The insect-variety of Angaran Early Permian

by Michael Wachtler
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Surprisingly just in the Early Permian Angara-Land mainly all dominating insect families were present. And from these can be deduced that many of them were potential pollinators. The Mayflies (Ephemerida) with *Misthodotes*, the Syntonopterida (*Miracopteron*), the Odonata with the Meganeuridae, Kennedyidae, Bakteniidae (*Engellestes*), the Blattinopseida, Caloneurida, Hypoperlida, the Dictyoneurida, the order of the Mischopterida, the Psocida, the Thripida, the Psocidea, the Hemiptera, the Palaeomanteida, Coleoptera, the Corydalida, Neuroptera, Jurinida, Panorpida, Trichoptera, Holometabola, the Eoblattida, Blattida, especially the order of Gryllidae (*Angaroptera nicolaswachtleri* gen. nov. sp. n.) were present in many families just from the Early Permian. Other orders were the Cnemidolestida, Perlida, Forficulida, Orthoptera, Phasmatida. Some spiders and scorpions (*Permomatveevia perneri* nov. gen. n. sp.) were also found (Permarachnidae, Permitonidae), as well potential progenitors of the Hymenoptera (Parasialis).

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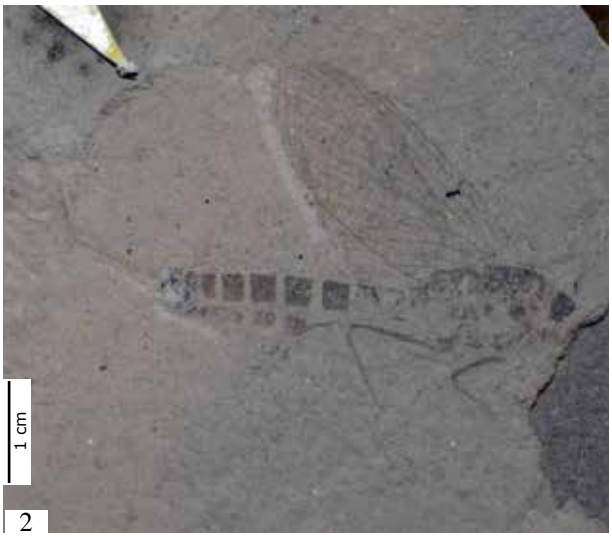
Key words: Early Permian, Insects, Angara

The Kungurian (Uppermost Lower Permian) fossil sites, Chekarda (Suksun-district, Perm region) has yielded the richest insect fossil records worldwide. All of them were excellently mostly entire preserved. The fossil-bearing sediments are located on the north-eastern slope of the Krasnaya Gora mountain on the left bank of the Sylva River near the Chekarda River mouth. Recent studies have revealed 25 orders, 99 families, 200 genera, and 257 species (Aristov & Rasnitsyn, 2015).

It is not generally known, that the hamlet Matvéevo, near the small town Lyswa, also holds a high amount of well-preserved insects. It can be established, that there usually on one square metre of deposited layer, about 3 to 5 insects, mostly of different genera and species, can be recovered. Only in a few other Early Permian sites worldwide

A fern (*Convexocarpus*) and a cricket (*Angaroptera nicolaswachtleri*) on the same slab. Courtesy: Museum Permian Period, Perm



A mayfly (*Misthodotes sharovi*) from Matvéevo (MAT 183); (Coll. Wachtler) (Early Permian, Kungurian, and one of the few insect-findings from Early Permian of Germany, Odernheim (Coll. Stapf/Krause, Nierstein)

fossil insects can be found. One of them is the Wellington Formation (Artinskian Stage of Elmo and Midco in Kansas/Oklahoma, USA), but by far not so rich as Chekarda (Martynov, 1940) or Matvéevo. There the insects are usually preserved only as isolated wings or fragments, whereas Chekarda and Matvéevo yield commonly complete specimen with folded or even expanded wings, that makes it easier for a detailed classification (Zalessky, 1939, Martynov, 1940, Novokshonov, Storozhenko, 1998, Storozhenko, 2002, Aristov, 2004, Eskov & Selden, 2005, Aristov & Rasnitsyn, 2015).
Findings in Europe are poor: Some doutful mayfly from Odernheim (Early Permian) has been the only result after intensive research of decades (Perner & Wachtler, 2015). The richness can only partially be explained by the unique preservation—also other places like Niederhausen and Odernheim in Germany offer mainly the same fine-granulated Permian deposits. Therefore, other solutions must be taken into consideration. One of them is the high amount of paleoangiospermous flora-elements in Permian Angara-Land in contrast to the mainly gymnosperm-dominated flora in Permian Europe.

About the Permian insect researches in the Fore-Urals

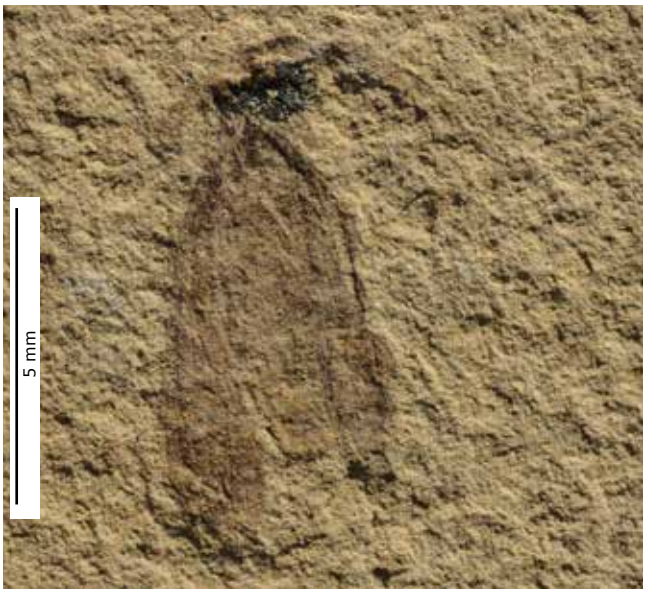
The researches in these, far from densely populated settlements, lying region were never intensive. The locality of Chekarda as Fossillagerstätte, especially for entomology, was discovered in 1928 by the student of local lore, Genrich Timofewitsch Mauer, who gathered a small collection of fossil insects from there. Mauer interested than—between 1930 and 1938—researchers from the University of Moscow, like Andrey Vasilyevich Martynov (1879–1938), and the palaeoentomologist Georges Zalessky, (not to confuse with the paleobotanist Mikhail Dmitrievich Zalesski). They discovered diverse rich fossil insect-sites that radically altered the state of knowledge of entomofaunas in Russia.
Martynov published fundamental papers on Polyneoptera and Palaeoptera, but his most important work about the Permian insects mainly from Chekarda appeared only after his death and was edited by Boris B. Rohdendorf (1904–1977). Martynov was also the first to compare the Chekarda fauna with the mainly coeval insects from Elmo, Kansas (Martynov, 1940). He was convinced that insect fossils should be studied and compared on modern insect orders and therefore he drew attention for the insects as strati graphical indicators.
The other Russian palaeoentomologist, Georges Zalessky, described and classified many insects from the Fore-Uralian localities, especially in his main work about the fossil insects from the Sylva-River including some hexapoda from Chekarda and also Matvéevo (G. Zalessky, 1939). After the first heyday between 1930 and 1940 followed other researches and expeditions in various years, headed first by A.G. Sharov between

