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Permian fossil Insects of North-East Europe.

By A. Martynov.

(With 19 Plates and 3 figures in Text.)

(Présenté par F. Loewinson-Lessing, membre de l'Académie des Sciences, le 20 mars 1927.)

Permian beds of continental and littoral facies occupy a very large space in the European part of the USSR. We already posses descriptions of many plants, fisches, Phyllopods, mollusks, and, finally, of a whole range of various reptiles, as also of Stegocephals. Under these conditions one would expect the discovery in these beds, along with plants, of a more or less rich entomofauna as well, but, as a matter of fact such discoveries of fossil Insects are scarce, and our knowledge of the Palaeozoic Insects of the USSR hitherto remains extremely scanty. Fossil Coal Insects from within the confines of the USSR have been hitherto quite unknown. Our knowledge of Permian Insects is confined to separate indications of Nečajev,[1] Krotov,[2] and, chiefly, to the work of A. Handlirsch of 1904,[3] in which the author has given a revision and general summary of the data relating to all the remains of Permian Insects in Russian beds known until then. In this work are enumerated 12 species, proceeding from:

[1] A. Nečajev. The fauna of the Permian beds of East European Russia. Труды Общ. Естествоисп. Казанск. Унив. (Trav. Soc. Natur. Univers. Kazan). 1894, T. XXVII, Fasc. 4, p. 380, fig. 3, 1—4 (russian).

[2] Krotov. Artinskyan. A monographic Revision etc. Trav. Soc. Natur. de Kazan. 1885, Vol. XIII, 5, p. 189, pl. I, fig. 1 (russian).

[3] A. Handlirsch. Über einige Insectenreste aus d. Permformation Russlands. Mém. Acad. Sci. St.-Pétersb. 1904, XVI, № 5, pl., fig. 1—7.

1) Tikhie Gory, on the Kama river, Kazan gvt. (Pl. XIX, № 3), 5 species (*Prosbole hirsuta* Handl., *Scytinoptera Kokeni* Handl., *Palaeomantis schmidti* Handl., *Petromantis rossica* Handl., *Limmatoblatta permensis* Handl.);

2) the mines of Kargala, Orenburg gvt. (Pl. XIX, № 1), 5 species (*Aissoblatta orenburgensis* and *A. rossica* Handl., *Phtartus rossicus* and *Pht. nečajevi* Handl., *Dyadozoarium pachypus* Handl.);

3) the vicinities of the village of Kolpakovo, on the Irenj river, Perm gvt. (Pl. XIX, № 2) (*Dyadentomum permense* Handl.);

4) the vicinities of the village of Schuny (Shuny), Kazan gvt. (Pl. XIX, № 4) (*Thnetus Stuckenbergi* Handl.).

A description of all these species is included also in the fundamental work of Handlirsch, 1908,[1] containing figures of some forms, that had not been inserted in the work of 1904. Later, in 1909, yet another form was described by Handlirsch[2] from Kargala, *Chalcorychus walchiae* Handl. Among the species just mentioned not all are well preserved; some are represented only by fragments of wings (*Limmatoblatta, Thnetus*), others are known by the larvae (gen. *Phtartus, Dyadentomum*), in some forms only the general contours of their body being preserved (*Dyadentomum, Chalcorychus*). The systematic position of these forms remained, of course, not completely ascertained.

Quite lately, when the present work was completed, I received a paper of Dr. D. M. Zalessky[3] with the description of a new extremely interesting neuropterous Insect from Kargala (*Sialidopsis kargalensis* Zalessky). A few words will be devoted to this Insect later, in the description of *Neuroptera*.

Our very scant knowledge of the Permian Insects of the USSR induced me to take a journey, in 1926, to the village of

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[1] A. Handlirsch. Die Fossilen Insecten. Leipzig, 1906—1908.

[2] A. Handlirsch. Mitt. Geolog. Ges. Wien, 1909, II, 382, fig. 1, 2.

