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New Beetles from the Permian of European Russia

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Abstract—New data on body structures or tshekardocoleids and permocupedids are given. *Uralocoleus ultimus* sp. nov. (Tshekardocoleidae) is described from the Lower Kazanian locality of Soyana in Arkhangelsk Region. This is the first record of this family in the Upper Permian.

INTRODUCTION

The most ancient Permian coleopterans are still poorly known, and every find of their representatives, especially rather complete remains, is worth detailed study and description as it may influence our knowledge about the structure of the oldest beetles. The distribution of the Permian beetles in the north-eastern part of European Russia is sporadic. However, this sporadicity is likely to be significant. Beetle remains rarely, (eight findings for 8000 insects totally found according to Ponomareva *et al.* (1998)), but rather constantly appear in the Kungurian (Iren' Formation) localities of Cis-Urals. All of them belong to the family Tshekardocoleidae. Their occurrence here is considerably low compared to the older (Artinskian) locality of Obora, Moravia. The number of beetles in the Upper Permian beds is at least ten times more judging from the data on the Kuznetsk Basin and Kazanian of European Russia. Meanwhile, there are not any beetles known from the Ufimian of either Pechora Basin and Cis-Urals. In the Kazanian of European Russia beetles are rather rare, several times less common than in the contemporary beds of Kuznetsk Basin. In the latter the quota of beetles rises 100 times towards the end of the Upper Permian whereas in European Russia it is nearly the same even in the Tatarian, Additionally, the paleosuccession of the beetles in the Kuznetsk Basin seems to be evolutionary, the succeeding assemblages appear to be well separated and successive, related forms characterized by more and more derived elytra enter into the record. The situation with Late Permian beetles of European Russia is quite different. There is a unique elytron belonging to the beetle of the family Tshekardocoleidae found in the Lower Kazanian locality of Soyana. All other Kazanian and Early Tatarian beetles are more or less similar evolutionary. Nearly all of them belong to the family Permocupedidae, mainly to the genera *Kaltanicupes* and endemic *Permocupes.* On balance, judging from the coleopteran fauna, the western Sub-Angaraland does not represent an ecotone but an independent zoogeographical unit specifically inhabited and having its own history different from that of Angaraland.

The second major reason for the study of this material was the finding of two rather complete tshekardocoleids by Novokshonov in the famous locality of Tshekarda. Although these individuals belong to previously described species, their study is very important. Bodies of these beetles are rarely fossilized, all known remains are incomplete and poorly preserved, so the new finds deserve investigation. Some features of tshekardocoleids, e.g. their 13-segmented antennae and the structure of the prothorax, are so unusual in beetles (Recent and Mesozoic beetles have usually 11-segmented antennae) that they appear doubtful. However, the antennae are clearly visible on the impressions discussed below. The situation is complicated by the cockroach family Umenocoleidae and related forms which have elytra strikingly similar to those of tshekardocoleids. It is not possible to determine whether a specimen belongs to beetles or cockroaches unless the body is investigated for cryptosterny. Thus, the specimen described as a representative of the peculiar beetle family Labradorocoleidae (Ponomarenko, 1969) may actually be a cockroach. On the other hand, *Umenocoleus* itself was originally described as a beetle (Chen and T'an, 1973), and only the study of the hind wings in

Explanation of Plate 7

Fig. 1. *Uralocoleus ultimus* sp. nov. holotype PIN. no. 3353/1055, x6. 6i.

Fig. 2. *Tsherkardocoleus magnus* Rohdendorf. 1944. specimen PU. no. 2/323: (2a) part. (2b) counterpart, x5, (2c) head and prothorax. X I5.

Fig. 3. *Sylvacoleus richteri* Ponomarenko. 1963, specimen PU. no. 2/326. x6.. 1.

Figs. 4-6. *Permocupes sojanensis* Ponomarenko, 1963: (4) specimen PIN. no. 3553/1111, (5) specimen PIN, no. 3353/1074. (6) specimen PIN, no. 3553/554.

