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Five new species of Eoptychopteridae (Diptera) from the Mesozoic of Asia

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ABSTRACT

Five new species of the extinct family Eoptychopteridae are described from Asia. They are *Eoptychoptera shurabica* n.sp. (Lower or Middle Jurassic, Kyrgyzstan), *E. elevata* n.sp., *Proptychopterina immensa* n.sp., *P. tenera* n.sp. (last three from the Upper Jurassic or Lower Cretaceous, Siberia), and *P. makarova* n.sp. (Lower Jurassic, Siberia).

Keywords. Diptera. Eoptychopteridae. Mesozoic. Siberia. Kyrgyzstan. Venation. Taxonomy. Ecology.

INTRODUCTION

The Eoptychopteridae, an extinct psychodomorph dipteran family, ancestral to recent Ptychopteridae, were widespread throughout Europe and Asia in the Mesozoic (Lukashevich et al., 1998). In the rich collections housed at the Paleontological Institute, Moscow (PIN), isolated wings of five new species are found and described below from three Jurassic (and possibly Lower Cretaceous) Asiatic localities.

All new species are representatives of two genera: *Eoptychoptera* HANDLIRSCH 1906 and *Proptychopterina* KALUGINA 1985. Eoptychoptera was a very widespread genus. It is known from the Early Jurassic to Early Cretaceous, in the most ancient localities of Asia (Sogjuty, Kyrgyzstan) and Europe (Dobbertin, Germany), as well as in the youngest deposits with Eoptychopteridae (Baisa, Russia, and Purbeck, England). Another genus, *Proptychopterina*, is known only from Jurassic beds of Asia (Lukashevich et al., 1998).

Localities which eoptychopterids are described from correspond to different paleoenvironments. The collection of the insect impressions from Shurab locality (Kyrgyzstan, Lower or Middle Jurassic) is quite rich (3583 specimens), but Diptera are extremely rare (50 impressions, including two eoptychopterids described below). Consequently, the aquatic dipterans (with aquatic preimaginal stages), often very abundant (and sometimes dominant) group in the Mesozoic, did not play their usual important role in this assemblage. So this site may belong to the Type B in the classification of Sinichenkova and Zherikhin (1996) as well as Ust'-Baley locality, where pupae of eoptychopterids were found. Based on the Sinichenkova and Zherikhin (l.c.) reconstruction these assemblages were restricted to the shallow small oxbow lakes with abundant allochthonous detritus in river valleys - the typical habitat of recent Ptychopteridae (Alexander, 1927). However, in the Shurab area, unlike Ust'-Baley, the dissolved oxygen concentration in oxbow lakes was probably not so high as is postulated for this extinct type of lacustrine ecosystems because of a warmer climate, but