[3] M. D. Zalessky. Observations sur un nouvel insect fossile du Permien de Kargala. Bull. Soc. Géol. France. 4-me sér., 1926, t. XXVI, p. 75—82, pl. III—IV.

Tikhie Gory, on the Kama river, Kazan gvt., where the German geologist E. Koken had the occasion of finding, in the eightieth years of last century, several good specimens (impressions) of wings, later described by Handlirsch. My search was crowned with succes and in a short time I collected several dozens of specimens.

The greater part of them were found in two concretions, which proved to be filled with remains of wings.

Together with these remains of Insects were often met with shells of *Lingula orientalis* Golowk., a form, very common there. The remains of plants are fairly numerous but they occur in somewhat lower beds, than remains of Insects. All these remains of Insects and plants belong, according to G. Fredericks,[1] to the Kazanian, or, to be more precise, to the lower beds of his Krasnovidian (= Conchiferous) horizon. Here were found *Homoptera*, *Protorthoptera*, *Miomoptera* (n. ordo), *Mecoptera*, *Neuroptera*, and, finally, *Palaeodictyoptera*, and *Agnatha*.

In the summer of the same year 1926 the geologist M. Edemskij had discovered a new locality with an occurrence of fossil Insects in Permian beds on the Sojana river, an affluent of the river Kuloj, in the Northern part of the Archangelsk gvt. (Pl. XIX, № 5). According to the communication of Edemskij[2] these beds with insects and plants at that place (named by him «Iva-Gora») are covered with a thick layer of lime-stone and belong either to the lower horizons of «zechstein», or even to the beds transitional to the «lower Perm»; their age cannot however be fully ascertained. According to information kindly communicated by G. Fredericks, these insectiferous beds belong, probably, to his Kamian (= brachiopodous) horizon of the Kazanian. Here representatives of *Psocoptera*, *Protorthoptera*, *Protoblattoidea*,

[1] G. Fredericks. Sur la stratigraphie du Permien de l'Oural. Rapport presenté au I Congrès géologique de Russie. Mém. Soc. Min. Russie. 1925, v. LIV, 1. p. 26—36 (russian); also my report to Acad. Sci. 1926.

[2] M. Edemsky. Report to Acad. Sci. 1926.

Mecoptera and *Megasecoptera* have been found. The general composition of the fauna is fairly similar to that of the fauna of Tikhie Gory, but nearly all the genera here are different. The present work is the result of the study of both collections, which contain not less, than 50 species, not taking account of several indeterminable fragments of wings, remains of abdomina, of parts of legs etc. These collections, obtained in a short space of time, compel us to assume, that a rich fauna is, indeed, buried in the Permian beds of the North European part of USSR, awaiting further researches.

February 1927.

INSECTA PTERYGOTA.

Divisio **Palaeoptera.**

Divisio *Palaeoptera* Martynov. Über Zwei Grundtypen der Flügel bei den Insecten und Ihre Evolution. Zeitschr. Morph. Ökol. Tiere. 1925, Bd. IV, H. 3.

Ordo **Palaeodictyoptera.**

These insects were not yet known from the Permian beds of the USSR, but one fragment of a wing from the village of Schuny, Kazan gvt., described in 1904 and attributed by Handlirsch to the may-flies, I consider as belonging rather to *Palaeodictyoptera*.

In the vicinities of Tikhie Gory were discovered three more forms of this order, represented, unfortunately, only by the fragments of wings.

Fam. **Breyeriidae** Handl. (?).

Kamia angustovenosa, n. gen., n. sp.

(Plate I, fig. 1.)

Two impressions of a fragment of a wing, №№ 2 and 11 (reverse). (Coll. № 2065.) Concretion A_1, Tikhie Gory on the Kama river. 1926. A. Martynov.

The preserved fragment includes, as I believe, the region of RS and M. Membrane thin, with slender, but distinct nervures.