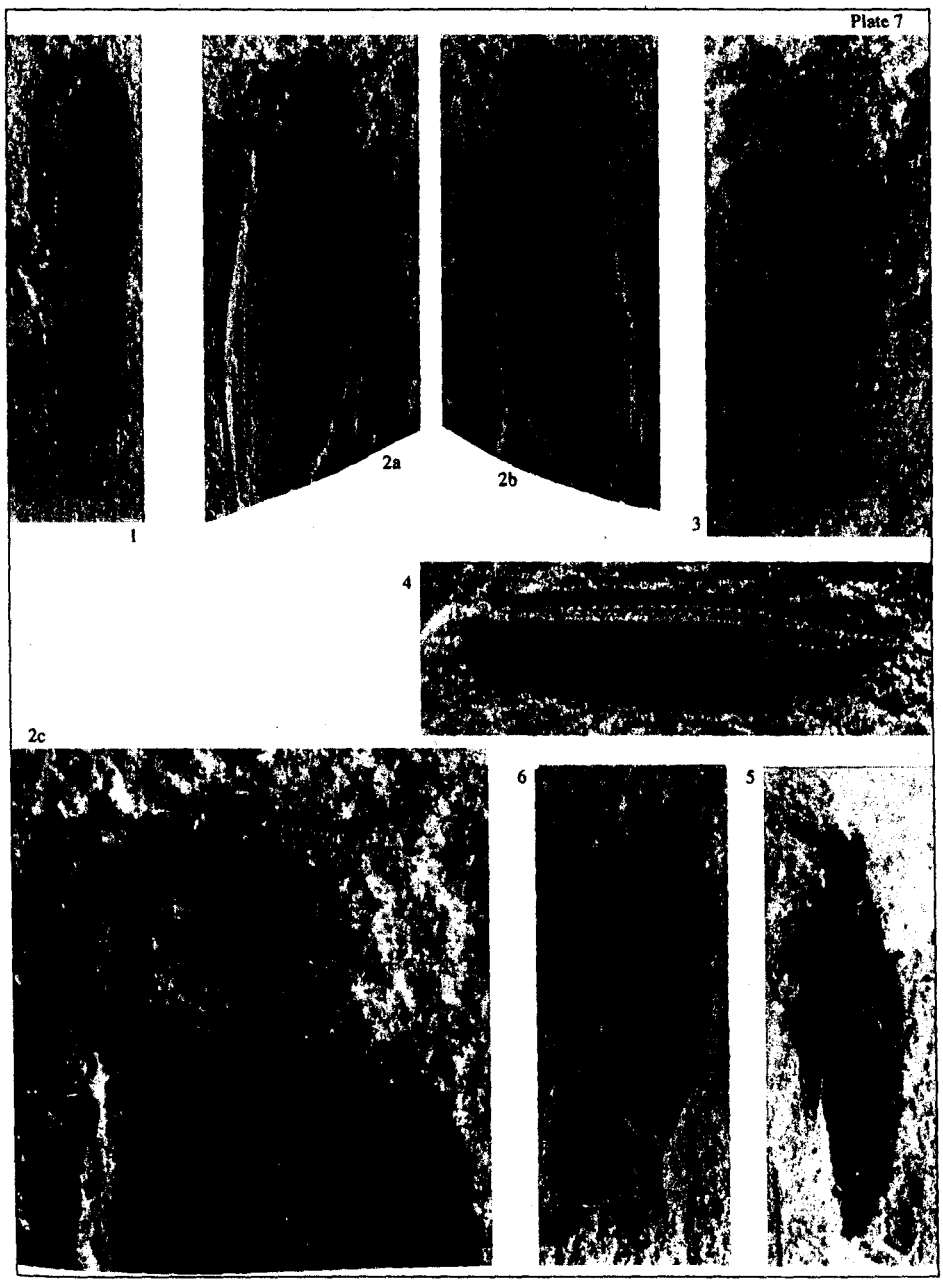
Plate 7
1
2a
2b
3
4
2c
6
5

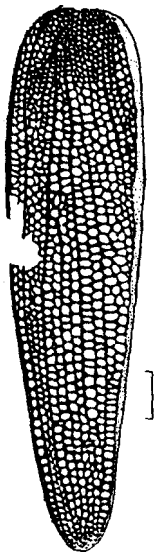

Fig. 1. *Uralocoleus ultimus* sp. nov., holotype PIN, no. 3353/1055. Scale bars in all ligures 1 mm.

completely preserved fossils proved its position within the cockroaches.

The investigated material, including the types, is housed in the collections of Paleontological Institute (PIN) and Perm State University (PU).

SYSTEMATIC PALEONTOLOGY

Family Tshekardocoleidae Rohdendorf, 1944

The first Late Permian representative of the family is described below, and stratigraphical range of Tshekardocoleidae extends to the Lower Kazanian. It is noteworthy that the last records of insect orders close to palaeodictyopterans are known from the Lower Kazanian as well unless the Mongolian locality of Bor-Tol-goi yielding palaeodictyopterans is more recent. Interestingly, the disappearance of both tshekardocoleids and palaeodictyopteran insects dietetically connected with ligneous plants occur against a background of essentially unchanged vegetation (Esaulova, 1986).

Genus *Uralocoleus G.* Zalessky, 1947

The only species of the genus was described from the Kungurian based on an isolated poorly preserved elytron. Re-examination of the holotype did not result in comprehensive description, only the main veins of the elytron were traced (Ponomarenko, 1963). The newly described elytron well agrees with the incomplete generic diagnosis, although some doubts in the generic placement still remain because of insufficiently known details of the type species. The enhanced diagnosis is not proposed here to avoid attributing the features of the Kazanian species to the whole genus.