1959 and 1961. Recently Daniil S. Aristov focused his research on the Permian insect-deposits in the Perm Krai (Aristov, 2015)
Most of the old collections are actually stored in Moscow in the Vernadskii State Geological Museum (SGM) nos. VI-198 and KP-769 (about 50 specimens) gathered for various years by T.G. Mauer, E.V. Permyakova, M.D. Zalessky, and G.M. Zalessky or at the Paleontological Institute of the Russian Academy of Sciences (PIN) (about 200 specimens) collected by V.G. Novokshonov in 1989–2000. All the collections give a stupendous insight about the richness and high variety of insects just from the Early Permian in the Cisurals.
Interactions between plants and insects evidenced by nibbled and cuspate margins, trench marks, obliterated surfaces, blotch marks, holes or egg pouches and irregularly distributed oviposition marks of egg-laying are also frequent.

Early Permian Insects from Matvéevo (Ural)

Psocoptera (booklouse) *Parapsocidium uralicum*

Some common insects are represented by the Psocoptera, especially *Parapsocidium uralicum.* It was just described by G. Zalessky (1939) from Matvéevo, as well Chekarda and figured (Pl. 1, fig. 4. Figs 19, 20).



***Parapsocidium uralicum*, booklouse**

Lenght of wings 5-6 mm, corpus 4 mm, (MAT 188); Matvéevo, Early Permian, Kungurian, (Coll. Wachtler)

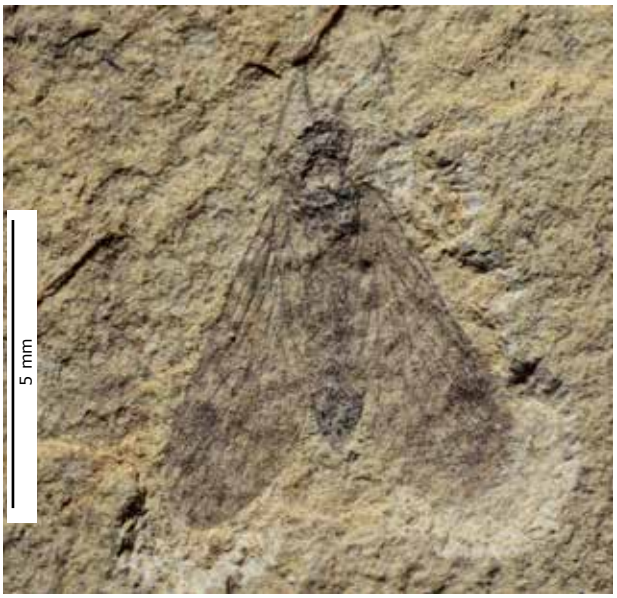
Krassilov et al., 1999, describe an interesting pollinivorous primitive booklouse *Parapsocidium uralicum* from Chekarda, with definable pollen grains in the organic gut contents. They recognized four morphotypes of pollen grains in the pollen mass filling the intestine (*Florinites luberae*, *Potonieisporites* sp., *Lunatisporites* sp., and *Protohaploxypinus perfecta* (Naumova) Samoilovich). Also on other three species belonging to Hypoperlida and Grylloblattida they found pollen grains in the gut of the insects. *Parapsocidium* has shared its foraging habitat with another pollinivorous insect, *Idelopsocus diradiatus* from the group of the Hypoperlida. It is considered as a representative of an extinct group ancestral to the booklice.

Hemiptera (true bugs) *Maueria pusillus*

The family of Maueriidae was first classified by Georges Zalessky in 1939 from Chekarda and other near lying localities, subdividing it in *Maueria pusillus, Maueria rhyncota* and *Maueria intermedia*. Some of these can also be regarded as synonymous. They are small-sized, with body a length of 5–6 mm, and a forewing length of 5–6 mm.
The oldest Hemiptera, the Archescytinidae, are first recorded from the Artinskian, being rare in that time, but becoming abundant in the Kungurian of the Urals. Their different positions of the rostrum base are comparable to those of cicadas, and in *Maueria* of true bugs, and built in that an example of archaic diversity within a primitive group (Shcherbakov & Popov, 2002). The origin of Archescytinina (and therefore of the Hemiptera as a whole) can be connected to the expansion of the angiosperm-groups and the flattened nymphal habitus (dissimilar to adult) was possibly acquired for living between the flowers.

