New genus of Ignotalidae (Cicadomorpha) with notes on other Homoptera from the Permian and Triassic of the Tunguska Basin

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ABSTRACT. *Ilimpeika humerosa* gen. et sp. n. from the Upper Permian of the Tunguska Basin is the first representative of the family Ignotalidae (known from South Africa and South China) in the northern extratropical zone. *Megoniella* Riek, 1973 = *Perissovenia* Riek, 1976, syn.n.; *M. multinerva* Riek, 1973 = *P. heidiae* Riek, 1976. Syn.n. Brief notes are given on other finds of Homoptera in the Permian and Triassic of the Tunguska Basin.

РЕЗЮМЕ. *Ilimpeika humerosa* gen. et sp. n. из верхней перми Тунгусского бассейна – первый представитель семейства Ignotalidae (известного из ЮАР и Южного Китая) в северной внетропической зоне. *Megoniella* Riek, 1973 = *Perissovenia* Riek, 1976, syn.n.; *M. multinerva* Riek, 1973 = *P. heidiae* Riek, 1976, syn.n. Кратко охарактеризованы семейства равнокрылых, отмеченные в перми и триасе Тунгусского бассейна.

The large polyneurous cicada wings from the Upper Permian of South Africa, separated into the family Ignotalidae and the superfamily Ignotaloidea, were considered to support the view that Homoptera descended from Protobatoidae [Riek, 1973]. Later, this family was included in Pereborioidae, and three genera from the Upper Permian of China [Lin, 1982] were added [Shcherbakov, 1984, 2000]. The Triassic genus *Beacovicula* Evans, 1963, included in Ignotalidae by Riek [1973], was transferred to another pereborioid family, Curvicubitidae [Shcherbakov, 1996, 2021]. Extreme polymerization of veins in some pereborioids was accompanied by the loss of such basic features of the Hemipteraforewing as the fusion of Sc with R (except for the base and apex) and distal fusion of claval veins [Shcherbakov, 2021]. However, the earliest members of the superfamily (such as Middle Permian *Scytophara* Martynov, 1937; Pereboriidae) confirm that the group originated from typical early Cicadomorpha, namely from Prosobolopseidae [Shcherbakov, 1984].

In the second half of the 20th century, geological and paleontological parties collected a significant number of fossil insects from the Permian and Triassic of the Tunguska Basin in Central Siberia, but only a small part of this material has been described. A new genus of Ignotalidae from the Upper Permian of the Tunguska Basin is established below, and brief notes are given on other Homoptera families known from these strata.

The material is deposited at the Borissiak Paleontological Institute, Russian Academy of Sciences, Moscow (PIN). Photographs were taken with a Nikon D70 digital camera. The vein nomenclature is after Scherbakov [1984, 1996].

Superfamily Pereborioidea M.Zaleskyy, 1930
Family Ignotalidae Riek, 1973

REVISED DIAGNOSIS. Moderately to very large, extremely polyneurous cicadas. Tegmen: Costal margin strongly convex at least proximally, area anterior to Sc wide. Sc free or distally connected with RA, with weak prenodal branches. Basal cell reduced. Membrane without punctures or granules. Hind wing: Costal margin strongly convex at base, nearly straight distally, with series of coupling hooks. R stem short and oblique; R with several, M with few, and CuA with many branches in bundle.

COMPOSITION. *Ignotala* Riek, 1973; *Megoniella* Riek, 1973 (= *Perissovenia* Riek, 1976, syn.n.); *Rhipiscytina* Lin, 1982; *Fureacysina* Lin, 1982; *Scopiprobole* Lin, 1982; *Ilimpeika* Shcherbakov, gen.n.

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REMARKS. Perissovena heidiae Riek, 1976, based on a hind wing from the Upper Permian of South Africa, has been assigned with some reservations to the family Pereboriidae (known from Russia and Brazil) with a note that it could possibly be the hind wing of Megoniella multinerva Riek, 1973 [Riek, 1976]. This hind wing is similar to that of Ilimeika gen.n., so the synonymy suggested by E.F. Riek is confirmed: Megoniella multinerva Riek, 1973 (= Perissovena heidiae Riek, 1976, syn.n.).

Ilimeika Shcherbakov, gen.n.

TYPE SPECIES. I. humerosa Shcherbakov, sp.n.

DIAGNOSIS. Large cicadas. Tegmen: Costal margin arched over most of its length. Broad area anterior to Sc with very low ridge along midline (C and its continuation) separating precostal and costal areas of subequal width. Sc free, not fused with R medially, prenodal branches sparse. M forked distal to R, forming short stalk with CuA near base; CuA stem convex. RP and MA forked more basally than CuA. Veins in prenodal part much less distinct and close-set than subparallel branches connected with strong crossveins in postnodal part. Hind wing: RP and M forked about wing midlength.