Anterior branch of RS divides, at first, into two branches, the latter divide again and form not less than 6 branchlets. Anterior branch of M, beginning from its end, somewhat deviates from RS (it cannot be further discerned); the following branches of M disposed wide apart. All the longitudinal nervures are connected by dense rows of crossveins, which are not quite regular, sometimes anastomosing and in proximity of the edge of the wing and of the region of Cu devolving into an irregular net.

Length of specimen 27 *mm*; total lenght of the wing must have been not less than 50 *mm*, perhaps, up to 60 *mm*.

By the character of the net, as well as, partly, by the configuration of the nervures, which I suppose to be RS, the fragment here described recalls the corresponding parts of the wings in the gen. *Borrea* Brongn. (*B. Lachlani* Brongn.), as figured by Handlirsch on the fig. 8, Pl. XI.[1]

By the character of the reticulum it is also similar to the genus *Breyeria* Borre. Besides *Breyeriidae* may also be observed a certain similarity with some *Spilapteridae*, such as *Compsoneura fusca* Brongn. Of course, it is difficult to form any definite opinion from such a small fragment. It may, possibly, prove to belong even to a separate family, but if that be the case, its position will, probably, still remain not far from the *Breyeriidae* (from the Upper Carbon of France and Belgium).

Palaeodictyoptera incertae sedis.

Thnetodes craticius, n. gen., n. sp.

(Pl. II, fig. 4.)

Two impressions of a fragment of a wing, №№ 43 and 58 (reverse). Concretion B. Tikhie Gory 1926. A. Martynov.

Membrane thin; longitudinal and cross veins strong. Longitudinal veins in the region of M and Cu (probably) approach the hind margin of the wing at acute angles and are connected by dense rows of regular transverse nervures, parallel with the hind

margin; near the edge they form some anastomoses; intercalary sectors wanting.

Length of the fragment 17 *mm*; the whole wing must be not less than 40 *mm* in length.

By the approximation of the longitudinal veins at sharp angles to the edge of wings and the character of the cross veins this genus appears to me to be rather closely allied to *Thnetus stuckenbergi* Handl., described by Handlirsch in 1904[2] and later described again and figured in 1908.[1] This last form is found near the vill. of Shuny, Kazan gov. in the beds, which belong to the Krasnovidian horizon of the Kazanian.[3] In the two works referred to, as well as in the Revision of 1919[4] the author refers the gen. *Thnetus* to *Plectoptera*, but the character of the cross veins, disposed, as in *Thnetodes*, in dense rows, not quite regular and partly anastomosing, most decidedly controverts such an assertion. The very small «Schaltsectoren» near the edge of the wing have almost the same aspect, as in *Kamia angustovenosa* and do not in themselves prove the ephemeridan nature of the wing.

By the character of their reticulum the gen. *Thnetus* and *Thnetodes* must be referred to the order *Palaeodictyoptera*, it being difficult on the strength of such small remains to determine the family they are more closely allied to.

Spongoneura incerta, n. gen., n. sp.

(Pl. I, fig. 2.)

Two impressions of a fragment of the wing, №№ 24 and 31 (reverse). Concretion A. Tikhie Gory, 1926. A. Martynov.

On this small fragment, 8 *mm* in length, are seen three longitudinal veins bounded by a thin reticulum of anastomosing veins:

[1] Handlirsch. Die Foss. Insekten, p. 386, pl. 37, fig. 16 (*Thnetus Stuckenbergi*).

[2] Handlirsch. Mém. Acad. Imp. Sci. St.-Pétersb., vol. XVI, № 5, p. 7.

[3] According to the kind communication of G. N. Fredericks.

[4] Handlirsch. Revision paläoz. Insecten. Denkschr. Akad. Wissensch. Wien. 1919, 96. Bd., p. 64.

the nervures arising from, or bordering the longitudinal veins, show a tendency as though of stretching themselves out and of taking a perpendicular position to the edge; in the intermediate regions appear some hexagonal cells. Total length of wings, probably, not less than 40—50 *mm.*

Judging by the character of the reticulum, this form must be assigned to a family distinct from those, to which the former genera belong.

Ordo **Megasecoptera.**

Fam. **Kulojidae** n. fam.