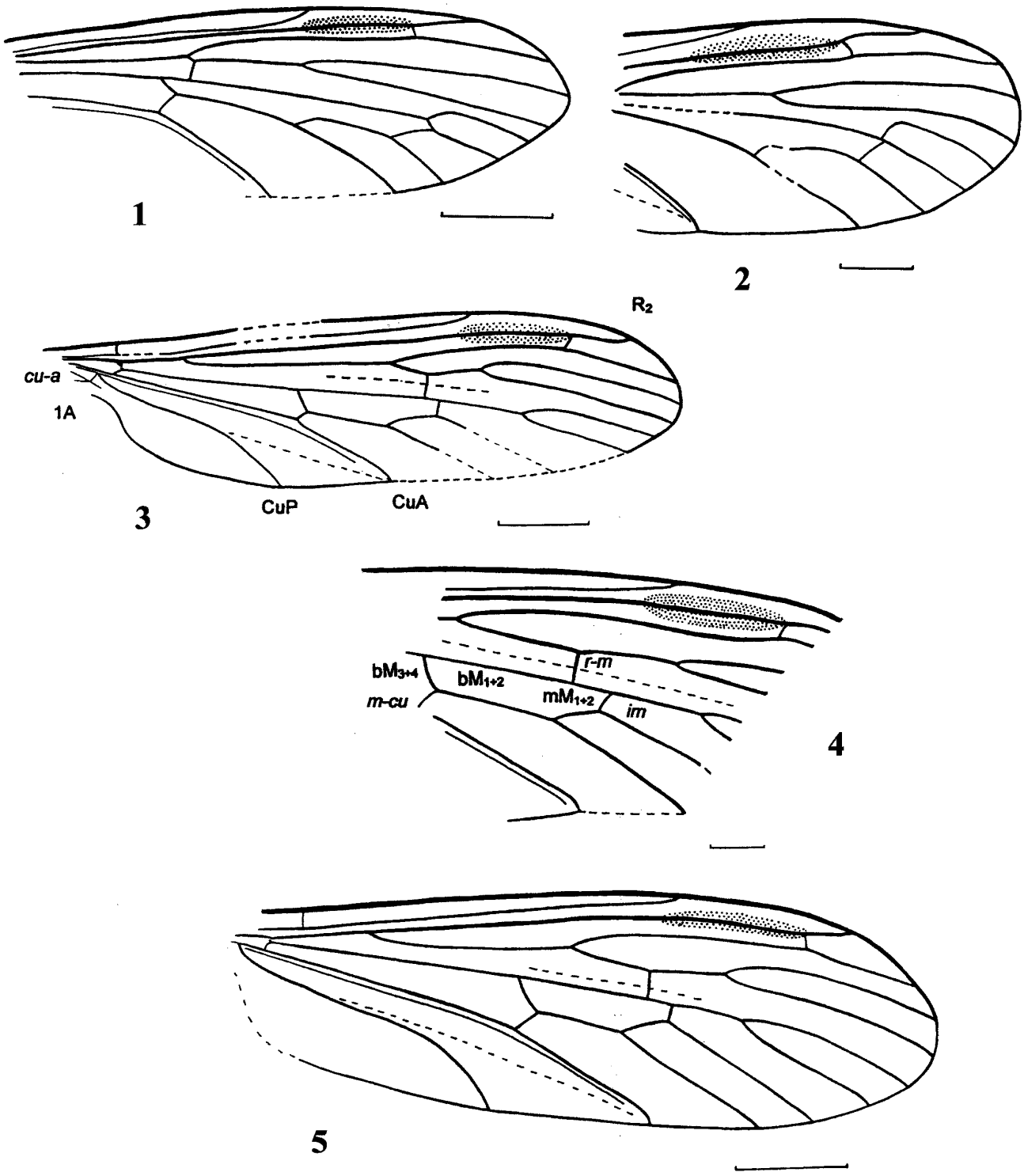

Figure 1. 1-2 Wings of new species of Eoptychoptera, 3-5 Wings of new species of Proptychopterina. 1. - *Eoptychoptera shurabica* LUKASHEVICH n.sp., holotype PIN, No.2389/684; 2.- *Eoptychoptera elevata* LUKASHEVICH n.sp., holotype PIN, No.923/1065; 3. - *Proptychopterina tenera* LUKASHEVICH n.sp., holotype PIN, No.923/1063; 4. - *Proptychopterina immensa* LUKASHEVICH n.sp., holotype PIN, No.923/786; 5. - *Proptychopterina makarova* LUKASHEVICH n.sp., holotype PIN, No.1256/150. Scale bar 1mm.

such highly oxygenated environments are not necessary for recent Ptychopteridae. On the contrary, their preimaginal stages have got some adaptations for the respiration of atmospheric oxygen in unstable environments (Hodkinson, 1973). Pupae of eoptychopterids are remarkably similar to those of Ptychopteridae (Lukashevich, 1995), so a similar life mode is highly probable.

Another locality, Kempendyay (Yakutia, Upper Jurassic or Lower Cretaceous), differs from the former. About 1200 insect impressions have been found there, and 152 of them belong to the Diptera (more than 10% of this collection; most of them are badly damaged). Till now the age of this assemblage remains uncertain, but the beds are doubtless fluvial (Sinitshenkova, 1992). The diversity of the Eoptychopteridae is quite high: four species in three genera, altogether nine specimens: holotype of *Crenoptychoptera gronskayae* described by Kalugina (1989), seven specimens treated below, and one (PIN, No. 923/1149) too poorly preserved to identify it below the family level.

The third locality, Krasnoyarsk (Siberia, Lower Jurassic), is more likely of a fluvial origin but the collection of insect impressions is too small for any reliable conclusions on paleoenvironments. About 150 identifiable remains are available, only 18 of which belong to the Diptera. One complete wing of an eoptychopterid is described below, while two other fragments (wing and body) of eoptychopterids were recorded as ?*Crenoptychoptera* spp. by Kalugina (Kalugina and Kovalev, 1985). However, it is known now that the r-m position before the Rs furcation (as in specimen PIN, No. 1256/62) could be met within *Eoptychoptera* as well, so the generic placement of these fossils are in fact uncertain.