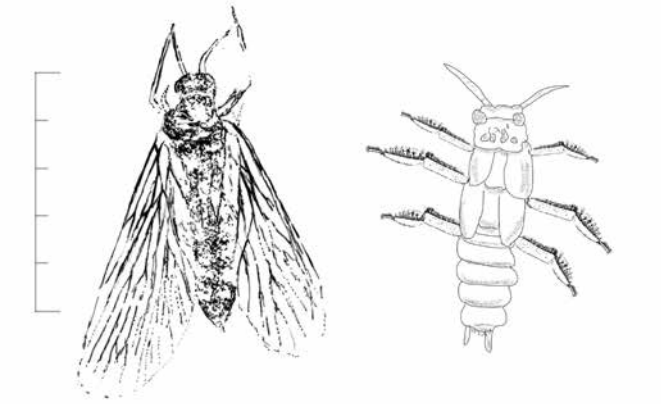
Plecoptera (stoneflies) *Uralonympha varica*

The stoneflies are believed to be one of the most primitive groups of Neoptera, with relatives beginning from the Carboniferous over the Early Permian. Some insects from Matvéevo can be inserted in the family of the Plecoptera. In the Kungurian of the Perm krai, stoneflie-remains are not seldom. Zalessky described in 1939 a part of a nymphe (Pl. 1, fig 5, p. 64, fig. 45). Today the presence of Plecoptera in a stream or still water

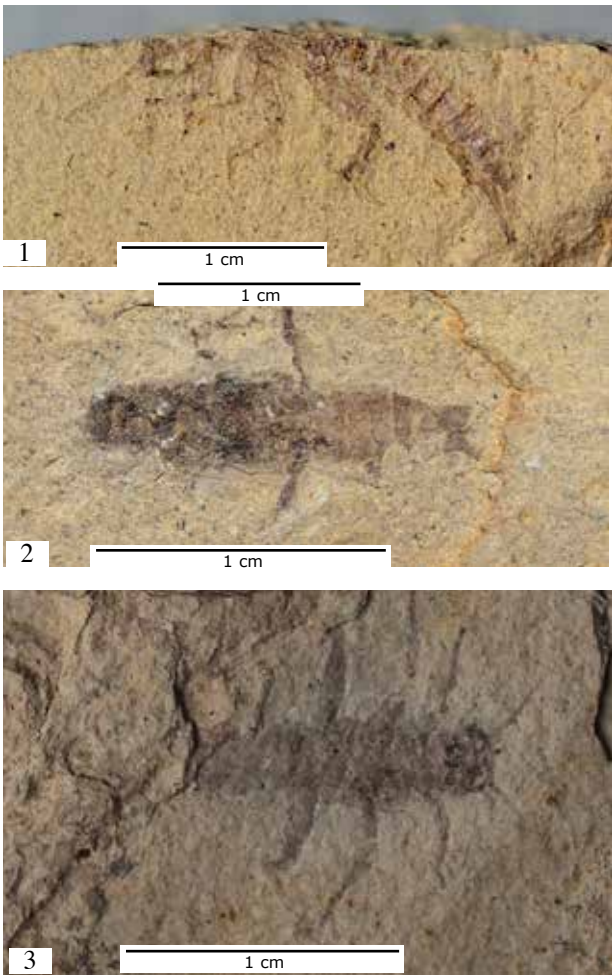


***Maueria pusillus*, Hemiptera, true bugs**

Lenght of wings 5-6 mm, corpus 4 mm, Matvéevo, Early Permian, Kungurian, (Coll. Dammann)



Maueria pusillus (left) (Drawing Dammann) and *Uralonympha varica* (right). Reconstructions



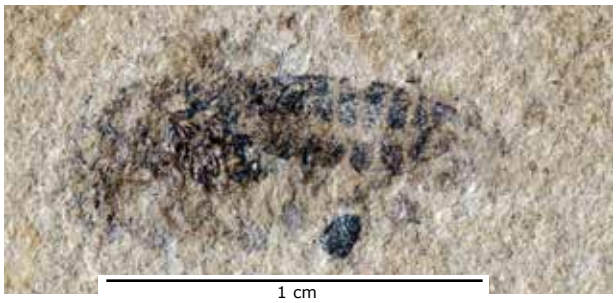
***Uralonympha varica*, stoneflies**

1. Lateral view, body length 20 mm, (MAT 454); 2. Overview, body length 14 mm, (MAT 453); (both Coll. Gerasch); 3. Overview, body length 12 mm,); All Matvéevo, Early Permian, Kungurian, (Coll. Dammann)

is usually an indicator of good water quality. The insects remain in the nymphal form for one to four years, before emerging and becoming terrestrial as adults. Therefore, in these Early Permian deposits the amount of fossilised nymphs is generally higher than other insects. Before becoming adults, the nymphs will leave the water, attach to a fixed surface and molt one last time. Adult stoneflies only survive for a few weeks. The Plecoptera have some specialized features compared to other insects like simple mouthparts with chewing mandibles, long, multiple-segmented antennae, large compound eyes, and two or three ocelli. The legs are robust, with each ending in two claws.

Pterygota (winged insect) *Cavalarva caudata*

Aristov and Rasnitsyn (2015) described a complete moulting case of insect larva from Chekarda with a body length of 9 mm, which can be regarded as synonymous with those found at Matvéevo. *Cavalarva* can be inserted in the order of the Holometabola within the Neoptera that go through distinctive larval, pupal, and adult stages. They are the most diverse insect superorders, with about 850,000 living species containing the butterflies, flies, fleas, bees, ants, and beetles. The insect larva is campodeiform, with distinct hypognathous head bearing antennae with short and thick scape and pedicel and thin, elongate flagellum, and possibly with compound eyes. Thoracic segments distinctly wider than head and abdomen, of sub-



***Cavalarva caudata*, Neoptera, winged insect**

Complete lenght 8 mm, (MAT 33); Matvéevo, Early Permian, Kungurian, (Coll. Wachtler)