COMPOSITION. Type species.

COMPARISON. Similar to the monotypic Late Permian Ignotala Riek, 1973 from Natal in the large size, the wide precostal area separated by a low ridge, and close-set upparched veins with distinct crossveins in the postnodal part of the tegmen, but the latter genus has the tegmen twice larger with Sc and R connected distally, M forked before R and not forming a short stalk with CuA, and the hind wing with M forked more distally.

ETYMOLOGY. From Ilimeika River (type locality); gender feminine.

Ilimeika humerosa Shcherbakov, sp.n.

Figs 1–4

MATERIAL. Holotype PIN 2099/2, incomplete right tegmen (clavus missing) on reddish burnt carbonaceous siltstone; paratype PIN 2099/1, left hind wing (anal area missing) on orange burnt siltstone; Krasnoyarsk Krai, Evenkiysky District, right bank of the Ilimeika River 3.3 km downstream of the Uksun(n)ukan River, collected by N.I. Emelyanov (All-Union Aerogeological Trust) in 1962; locality Ilimeika, or Red Cliff (Красный утёс) [Meyen, 1966], or Uksunukan-2 (outcrop 716 of G.N. Sadovnikov); 62.25°N, 105.29°E; Degali Formation [Meyen, 1966], Upper Permian.

DESCRIPTION. Tegmen 47 mm long and 19 mm wide as preserved (estimated full length ca. 60 mm), elongate. Prenodal Sc branches weak, not branched profusely and not turned longitudinally towards wing margin. RA apparently with at least 4 branches, RP with about 6, M and CuA with about 10 branches each. Distinct crossveins only in postnodal part (except for one nodal r-m), numerous, slightly inclined distally, more close-set in CuA area. Hind wing 35 mm long and 22 mm wide as preserved, much shorter than tegmen. Costal margin strongly arched at base, with about ten strong coupling hooks. R stem short and oblique, RA with 3 main branches, RP with 6 branches, M with 3 or 4, CuA with bundle of at least 13 branches. Colour pattern on wings not preserved.

REMARKS. The locality was listed among those with the Korvunchana flora of possible Early Triassic age (and the formation was mentioned as the Limptekon Formation) [Shcherbakov, 2000; Ponomarenko, Shcherbakov, 2004; Ponomarenko, 2006], but in fact it is rich in cordaites, belongs to the Degali Formation s.str. (lower subformation of the former Degali Formation s.l.) and is undoubtedly Late Permian [Meyen, 1966].

ETYMOLOGY. From Latin humerus (shoulder).
Discussion

In the Tunguska Basin, Homoptera fossils have been recorded from coal-bearing deposits with cordaitale flora and from intertrappean beds with the so-called Korvunchana flora. In the Upper (and possibly uppermost Middle) Permian of the Pelyatka and Degali Formations, the families Prosbolidae (Prosboleida), Parebrioidea and Ignotalidae (Parebrioroidea), Stenoviidae and Paraknightiidae (Scytinopteroidea) are found. It is noteworthy that no Homoptera have been recorded in the older deposits of the Tunguska Basin. Scytinopteroidea, which presumably lived on helophytes and other waterside vegetation, numerically dominate in some localities, e.g. the insect assemblage of the Kerbo-1 locality (Gagarin Ostrov Formation) almost entirely consists of numerous nymphs and few adults of one Paraknightiidae species [Shcherbakov, 2000].

Intertrappean beds with the florals rich in lycopods or conifers and ferns are usually considered Lower Triassic (see Mogucheva [2016]), although there is increasing evidence that at least the lower of these formations lie below the Permian–Triassic boundary (PTB) of the International Stratigraphic Scale. Insect fossils have been found in intertrappean beds of the Bugarkita, Nidym and Kochechumo Formations, which are all Lower Triassic after the regional stratigraphic scheme [Saks et al., 1981] or all Upper Permian after Sadovnikov [2015], but may turn out to be so-called “boundary beds” with the PTB between the Bugarkita and Nidym formations (see Shcherbakov et al. [2021]).

Moderately diverse Dysmorphoptilidae (Prosboleida) are common in the Bugarkita Formation (localities Anakit and Khungtukun). One of these dorsomphylodels is Unturella truncata Shcherbakov, 2022, described from several tegmina from the Khungtukun-2 and Untuun-2 localities, the latter locality being currently assigned to the Kochechumo Formation (Agitkan Sequence) [Shcherbakov, 2022], so this species probably crossed the PTB. The most basal homopterans, Archescytinidae (Paleorrhyncha), known since the Early Triassic (see Mogucheva [2016]), but may turn out to be so-called “boundary beds” with the PTB between the Bugarkita and Nidym formations (see Shcherbakov et al. [2021]).

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