One can see that the finds of the Eoptychopteridae are rather common in localities of fluvial origin or, at least, connected with river valleys. Hence, the presence of at least small-sized species of Eoptychopteridae seems to be highly probable also in fossil resins, especially of a retinite-type, which often originate from riverine forests (Zherikhin and Sukacheva, 1992). However, no eoptychopterids have been found from the Upper Cretaceous resins which are now relatively well-studied at least in Asia and North America; most probably, the family has became extinct somewhere in Mid-Cretaceous times. The Ptychopteridae of similar ecology which certainly existed in the Late Cretaceous are relatively large and thus the probability of their burial in resins is low. If so, one may predict that Eoptychopteridae will be discovered in Lower Cretaceous ambers which are still insufficiently studied. Indeed, very recently several specimens were recovered in the Lebanese amber of supposedly Barremian or Aptian age (Lukashevich and Azar, in preparation); also other insect-bearing Lower Cretaceous resins such as the English (Wealden), Austrian (Gölling) and Spanish (Alava) "ambers" should be of interest in this respect. In the latter about seven hundreds of dipterans have been recorded, but a great number of these flies are still not studied (Szadziewski and Arillo, 1998).

All specimens described below are housed in the Paleontological Institute, Moscow (PIN).

Venation nomenclature as in Shcherbakov et al., 1995; abbreviation as in Lukashevich et al., 1998.

SYSTEMATICS

Family: Eoptychopteridae HANDLIRSCH, 1906

GENUS ***Eoptychoptera*** HANDLIRSCH 1906

Eoptychoptera shurabica LUKASHEVICH n.sp.
Figure 1.1

Etymology: From Shurab locality.

Material examined: Holotype.- PIN, No.2389/684, incomplete impression of isolated wing without anal part; Kyrgyzstan, Osh Region, Batken District, 10 km south of Samarkandek, Shurab (= Say Sagul) locality; Lower - Middle Jurassic. Other material: PIN, No.2389/685. It is possible that this incomplete wing impression belongs to the species.

Description: Length of preserved wing impression 5.2 mm; probable total length no less than 6.0 mm. Wing with an elongate pale pterostigma, otherwise spotless. Sc terminating somewhat distal to R_{4+5} furcation which is situated distal to M_{3+4} furcation. Sc apex and points of R_{4+5} and M_{3+4} furcations are at the straight line and Sc apex is the most distal point. R_{2+3} 1.6 times longer than R_3. R_2 near the level of M_{1+2} furcation. dR1 6 times longer than R_2. R_{4+5} fork 2.4 times longer than R_{4+5}. Crossvein r-m situated just beyond the point of Rs furcation. Vein M_{1+2} in straight prolongation of M stem. mM_{1+2} 7.5 times longer than bM_{1+2}. bM_{3+4} slightly shorter than m-cu.

Comparison: This species resembles *E.vitrea* LUKASHEVICH 1998 from the Early Jurassic of Kyrgyzstan, differing in the inclination of the straight line, con-