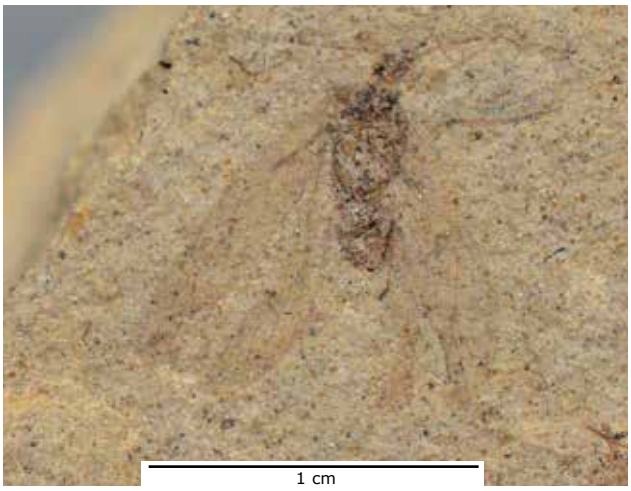
***Euryptilon blattoides*. Grylloblattodea. Ice crawlers**

Complete length 30 mm, (MAT 189; Matvéevo, Early Permian, Kungurian, (Coll. Wachtler)

equal size and sclerotization, bearing short four segmented legs with paired claws and lacking wing pads. Abdomen straight, moderately elongate, gradually narrowing rearward, with seven visible segments showing no free pleural sclerites, with no appendages preserved other than two long and very thin, apparently mult-segmented caudal threads. Similar abdominal appendages are known in some beetle larvae (Aristov & Rasnitsyn, 2015).

Protohymenoptera *Permopsyllopsis maueriaeformis*

Permopsyllopsis belongs to the Archescytinidae and was first described by G. M. Zalessky in 1939 from a specimen found in



***Permopsyllopsis maueriaeformis*. Hymenoptera**

Body length 3 mm, (MAT 452; Matvéevo, Early Permian, Kungurian, (Coll. Gerasch)

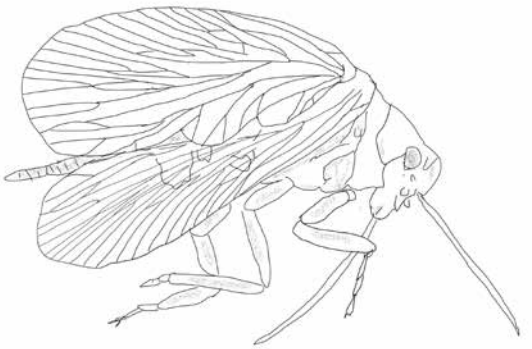
Chekarda. Probably they can be regarded as ancestors of the highly interesting pollinator-group of Hymenoptera, today comprising the sawflies, wasps, bees, and ants.

Miomoptera - Palaeomanteidae *Sellardsiopsis conspicua*

Sellardsiopsis conspicua was first described by Zalessky (1939), whereas Martynov (1940) introduced after another insect-species *Palaeomantisca lata* from Chekarda, regarded as synonymous. He considered the Palaeomantidae as the type family of the Miomoptera belonging to the superorder Acercaria. The systematic positions of the extinct insect orders Hypoperlida, Miomoptera and Permopsocida are enigmatic but they can be regarded as stem group of Condylognatha to which today belong the Hemiptera or true bugs, like the Cicadidae or the Psocodea (Psocoptera).

Blattoidea (cockroaches) Rachimentomon reticulatum

G. M. Zalessky (1939) described *Rachimentomon reticulatum* (pl. II and III, Figs. 1,2 and Fig. 23) and R. affine (Fig. 38) mainly from Chekarda, introducing in the Protoblattoidea the new family of Rachimentomonidae. Fossil Blattoidea are just known from the Carboniferous, when they apparently constituted a large part of the insect fauna. Today they contain the coackroaches as well the termites.



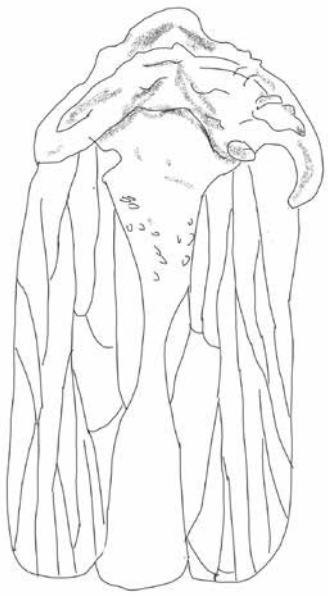
***Sellardsiopsis conspicua*. Miomoptera, Palaeomantidae**

Body length 20 mm, Interesting is the pollen-content in the stomach (MAT 181; Matvéevo, Early Permian, Kungurian, (Coll. Wachtler)

Rachimentomon reticulatum is flattened dorsolaterally and is roughly oval. The head is covered with a shield-like plate, the pronotum is bent, with the mouth opening down. The antennae are multisegmented. The forewings are leathery and the hind wings membranous. The coxae of the legs are flattened to enable the femurs to fit neatly against them when folded. The ovipositor is entirely merged into the body.

Grylloblattodea (Ice crawlers) Euryptilon blattoides

Andrey V. Martynov (1940) inserted the genus Euryptilon into the Grylloblattida. The rising of this group coincides with the Permian, although they just appeared in the Upper Carboniferous. The diversity increased during the Kungurian, in which the order's growth reaches its highest point (Aristov, 2004). *Euryptilon blattoides* represents the most common species. The pronotum is wide and flat, with oval projections on the sides. The legs resemble the cockroaches. The forewings are wide.



***Rachimentomon reticulatum*, Blattodea. cockroaches**

Complete lenght 18 mm, (MAT 184); Matvéevo, Early Permian, Kungurian, (Coll. Wachtler)

Systematic Paleontology

Class Insecta
Order Orthoptera

Genus *Angaroptera* nov. gen. n. sp. WACHTLER 2017

Etymology

A typical insect of the Early Permian Angara-continent.

Angaroptera nicolaswachtleri n. sp. WACHTLER 2017

Type horizon and age

Ural, Early Permian, Kungurian (272.3–283.5 Mya)

Holotype

MAT 190 Coll. Wachtler, Dolomythos Museum, Innichen

Etymology

Honouring Nicolas Wachtler who researched at Matvéevo and found the first specimen.

Diagnosis

Moderate sized insect with strong body and slender limbs. The antennae are delicate, as well the cerci.