Uralocoleus ultimus Ponomarenko, sp. nov.

Plate 7. fig. 1

Etymology. From Latin *ultimus* (last).

Holotype. PIN, no. 3353/1055, counterpart of left elytron; Arkhangelsk Region, the Letopala River, tributary of the Soyana River, Soyana locality; Upper Permian, Lower Kazanian.

Description (Fig. 1). The elytron is elongate, 4 times as long as broad, narrowed beyond the basal third, its apex is rounded and not tapered. The epipleural border is not broad, has two rows of cells in the basal half with irregular cells of the third row, and one row of cells distally. The main veins well differ from the intercalary veins, the veins are much narrower than the cells. Tubercles on the veins are concentrated mainly at their junctions, the lateral part of the epicranial border and sutural border are densely tuberculate. The area in front of RS has four rows of cells in its basal quarter, three rows in the second quarter, and two such rows beyond its midlength. The fore branch of R is distinct, the hind one is weak and quickly disappears among the polygonal cells. RS has a single branch starting at the basal third of the elytron and terminating at its apex, there are two rows of cells in each of the areas. The distinct common stem M + CuA is absent, however, M is curved backwards near the basal quarter, then runs obliquely towards the apex, CuA originates among the polygonal cells at the level of M bent and has one row of cells in front of and behind, then CuA runs towards the apical third, curves distally along to the sutural margin, and has only one row of cells behind. CuP does not run to the sutural margin and disappears in polygonal cells little distal of the basal third of the elytron, there are four rows of cells in the area behind CuP at the base. 2A runs to the sutural margin near the basal third. 3A is rather long, there are two rows of cells behind of it, there are more than ten cells in a row.

Measurements (mm): elytron length, 12. elytron width, 3.

Comparison. Differs from the type species in being twice as large.

Remark. As only an isolated elytron is available this species cannot be proved to be a beetle and not; a cockroach.

Material. Holotype.

Genus *Tsherkardocoleus* Rohdendorf, 1944

Tsherkardocoleus magnus Rohdendorf, 1944

Plate 7, fig. 2

Holotype. PIN, nos. 28/I68 and 29/168, part and counterpart; Perm Region, Suksun District, outcrop at

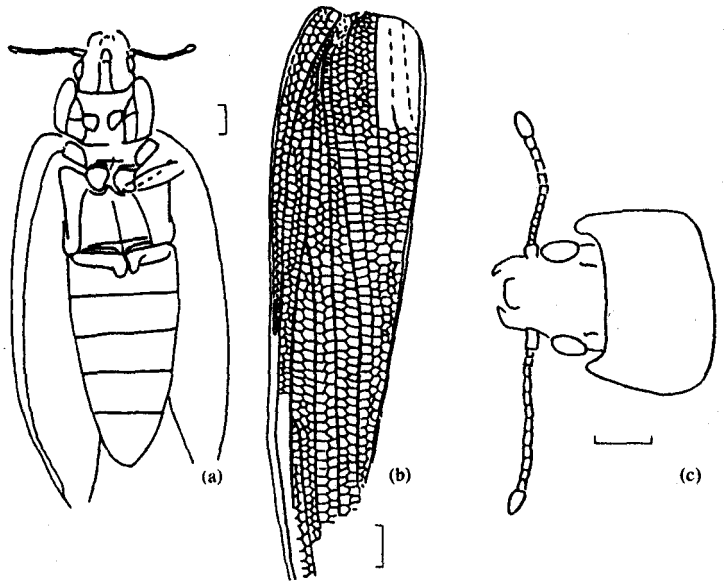

Fig. 2. Ts*herkardocoleus magnus* Rohdendorf. 1944.. specimen PU. no. 2/323: (a) general appearance viewed from below, (b) partial reconstruction or elytron: (c) head and pronotum viewed from above.

the left bank of the Sylva River near the village of Tshekarda; Lower Permian, Kungurian, Koshelevka Formation.