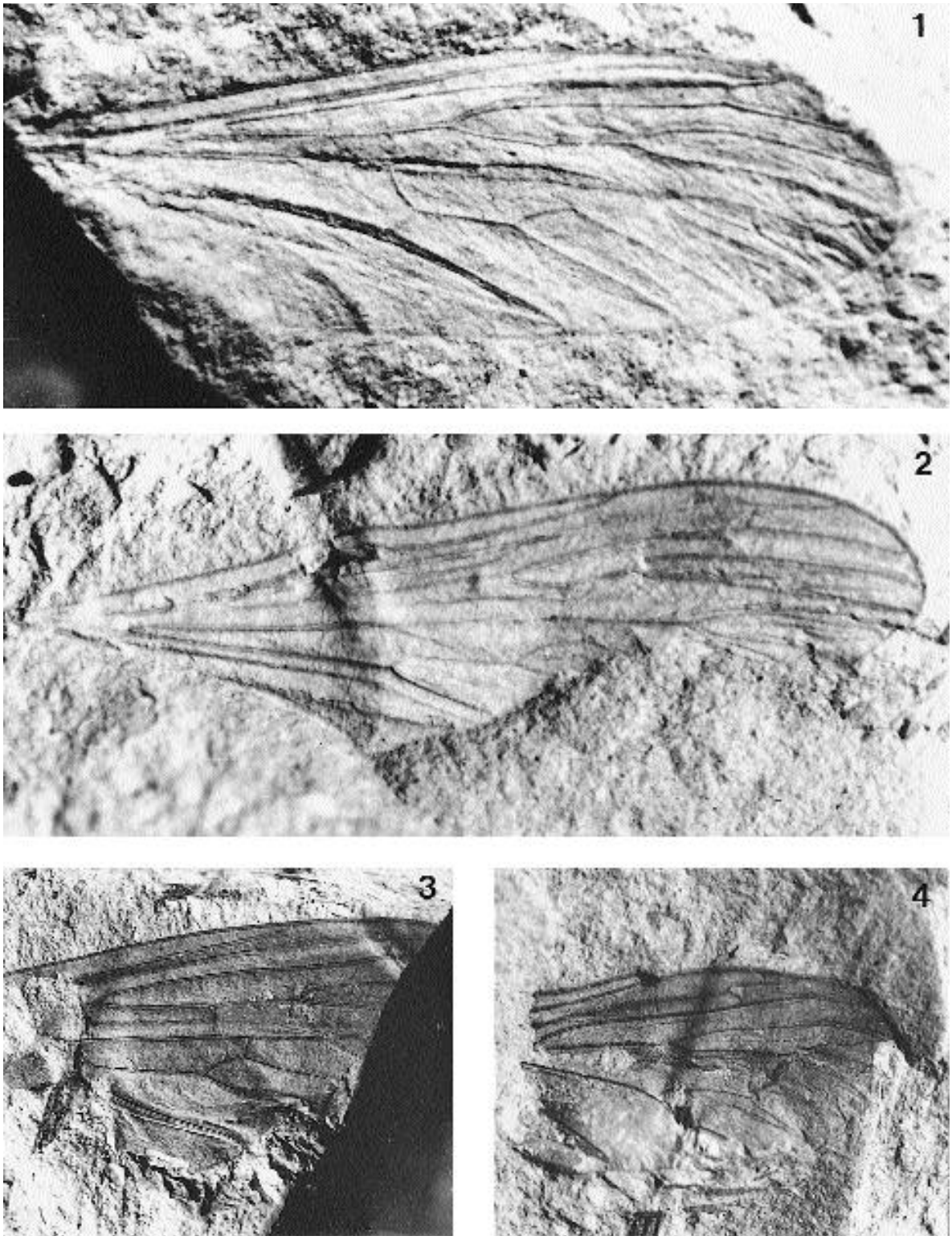

Figure 2. 1. - *Proptychopterina makarova* LUKASHEVICH n.sp., holotype PIN, No.1256/150; 2. - *Proptychopterina tenera* LUKASHEVICH n.sp., holotype PIN, No.923/1063; 3. - *Proptychopterina immensa* LUKASHEVICH n.sp., holotype PIN, No.923/786; 4. - *Eoptychoptera elevata* LUKASHEVICH n.sp., holotype PIN, No.923/1065.

necting the Sc apex and the points of R_{4+5} and M_{3+4} furcations (in *E.vitrea* M_{3+4} furcation is the most distal point), and M stem forking asymmetrically.

Eoptychoptera elevata LUKASHEVICH n.sp.
Figures 1.2 and 2.4

Etymology: From Latin *elevatus* (raised), on account of the position of M_{1+2} fork.

Material examined: Holotype.- PIN, No.923/1065, incomplete positive and negative impression of isolated wing without proximal part; Yakutia-Sakha, Suntar District, right bank of the Kempendyay River 40 km upstream from Kempendyay, Kempendyay locality; Upper Jurassic - Lower Cretaceous.

Description: Length of preserved wing impression 5.4 mm; probable total length no less than 10.0 mm. Wing with an elongate pale pterostigma, otherwise spotless. Sc terminating proximal to R_{4+5} furcation which is situated distal to M_{3+4} furcation. R_{2+3} 1.7 times longer than R_3. R_2 proximal to M_{1+2} furcation. dR1 4 times longer than R_2. R_{4+5} fork 1.6 times longer than R_{4+5}. Crossvein r-m situated not beyond the point of Rs furcation. M_{1+2} aligned with M_2. Crossvein im is almost at M_{1+2} furcation.

Comparison: This species resembles *E. maxima* (Kalugina, 1985) from the Middle Jurassic of Siberia, but M_{1+2} forking symmetrically in the latter.

GENUS ***Proptychopterina*** KALUGINA 1985

Proptychopterina tenera LUKASHEVICH n.sp.
Figures 1.3 and 2.2

Etymology: From Latin *tener* (tender).