SC does not reach the end of the wing. R in the distal part deviates considerably from the strongly convex costal margin; RS forms only two simple branches; the branches of M (two or three) bow-shaped; cross veins fairly numerous.

Gen. **Kuloja**, n. gen.

(Pl. I, fig. 4.)

Two impressions of the distal part of the wing, №№ 1 and 2 (reverse). (Coll. № 2050.) «Iva-Gora» on the Soyana river. 1926. M. Edemskij.

To the characteristics of the family the following may be added. In the distal part of the wing SC approaches and fuses with C; costal margin in the apical region strongly convex forwards, and between it and the Radius a broad field (area costalis) is formed. The branches of RS and M approximatedly parallel. Traces of cross veins are not rare. Dimensions rather large.

K. expansa, n. sp.

(Pl. I, fig. 4).

Two impressions of the distal part of a wing, №№ 1 and 2 (reverse). «Iva-Gora», on the Soyana river, an affluent of the Kouloj river. 1926. M. Edemskij.

Length of the specimen 14 *mm*, breadth 11 *mm*; total length of the wing must be about 40 *mm*. In the distal part of the wing the area between R and C is, in its middle part, somewhat broader, than the distance between R and RS_1. RS divided into two branches, and both branches are almost parallel, only slightly diverging towards the tips. Cross veins appear rather dense and parallel to the edge of wing.

The genus *Kuloja* somewhat resembles certain *Mischopteridae* Handl., such as the genus *Sphecoptera* Brongn., but easily differs from them, chiefly, by R before its end deviating from the front margin and RS consisting of only two branches.

In no less degree does it differ from *Brodiidae* and other families, and I think, it should be separated into a distinct family. It must be one of the most specialized and perfect *Megasecoptera*, which at the end of the Permian period become extinct.

Ordo **Plectoptera.**

Fam. **Protereismidae** Handl.

Loxophlebia apicalis, n. gen., n. sp.

(Pl. I, fig. 5.)

One specimen, № 41, representing the distal fragment of a wing. Concretion A. Tikhie Gory, 1926. A. Martynov.

Length of the fragment 6,5 *mm*, breadth 7 *mm*; total length of the wing must be about 23—26 *mm*, as in *Protereisma* Sell.[1] On our specimen SC is convex, R concave etc., which signifies, that the wing is seen from beneath. SC, R, RS, and RS_2 nearly parallel, the end portions of the first three nervures rather strongly curved towards the apex of the wing; the fork of RS_3 elongated: cross veins dense.

In the general configuration of the longitudinal nervures, as well as in the dense cross veins, this wing recalls various *Protereis-*

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[1] E. H. Sellards. Types of Permian Insects. Amer. Journ. Sci. 1907, vol. XXIII, pp. 345—355.

midae. In the elongated fork of RS_3 it somewhat resembles *Rekter extensus* Sell., in the approximated ends of RS_1 and R — *Rekter arcuatus* Sell. Size as in the gen. *Protereisma*.

The fragment is too small for determining its true systematical position, but its reference to the fam. *Protereismidae*, known from Permian beds of Kansas, appears to be correct.

In 1894 Prof. Nečajev recorded[1] from the Permian beds of Kargala, Orenburg gvt., several larvae, one of which was figured in fig. 3, № 4. This figure shows clearly, that this larva belongs to *Plectoptera*. Both larval *Ephemeridae* were described by Handlirsch in 1904 and in 1908[2] under the names *Phtarthus rossicus* and *Phtartus nečajewi*. In 1919[3] this author briefly pointed out, that they «vielleicht zu *Protereismidae* gehören». At present, when this family is discovered in the beds near Tikhie Gory, Handlirsch's supposition becomes very probable.

The third larval form from the Russian Permian (vill. Kolpakovo, on the Irenj river, Perm gvt., Ufimian horizon of Kungurian), considered by Handlirsch (1904 and 1908) as belonging to *Plectoptera*, is *Dyadentomum permense* Handl.