Description

Insect body about 4.0 cm long in the middle 1.0 cm width. Antennae filiform about 1 cm long, cerci of equal length, 1.0 cm, to burrow forwards as well as backwards. Head 0.4 cm, thorax 1.0 cm, abdomen about 2.0 cm, segmented. Elytra are half the length of the abdomen; the short wings are transparent. Probably it was flightless.

Discussion

Early Permian *Angaroptera nicolaswachtleri* has strong resemblances with modern Gryllidae, in the insect family Orthoptera to which belong the grasshoppers, locusts and crickets. The Gryllidae are divided into two main groups, the Ensifera (crickets) and the Caelifera (grasshoppers). Ensiferans are distinguished from Caeliferans by their elongated, threadlike antennae. The Gryllidae have mainly cylindrical bodies, and long antennae. The abdomen ends in a pair of long spikes. The hind legs have enlarged femora. Today's largest Gryllidae members are the bull crickets, *Brachytrupes*, which are up to 5 cm long, in that *Angaroptera nicolaswachtleri,* with its 3.5 cm was just huge. Fossil Ensifera are found from the late Carboniferous period and the true crickets, Gryllidae, as seen with *Angaroptera nicolaswachtleri* from the Early Permian. Some affinities indicate also in direction of the Anisoptera, and that *Angaroptera nicolaswachtleri* represent a dragonfly nymph. Also, today they can reach a length of 5-6 cm. Dragonflies undergo incomplete metamorphosis. Their life cycle includes three stages – egg, nymph and adult. All dragonfly nymphs are predators. They mostly occur in still waters, but can be found in slow flowing parts of rivers and streams as well. Characteristic feature of all the nymphs of order Odonata is their extendable lower lip. This consists of two connected parts and a pair of labial palps. Palps end with thorns, which are used to grab the prey. Odonate nymphs generally have long bodies, large heads with large eyes, and long, slender legs.

But bringing in connection the two possibilities it seems that *Angaroptera nicolaswachtleri* nevertheless can be inserted with some caution in the group of Gryllidae. The odonates have a long, extendible mouthpart they keep folded up under their heads. This specialized mouthpart allows the nymphs to hunt effectively. But this specialized mouthpart cannot seen in *Angaroptera nicolaswachtleri.* In Matvéevo *Angaroptera nicolaswachtleri* seems to be somewhat frequent, maybe this can also depend that in the mud digging animals, also like *Permomatveevia perneri,* a scorpion, have more possibilities to get fossilised.

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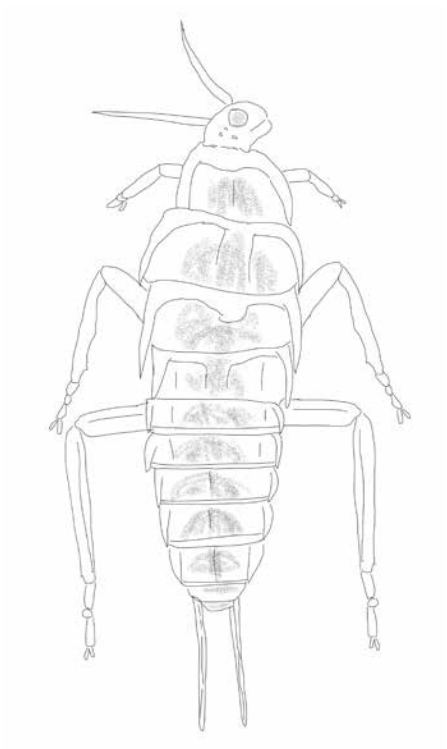
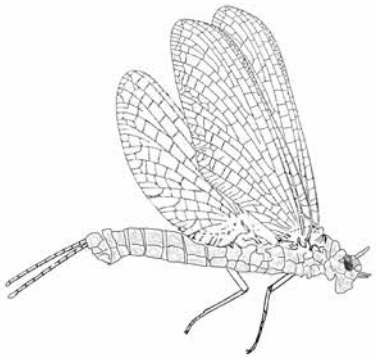
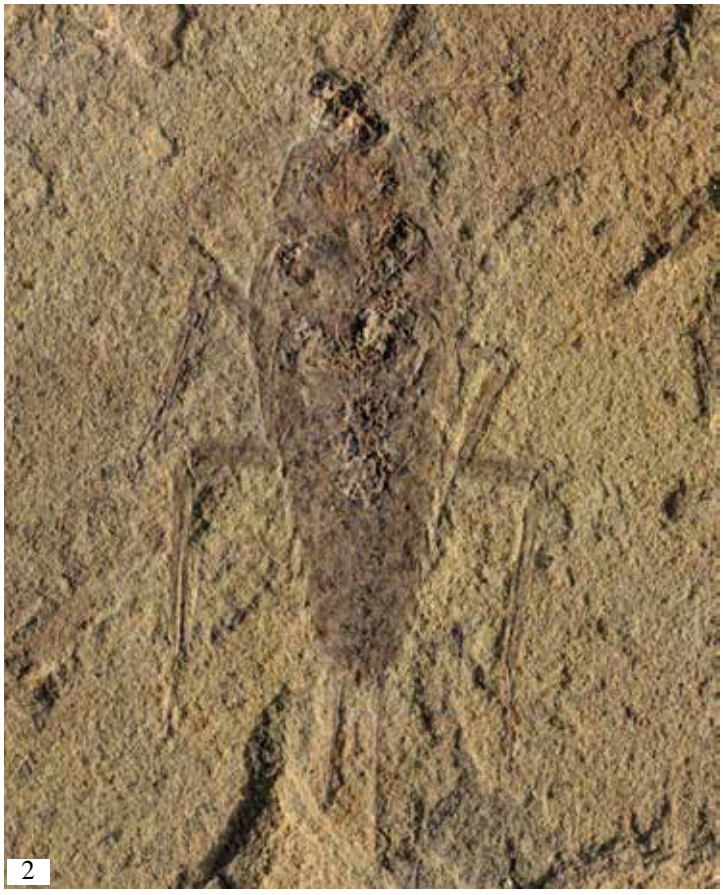




