotype, spec. PIN, nos. 3474/225 and 240 originate from the same locality.

Glaphyrophlebia kamaensis Aristov et Rasnitsyn, sp. nov.

Plate 12, fig. 5

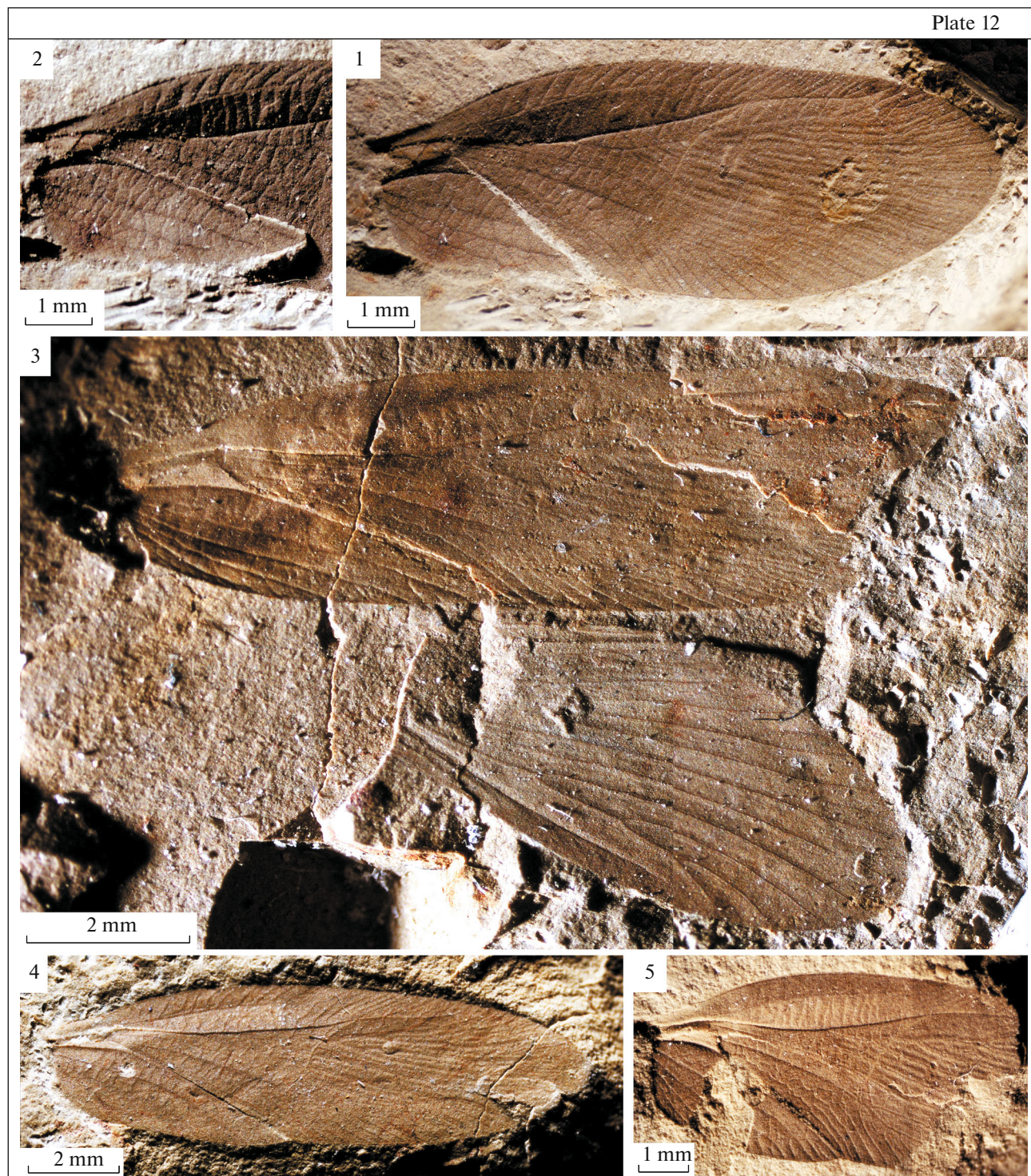
Etymology. After the Kama River.

Holotype. PIN, no. 3474/227, part and counterpart imprints without apical third; Russia, Perm Region, Tyulkino locality; Middle Permian, Ufimian Stage, Solikamskian Regional Substage, Solikamsk Formation, Upper Solikamsk Subformation.

Description (Fig. 2d). Small insects. The anterior margin of the forewing is distinctly convex in the basal half of the wing. The costal area at RS bases is half as wide as the subcostal. SC short, parallel to the anterior wing margin; reaches basal level of nodal line, with simple anterior branches. Behind the RS bases, R is distinctly curved, with dense simple anterior branches. RS extends from R with two stems, originates at a line of the wing basal third; its anterior stem is comb-like backward with more than four main branches; the posterior stem is simple before the distal third of the wing. M is simple, slightly curved before the distal third of the wing. CuA begins forking behind M_5 apex with more than 10 endings; in its distal third, splits into simple or late branching anterior branch and the backward pectinate posterior. Area of bases of CuA main posterior branches is disorganized, not confluent into a distinct bifurcation. A_1 simple with two terminal bifurcations. A_2 with four main branches and at least eight endings. Crossveins simple, Y- and H-shaped, forming two or more rows of cells in the subcostal and at the bases of intercubital area and the area between the A_1 and A_2 bases. The preserved part of the wing is not darkened.

Explanation of Plate 11

Figs. 1–6. *Glaphyrophlebia vaga* sp. nov., forewings: (1) holotype PIN, no. 3474/231; (2) paratype PIN, no. 3474/232; (3) paratype PIN, no. 3474/245; (4) paratype PIN, no. 3474/243; (5) paratype PIN, no. 3474/221; (6) paratype PIN, no. 3474/220.



Explanation of Plate 12

Figs. 1–3. *Glaphyrophlebia vaga* sp. nov.: (1), (2) paratype PIN, no. 3474/270, forewing: (1) after preparation, (2) wing base prior to preparation, (3) paratype PIN, no. 3474/222, forewing and incomplete hind-wing.

Fig. 4. *Glaphyrophlebia rara* sp. nov., holotype PIN, no. 3474/219, forewing.

Fig. 5. *Glaphyrophlebia kamaensis* sp. nov., holotype PIN, no. 3474/227, forewing.

Measurements, mm. Fragment 7.5 in length; presumed length of forewing approximately 9.

Comparison. New species is most similar to *G. iva* Aristov et Rasnitsyn, 2021 from the Middle Permian Soyana locality (Kazanian Stage of Arkhangelsk Region, Russia) in the simple M, the double base of the regularly comb-like RS and the not precisely comb-like CuA and differs in shorter SC and branching crossvein in the subcostal area. In *G. iva*, SC ends behind the basal level of the nodal line; the crossveins in the subcostal area are simple (Aristov and Rasnitsyn, 2021a).

Material. Holotype.

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CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

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