This insect was referred to earlier by Krotov,[4] as an «Orthopteron». It is represented only by the head and the prothorax with anterior legs. I also think, that this form belongs, in all probability, to *Plectoptera*.

As to *Thnetus Stuckenbergi* Handl., first described by that author in 1904, then in 1908[5] (with fig. 16, Pl. 37) and also considered as being an Ephemerid, I cannot agree with that opinion and think, that it should be rather ranked with the great order *Palaeodictyoptera* (see above).

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[1] A. Nečaev. Travaux Soc. Imp. Naturalist. Univ. Kazan. 1894, XXVII, 4, p. 380—382 (russian).

[2] A. Handlirsch. Die Fossilen Insekten. S. 386—387, Taf. 37, fig. 17—19.

[3] A. Handlirsch. Revis. d. Paläoz. Insecten, S. 65.

[4] Krotov, op. cit., p. 189, pl. 1, fig. 1.

[5] A. Handlirsch. Foss. Ins.,

Divisio **Neoptera.**

Divisio *Neoptera* Martynov. Zeitschr. Morphol. Ökol. d. Tiere. 1925. Bd. IV, H. 3.

Ordo **Homoptera.**

Two species of *Homoptera* were known from Permian beds of the USSR: *Prosbole hirsuta* Handl. and *Scytinoptera Kokeni* Handl. Both these forms were considered by Handlirsch as being representatives of two new distinct families, *Prosbolidae* and *Scytinopteridae*, which were even united to form the order of *Palaeohemiptera*. Later Tillyard[1] and, partly, Muir[2] have advanced the opinion, that both these families may be wholly assigned to the order *Homoptera*. Personally I share the same point of view.

The remains of *Homoptera* from the rivers Kama and Soyana can also be mostly attributed to the families *Prosbolidae* and *Scytinopteridae*, but one of the species appears to me to belong to the fam. *Cixiidae*, and another, perhaps, to the family *Tropiduchidae*, or its allies. All these remains are represented by tegmina, rarely by wings; their preservation is good, sometimes excellent.

As to the interpretation of the nervuration, we must rely upon the indications, that the study of nervation itself supplies us with. The interpretation of the systems of Cu and M does not offer any difficulties, and the chief point consists in establishing the homologisation of R, RS and SC. Among our forms the most primitive features of nervation are displayed by the members of the fam. *Prosbolidae*. Here we recognize at once Cu, M and R and in front of R the typical concave subcosta, usually feeble and often almost disappearing. It is the presence of this subcosta that gives us full grounds for acknowledging the Radius in the stem, lying immediately beside it; the branch of R is RS. This subcosta

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[1] R. J. Tillyard. Proc. Linn. Soc. New South Wales. 1919, XLIV, part. 4.
[2] F. Muir, teste Tillyard's, ibid., 1922, vol. XLVII, part. 4, p. 458.

Explanation of Plates I—XIX.

Plate I.

1. *Kamia angustovenosa*, n. g. n. sp.; fragment of the wing.
2. *Spongoneura incerta*, n. g. n. sp.; a fragment of the wing.
3. *Prosbole elongata*, n. sp.
4. *Kuloja expansa*, n. g. n. sp.
5. *Loxophlebia apicalis*, n. g. n. sp.; portion of the wing.

Plate II.

1. Tegmen of *Permocicada umbrata*, n. g. n. sp., photograph.
2. Tegmen of *Sojanoneura edemskyi*, n. g. n. sp., »
3. A portion of the wing of *Thnctodes craticius*, n. g. n. sp.
4. *Prosbole biexcisa*, n. g. n. sp.; hind wing.
5. *Euthygramma parallela*, n. g. n. sp.; anterior wing.

Plate III.

1. *Sojanoneura* proxima, n. sp.; hind-wing.
2. Tegmen of *Permocicada nigronervosa*, n. sp.
3. *Prosbole biexcisa*, n. sp.; hind-wing.
4. *Mitchelloneura permiana* Till.; —·—·— my restoration.