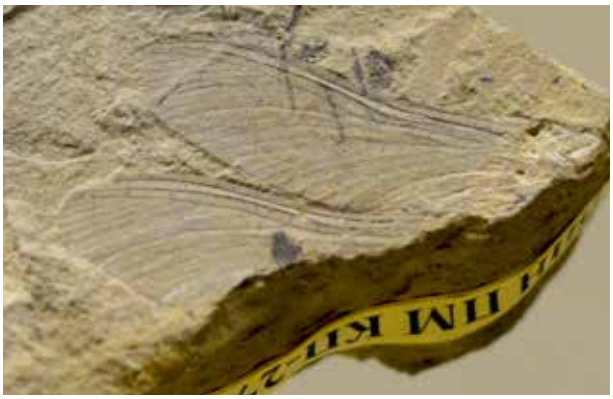
(*Misthodotes sharovi*; (Mayfly); Matvéevo (MAT 183); (Coll. Wachtler) (Early Permian, Kungu-rian,



***Angaroptera nicolaswachtleri* nov. gen. n. sp. Wachtler, 2017**

Designed holotype MAT 190, plate and counterplate, Reconstruction. Matvéevo, Early Permian, Kungurian, Coll. Wachtler Dolomythos Museum

Early Permian insects from Chekarda(Ural)



Paradunbaria pectinata

Palaeodictyoptera - Spilapteridae

Reference: A. G. Sharov and N. D. Sinitshenkova. 1977. New Palaeodictyoptera from the USSR. Paleontological Journal 11(1):44-59; Winged insect

Measurements (in mm): Body length 25.0, forewing 22.0 x 7.0, hindwing 23.0 x 9.0, PIN 1700/358 Paleontological Institute of the Russian Academy of Sciences

Arctotypus sylvaensis

Meganisoptera - Meganeuridae

Reference: A. V. Martynov. 1940. Permian fossil insects from Chekarda. Akademiya Nauk SSSR, Trudy Paleontologicheskogo Instituta 11:1-63

Type specimen: PIN 118/121, an exoskeleton (head & Thorax fragments with two fore & hind wing bases).

Measurements (in mm): hindwing 105.0 x 22.8

Sylvacoleus sharovi

Coleoptera - Tshekardocoleidae (Beetle)

Reference: A. G. Ponomarenko. 1963. Paleozoyskie zhuki Cupididea evropeyskoy chasti SSSR. Paleontologicheskii Zhurnal 1963(1):70-85

Sister taxa: Avocoleus, Dictyocoleus, Moravocoleus, Sylvacoleodes, Tshekardocoleus, Uralocoleus, Retelytron, Eocoleus, Boscoleus, Umoricoleus, Prosperocoleus, Votocoleus

Early Permian insects from Chekarda(Ural)

Sylviodes perloides

Reculida - Sylvaphlebiidae

Reference: A. V. Martynov. 1940. Permian fossil insects from Chekarda. Akademiya Nauk SSSR, Trudy Paleontologicheskogo Instituta 11:1-63

Type specimen: PIN 118/62, an exoskeleton. Average measurements (in mm): body length 25.0, forewing length 22.8, hindwing length 23.0, pronotum length 2.80

Orthoptera

Undefined insect.

Courtesy: Perm museum of local lore

Tcholmanvissia longipes

Orthoptera

Type genus: Tcholmanvissia Zalessky, M.D., 1929; priority for family-group names based on Tcholmanvissia dates from Tcholmanvissioidea Zalessky, G.M., 1934 Synonyms: Metoedischia longipes – Martynov 1940, p. 35, Fig. 36 (original description). Pinegia longipes – Sharov 1962, p. 148, Fig. 390 (

Type specimen PIN 34/118; other examined material: specimens PIN 1700/1488, PIN 1452/5, PIN 1700/1531, PIN 1700/1454 and PIN 1700/1483, Palaeontological Institute, Russian Academy of Sciences (Moscow).

Culiciforma formosa

Reculida - Lemmatophoridae

Reference: D. S. Aristov. 2004. The Fauna of Grylloblattid Insects (Grylloblattida) of the Lower Permian Locality of Tshekarda. Paleontological Journal 38:S80-S145

Courtesy: Permian Period Museum

Early Permian (Kungurian) insects from Chekarda(Ural)

Petromantis sylvaensis

Mecoptera - Permochoristidae (Scorponfly)

Alternative combinations: Mesochorista sylvaensis, Permochorista sylvaensis

Reference: A. V. Martynov. 1940. Permian fossil insects from Chekarda. Akademiya Nauk SSSR, Trudy Paleontologicheskogo Instituta 11:1-63

Average measurements (in mm): wing 5.10 x 2.25

Paratillyardembia sepicolorata

Cnemidolestodea - Protembiidae

Reference: D. S. Aristov. 2000. New insects of the order Grylloblattida (Insecta) from the Lower Permian of the middle Urals. Paleontological Journal 34:519-521

Average measurements (in mm): body length 8.60

Uralelytron insignis

Protelytroptera - Bardocoleidae

Alternative combination: Bardocoleus insignis

Reference: G. M. Zalessky. 1947. O dvukh novykh Permskikh zhukakh. Doklady Akademii Nauk SSSR 56:

Type specimen: Its type locality is Barda Locality, Krutaya Katushka (Zalessky collection)

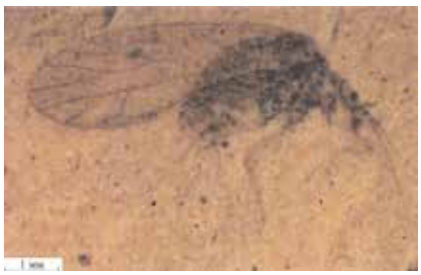
Average measurements (in mm): body length 10.5, elytron 7.20 x 2.50

Parasialis rozhkovi

Megaloptera - Parasialidae

Reference: V. G. Novokshonov. 1993. New insects (Insecta) from the Lower Permian of Chekarda (central Urals). Paleontological Journal 27(1A)