Description (Fig. 2). This is the largest representative of the family and one of the largest Permian beetles. The body is sub cylindrical, elongate, 2. 5 times as long as broad. The head is small, its length is sub-equal to its width. The eyes are large, much larger than cheeks and temples, shifted to the upper side of the head so the eye apodemes are ring-like. The parietal part of the head has two longitudinal elevations and tubercles over the hind part of eyes. The antennae are filiform, consist of 13 segments, with beaded apical segments, the first segment is much larger, the distal segments are larger than the basal ones, the last segment is enlarged. The pronotum is transverse, 1. 8 times as broad as long, narrowed frontally, widest in its hind third, rounded laterally. The disc of the pronotum is strongly elevated over the lateral parts. The paranotalia are wide, angled frontally. The prothorax is longer than the fore coxae. The fore coxae are closed, rounded, slightly transverse, the prosternai process between them is narrow, much narrower than the fore coxae, the fore femora project over the sides of the pronotum. The scutellum is small, triangular. The mesothorax is rather large, bearing the paracoxal suture and large external trochantines. The mesepisterna and mesepimerons reach the forecoxal cavities. The metathorax is small, its length is sub equal to its hind margin. The length of the fore margin of the metathorax does not exceed that of the metepisternum. The paracoxal and trochantinal sutures are distinct, the longitudinal suture is hardly visible. The length of the hind coxae is sub equal to their width at the fore margin. The first and the last external sternites of the abdomen are 1. 3 times as long as others, the abdomen is narrowed from the base of the penultimate sternite. The legs are short, the middle and hind femora do not project the body contour. The elytra (Fig. 2b) are elongate, originally 4.5 times as long as broad, an isolated elytron with expanded frontal areas should be broader, the elytra project over the abdomen tip for its quarter. The basal branch of RS starts little proximal of the elytron mid length, the distal branch starts in the apical third, there are two rows of cells behind of both branches. M obliquely runs towards the rear margin of the elytron in the apical quarter, there is one row of cells behind it in the basal quarter, and CuA is less defined here. CuA obliquely runs towards the sutural margin and weakly curved along it, there is one row of broad cells behind it. CuP obliquely runs to the rear margin near the mid length of the elytron. There are four rows of cell behind of CuP at the base of the

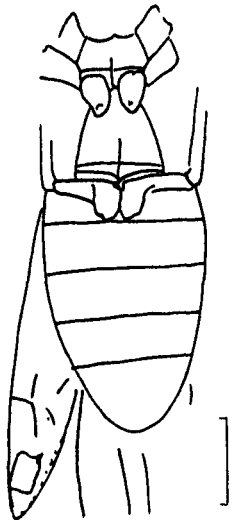

Fig. 3. *Permocupes sojanensis* Ponomarenko, 1963, specimen PIN, no. 3353/554.

elytron and two rows distally. A1 is indistinct. The veins of the wing are thin, notably thinner than is usual in beetles of comparable size.

Measurements (mm): body length (to the tip of abdomen), IS, body width, 6, length of elytron remain, 13, complete elytron length, approx. 15.

Remarks. This species was known from an incomplete specimen. The new find is more complete and allows investigation of the structures of the head, antennae, thorax, and abdomen. Some of the areas of the elytra are better preserved as well. As usual for complete beetle fossil, the structure of the areas before RS is obscure because these areas were compressed after burial. The description above is based on the features preserved in both the holotype and newly found specimen. However, the areas behind RS are unavailable in the holotype, and their original description is wrong.

Material. Holotype and the specimen PU, no. 2/323 from the type locality.

Genus *Sylvacoleus* Ponomarenko, 1963
***Sylvacoleus richteri* Ponomarenko, 1963**

Plate 7. fig. 5

This species was known from an isolated elytron. The newly found specimen allocated to this species is more complete, and based on visible features including such important features as the structure of the head and pronotum appears to be identical to S. *sharovi* Ponomarenko, 1963. Further finds will possibly demonstrate differences between these species to be individual variability. It will result in synonymy. The new specimen shows significant feature separating it from the types of both species, i.e., CuA is poorly expressed and M, on the contrary, is better defined so the specimen in question resembles representatives of the genus *Sylvacoleodes* Ponomarenko, 1969. However, such a difference may be explained taphonomically.

Family Permocupedidae Martynov, 1933
Genus *Permocupes* Martynov, 1933
Permocupes sojanensis Ponomarenko, 1963

Plate 7, figs. 4-6

Three specimens belonging to this family have been found in the Lower Kazanian locality of Soyana in addition to those described by Sharov in 1972. They are shown to be *P. sojanensis,* previously described (Ponomarenko, 1963). These remains are worthy of description, although this is the most common species in the oryctocenosis and possibly the most abundant of Permian beetles. One specimen is represented by well preserved elytron (Pl. 7, fig. 4), the second one is an elytron that has been fossilized preserving its natural convexity (Pl. 7, fig. 5), and, finally, the third one (Fig. 3, Pl. 7, fig. 6) is represented by the meso- and metathorax, abdomen, and a part of the folded wing. The latter is the first fossil of a permocupedid preserved in such a condition. It cannot be referred to *P. sojanensis* with certainty as far as it is associated with other remains based only on its size. However, such an assumption seems to be quite reasonable because of frequent occurrence of this species.

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