Material examined: Holotype.- PIN, No.923/1063, positive and negative impression of an isolated wing; Yakutia-Sakha, Suntar District, right bank of the Kempendyay River 40 km upstream from Kempendyay, Kempendyay locality; Upper Jurassic - Lower Cretaceous. Other material: an incomplete impression of isolated wing PIN, No.923/1064.

Description: Wing length 7.2-9.4 mm. Wing with an elongate pale pterostigma, otherwise spotless. Sc terminating at the level of R_{4+5} furcation and distal to M_{3+4} furcation. R_2 4 times shorter than dR1. R_{4+5} fork 1.3-2.4 times longer than R_{4+5}. Crossvein r-m situated about midlength of R_{4+5}, distal to M_{3+4} furcation, 3.5 times shorter than dM_{1+2}. R_2=im<r-m=bM_{3+4}. dM_{1+2} 6 times longer than mM_{1+2}, which subequal to crossvein im. Cell d subequal to M_{1+2} fork. bM3 4 times longer than im. bM_{3+4} 2 times longer than m-cu. 1A distad of cu-a retained as rather long spur.

Comparison: This species resembles *P. evecta* LUKASHEVICH 1993 from the Late Jurassic of Kazakhstan, but bM_{3+4} subequal to m-cu in the latter.

Remarks: Such large variation of the ratio R_{4+5} fork to R_{4+5} occurs in *P. handlirshi* and *P. yeniseica* too. It may be the sexual dimorphism that is responsible, but the assumption remains unsteady since all impressions (aside from the holotype of *P. yeniseica*) are isolated wings.

Proptychopterina immensa LUKASHEVICH n.sp.
Figures 1.4 and 2.3

Etymology: From Latin *immensus* (large).

Material examined: Holotype.- PIN, No.923/786, incomplete positive and negative impression of an isolated wing; Yakutia-Sakha, Suntar District, right bank of the Kempendyay River 40 km upstream from Kempendyay, Kempendyay locality; Upper Jurassic - Lower Cretaceous. Other material: positive and negative impressions of incomplete wings PIN, No. 923/1066, 1085, 1128. It is possible that these impressions belong to the species.

Description: Length of preserved wing impression 8.4 mm; probable total length no less than 15.0 mm. Wing with an elongate pale pterostigma, otherwise spotless. Sc terminating at the level of R_{4+5} furcation and distal to M_{3+4} furcation. Rs forked very early, near the base of d cell (about 0.15 of its length). Crossvein r-m situated about midlength of R_{4+5}, distal to M_{3+4} furcation, 3 times shorter than dM_{1+2}. R_2<im<r-m=bM_{3+4}. dM_{1+2} 2.5 times longer than mM_{1+2}, which subequal to r-m. bM_3 2.5 times longer than crossvein im.

Comparison: All other species are smaller and with Rs forked later (at least at 0.3 of the length of d cell, usually later).

Proptychopterina makarova LUKASHEVICH n.sp.
Figures 1.5 and 2.1

Etymology: From Makarova Formation.

Material examined: Holotype: PIN, No.1256/150, well preserved positive and negative impression of an isolated wing without base; Krasnoyarsk Province, left bank of the Yenisey River downstream from Krasnoyarsk, opposite the downstream edge of island Tatyshev, Krasnoyarsk (=Tatyshev) locality; Lower Jurassic, Makarova Formation.

Description: Wing length 6.4 mm. Wing with an elongate pale pterostigma, otherwise spotless. Sc terminating proximal to R_{4+5} furcation and distal to M_{3+4} furcation. R_2 4 times shorter than dR1. R_{4+5} fork subequal to M_{3+4} fork and 1.5 times longer than R_{4+5}. Crossvein r-m situated about midlength of R_{4+5}, distal to M_{3+4} furcation, 2.5 times shorter than dM_{1+2}. R_2<im<r-m<bM_{3+4}. dM_{1+2} 3 times longer than mM_{1+2}, which subequal to crossvein im. Cell d subequal to M_{1+2} fork and 1.4 shorter than M_{3+4} fork. bM_3 3 times longer than crossvein im. bM_{3+4} subequal to crossvein m-cu.

Comparison: This species resembles *P. sharategica* KALUGINA 1992 from the Late Jurassic of Mongolia, differing in relatively shorter R_{4+5} fork and longer mM_{1+2} (in *P. sharategica* R_{4+5} fork twice longer than R_{4+5} and dM_{1+2} 5 times longer than mM_{1+2}).

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