Average measurements (in mm): body length 9.80, forewing 8.00 x 2.70



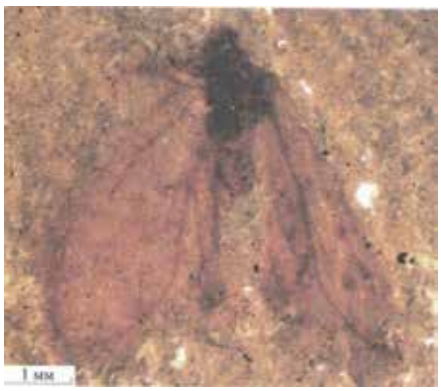
Parapsocidium uralicum

Permopsocida - Psocidiidae

Synonym: Dichentomum uralicum

Reference: G. Zalessky. 1937. Ancestors of Some Groups of the Present-day Insects. Nature

Average measurements (in mm): body length 3.00, forewing length 4.00



Tschekardus hispidus

Thripida

Reference: V. N. Vishnyakova. 1981. Novye Paleozojskie i Mezozojskie lofionevridy (Thripida, Lophioneuridae). Akademiya Nauk SSSR, Trudy Paleontologicheskogo Instituta 183:43-63

Average measurements (in mm): body length 2.50, forewing 4.00 x 1.60

Permonikia aestiva

Miomoptera - Palaeomanteidae

Alternative combination: Palaeomantis aestiva

Reference: V. G. Novokshonov. 2000. New Palaeomanteida=Miomoptera from the Lower Permian of Tshekarda. Paleontological Journal 34(Suppl 3):S 303-S 308

Average measurements (in mm): forewing length 9.50

Glossopterum martynovae

Glosselytrodea - Glosselytridae

Full reference: V. G. Novokshonov. 1998. New insects (Insecta: Hypoperlida, Mischopterida, Jurinida) from the Lower Permian of the Middle Urals. Paleontological Journal 32:46-53

Average measurements (in mm): forewing length 6.30

Tshekarcephalus bigladipotens

Dicondylia - Tshekarcephalidae

Reference: V. G. Novokshonov and A. P. Rasnitsyn. 2000. A new enigmatic group of insects (Psocidea, Tshekarcephalidae) from Tshekarda (Lower Permian of the middle Urals). Paleontological Journal 34

Average measurements (in mm): forewing length 6.30

Early Permian (Kungurian) insects from Chekarda(Ural)

Sylvonympha tshekardensis

Grylloblattida (Ice crawler)

Reference: V. G. Novokshonov and N. N. Pan'kov. 1999. A new aquatic insect larva (Plecopteroidea) from the Lower Permian of the Urals. Neues Jahrbuch für Geologie und Paläontologie, Monatshefte 1999(4):193-198

Type specimen: PU N 1/7, a nymph (Imprint of larva).

Average measurements (in mm): body length 14.5

Permuralia maculata

Diaphanopterodea - Parelmoidae

Alternative combination: Uralia maculata

Reference: J. Kukalová-Peck and N. D. Sinichenkova. 1992. The wing venation and systematics of Lower Permian Diaphanopterodea from the Ural Mountains, Russia (Insecta: Paleoptera). Canadian Journal of Zoology 70

Average measurements (in mm): body length 17.0, forewing length 14.3, hindwing length 12.5

Tshekardoperla depicta

Slecoptera - Tshekardoperlidae (Stone Fly)

Reference: N. D. Sinitshenkova. 1987. Istopicheskoe razvitie vesiyanok. Akademiya Nauk SSSR, Trudy Paleontologicheskogo Instituta 221:1-142

Type specimen: PIN 1700/1263, a nymph.

Tillyardembia antennaeplana

Cnemidolestodea - Tillyardembiidae

Synonyms: Permocapnia brevipes Martynov 1940, Tillyardembia biarmica Zalessky 1937, Tillyardembia minuta Zalessky 1950

Reference: G. Zalessky. 1937. Ancestors of Some Groups of the Present-day Insects. Nature 140:847-848

Average measurements (in mm): body length 12.7, forewing 11.5 x 3.5, wing 8.83 x 3.40

Arachnophasma scurra

Phasmatodea - Permophasmatidae (stick insect)

Reference: D. S. Aristov and A. P. Rasnitsyn. 2015. New insects from the Kungurian of Tshekarda fossil site in Permian territory of Russia. Russian Entomological Journal 24:17-35

Type specimen: PIN 1700/3349, a nymph.

Permomatveevia perneri nov. gen. n. sp., an Early Permian scorpion from Russian Angara-Land

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Abstract
A new Early Permian Scorpion *Permomatveevia perneri* nov. gen. n. sp., from the Kungurian of Ural/Russia with cuticle preservation, long extremities, straight pedipalpal claws and strong granulation on carapace and lower mesosoma will be described.

Online: December 2017
Key words: Insects, Scorpions, Permian

Systematic Paleontology

Phylum Insecta
Class Arachnida
Order Scorpiones Koch, 1837

Genus Permomatveevia nov. gen. n. sp. DAMMANN 2017

Etymology

After the Permian period and Matvéevo, the locality where it was discovered first.

Diagnosis

Large wingless insect with robust bended abdomen and long legs.

Permomatveevia perneri n. sp. DAMMANN 2017

Type horizon and age

Ural, Early Permian, Kungurian (272.3–283.5 Mya)

Holotype

MAT 122 (Dammann Collection, Senckenberg Forschungsgesellschaft, Frankfurt)