Plate IV.

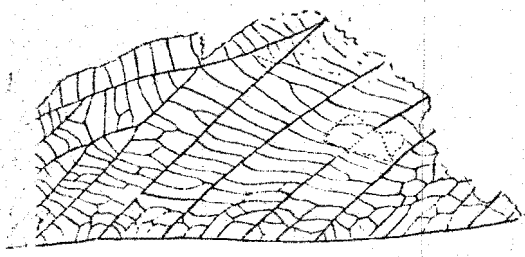
1. *Sojanoneura edemskyi*, n. g. n. sp.; tegmen.
2. *Permocicada umbrata*, n. g. n. sp.; tegmen.
3. *Scytinoptera maculata*, n. sp ; tegmen.
4. *Scytinoptera similis*, n. sp.; tegmen.

Plate V.

1. *Atactophlebia termitoides*, n. g. n. sp.; anterior wing.
2. *Metoedischia magnifica*, n. g. n. sp.; anterior wing.
3. *Haplopterum majus*, n. g. n. sp.; hind wing.
4. *Hypoperla elegans*, n. g. n. sp.; anterior wing.
5. *Scytinoptera maculata*, n. sp.; posterior wing.
6. *Palaeomantis schmidti* Handl., anterior wing.

Plate VI.

1. Tegmen of *Scytinoptera obliquo-ovata*, n. g. n. sp.
2. *Scytinoptera maculata*, n. g. n. sp.; hind wing.
3. *Anomoscytha reducta*, n. g. n. sp.; tegmen.
4. *Sojanoneura elytrata*, n. g. n. sp.; tegmen; a — anterior groove.



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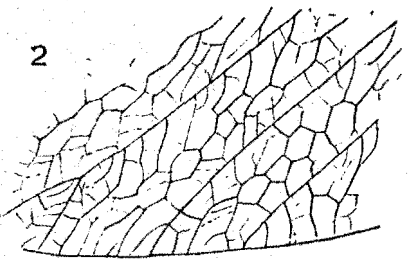

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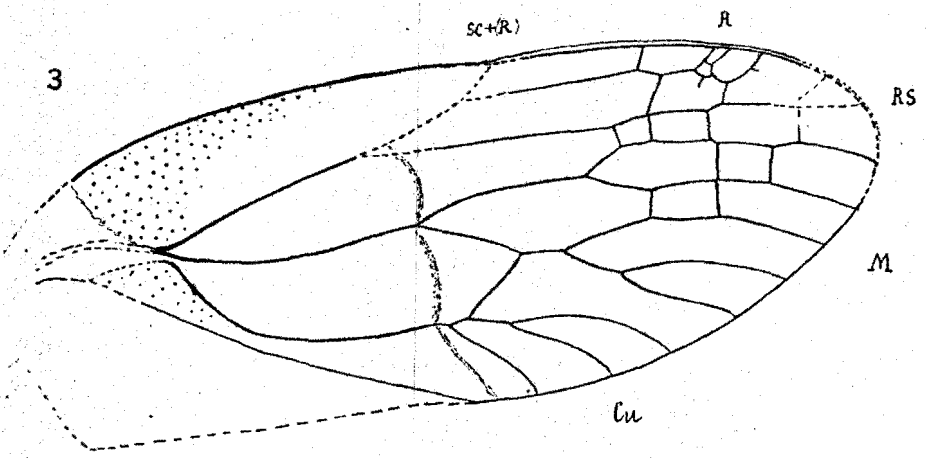

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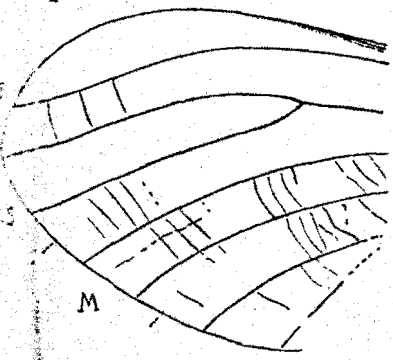

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