Etymology

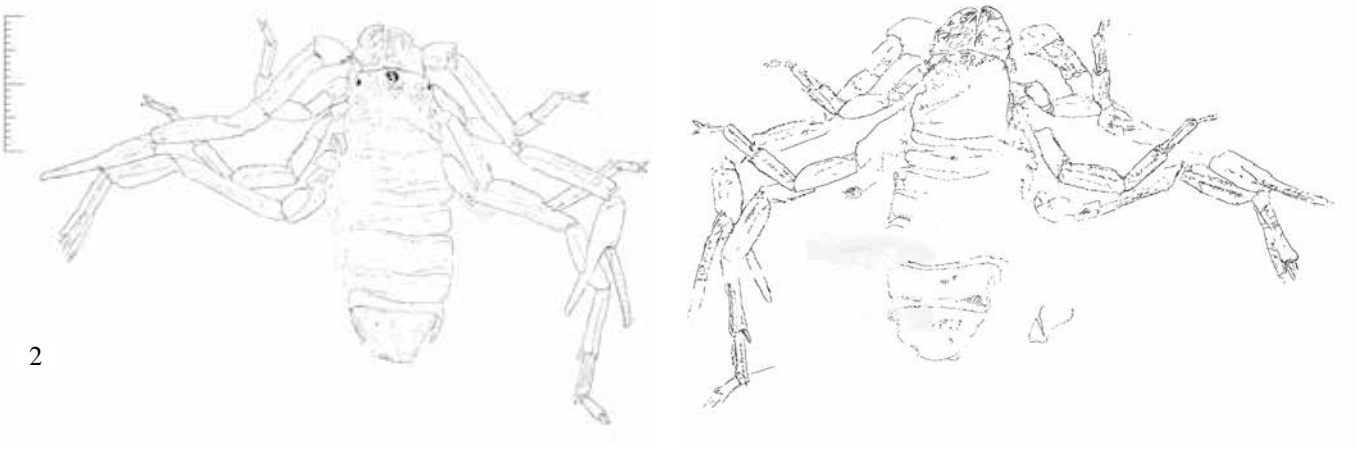
Honouring the German researcher Thomas Perner, author of several scientific publications.

Diagnosis

An early Permian (Kungurian) Scorpion with strong pedipalps, a massive, segmented body and very long posterior legs. Pedipalpal claws are straight; carapace and final segment of the mesosoma strongly granulated. It displays no clear evidence of a 4th pair of legs.

Description

The specimen is from Matvéevo. It is preserved in the positive and negative slab which both show almost the entire specimen. The body is visible in dorsal view, yet, as extremities and chelicera are preserved as imprint, both dorsal and ventral views of the latter are visible. Some cuticle fragments of the extremities as well as large parts of the dorsal body cuticle are preserved, split to both slabs. The overall (visible) body length is 50 mm, its overall width 16mm. The specimen displays an averagely broad, robust body with very long extremities. Especially the posterior legs appear enormous in relation to the (visible) body length. Only three pairs of legs are visible as well a pair of long, straight and modestly robust pedipalpal claws.
The carapace is quadrate. A strong pair of chelicera is visible. 2 median eyes close to the central anterior margin of the carapace, 2 lateral eyes are at the anterior margins of the carapace. The carapace displays strong granulation. The pedipalpal claws are long, straight and robust, mediocrely inflated. The femur displays a distinct line of carinae medially as well as a second more fragmented line parallel and anteriorly, to a lesser extend also the patella. The legs increase in size from the anterior to the posterior pairs (overall length from femur to tarsal claws: 2,7 to 4,8 cm). Patellae inflated. All legs display a distinct line of carinae on the femur, patella, tibia and basitarsus. Only the patel-



***Permomatveevia perneri*, nov. gen. n. sp. DAMMANN, 2017**

1. Designed holotype MAT 122. 2. Reconstruction of the real body-conservation, plate and counter-plate; 3. Detail of the pecine, singular chemosensory organs of the scorpions. Matvéevo, Early Permian, Kungurian, (Collection and drawing Martin Dammann)

la of the anterior extremities shows hardly any evidence of carinae.
Only three leg pairs are visually discernible with all pairs bearing identical proportions to a counterpart. So presumably the six visible legs constitute three complete pairs. A trochanter and fragments of a fourth pair of extremities might be visible on the left side of the body between the anterior and medial (visible) extremities.
A fragment of a pectine is visible below the femur of the right posterior leg, a small, lengthily oval structure of about 5 mm length, best visible as imprint on the negative slab. An area with similarly modest granulation is also visible on the opposite femur.
The mesosoma consists of seven slightly convex segments and forms about two-thirds of the overall body length. The posterior segment is by far the largest and displays a prominent embossment and strong granulation. The segments become gradually smaller thinner towards the carapace. There is no clear evidence of a metasoma, yet the double S-shaped posterior margins of the last segment point towards the existence of a tail, as well a faint imprint on the negative slab which might be trace of a tergum. Further scrutiny might reveal more evidence.

Discussion

Permomatveevia perneri constitutes the largest-sized insect yet found of the Early Permian Kungurian layers. Though being exceptionally complete and preserved in very fine sediments the fossil displays no clear evidence of a fourth pair of legs nor a metasoma. The absence of a fourth pair of legs would put the specimen at odds with the basic arachnid outline. To think of an animal that meets most characteristics of scorpions but fails to possess the most basic arachnid character of four pairs of legs seems very unlikely. There is evidence of a trochanter that cannot be attributed with certainty to one of the six visible extremities and cuticle fragments around the left posterior femur might not all belong to the posterior left leg. Also, a possible imprint over the anterior part of the mesosoma is visible. The apparent gap between the medium and posterior pair of legs leaves enough space for the attachment of a fourth pair and thus would bring the specimen back into the basic arachnid scheme.
Hints provided for a missing metasoma are the double S-shaped end of the mesosoma, the proportion of the posterior legs and a possible imprint of two tergite segments on the negative slab. The bulbous embossment of the posterior last segment of the mesosoma remains unexplained.
All visible characters (size, proportion of the posterior legs, number of segments of the mesosoma, carinae, pectines) are at odds with Pseudoscorpions or any arachnid species other than the Scorpiones so that the fossil despite missing the 4th pair of legs and the metasoma is assigned to the Scorpiones.
It displays significant differences to upper Carboniferous scorpions such as *Eoscorpius* and *Paraisobuthus* through the large straight predipalpal claws and the architecture of the carapace, especially the form of the embossment of the median eyes.
The scorpion fossil record dates back to the Middle Silurian, about 430 mya, being in that time probably aquatic. The first land-living scorpions are encountered in the Early Carboniferous. Fossilised species we have also in Early Cretaceous Crato Formation (Martill et al., 2007). Today scorpions are distributed throughout the warmer regions, but can be found in environments ranging from rainforests to deserts.

References

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