

PART II

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1. Introduction

Until very recently, fossil insects were practically unknown in Israel. Before publication by Dobruskina *et al.* (1997), the only insect fossil has been figured in a paper on fossil plants (Lorch, 1965, fig. 13). Dobruskina *et al.* (1997) have recorded and figured 6 fossil insects and provided species level description of two of them, including the one figured by Lorch (*Samsonileon medievalis* Ponomarenko, 1997, see below). Three more belonging to cockroaches have been later described by Vršanský (2004 b).

The Israel fossils come from two stratigraphic levels identified as the Lower and Upper Cretaceous (Chapter 4). The first assemblage from the Hauterivian - Barremian Tayasir volcanites in Shomron, North Israel, comprises *Cretosperchus medievalis* Ponomarenko, 1997 (Coleoptera: Hydrophilidae), *Gondwablatta abrahami* Vršanský, 2004 (Blattodea: Mesoblattinidae), and a poorly preserved dragonfly nymph (Odonata: Anisoptera).

The main insect assemblage comes from the Ora Formation in southern Negev (South Israel). The findings were made in the Gerofit locality by J. Lorch and his students in early 1960s (antlion *Samsonileon medievalis* Ponomarenko, 1997, Neuroptera: Myrmeleontidae, and cockroach *Turoniblattea israelica* Vršanský, 2004, Mesoblattinidae), followed by I.A. Dobruskina and A.P. Rasnitsyn in 1995 (cockroach *Nehevblattella grofitica* Vršanský, 2004, Blattellidae, an elytron possibly belonging to a diving beetle, Dytiscidae, and an unidentifiable, poorly preserved insect wing). More insects were collected in the Gerofit by V.A. Krassilov, in part jointly with A.P. Rasnitsyn, in 2003-2007, representing a cicad (Cicadellidae: ?Ledrinae indet.), two beetle elytra (*Memptus* sp., Adepaga *incertae sedis*, and Carabidae gen. sp.), a single elytron and three tegmina of roaches, and an ootheca (egg case) of a praying mantis or a roach. These are considered in more detail below. Another insect site Qetura has yielded only two beetle elytras belonging to one more species of *Memptus* and to *Echinocnemus*? sp., Curculionidae (see below).

The insect assemblage of Israel is of special interest in many aspects, such as: (1) Fossil insects are insufficiently known in the Near East and, in particular, of the critical period of their evolution in the Late Cretaceous when the major features of modern terrestrial biota have appeared. Moreover, the earlier information on the Near East insect world revealed an unexpected mixture of Gondwanan and Laurasian elements (Dobruskina *et al.*, 1997).

(2) The plate tectonic reconstructions imply that the northern front of Gondwana (including Israel) approached Laurasia during the mid-Cretaceous. The fossil insect assemblage from Israel may help testifying this hypothesis, shedding light on relations of the northern and southern biotic realms at this time.

(3) Early evolution of the specific mangrove fauna are practically unknown, with a single insect fossil recorded so far from palaeomangal environments (Sukačeva *et al.* 2006; Vršanský 2007 a). Our study of the Cretaceous insect fauna of Gerofit, where an incipient

mangrove vegetation has been inferred from paleobotanical data (Krassilov *et al.*, 2005) bears on this problem as well.

(4) And the most intriguing is the discrepancy between the advanced evolutionary aspect and the geological age of Gerofit assemblage, to be further discussed below.

The material considered is kept at the Paleontological Institute, Russian Academy of Sciences, Moscow (PIN), the Geological Museum, Institute of Earth Science, Hebrew University of Jerusalem (HU), and the Institute of Evolution, University of Haifa (IEUH).

2. Systematic description

Order Hemiptera (= Cimicida)

by A.P. Rasnitsyn

The only hemipteran fossil is found in the Gerofit locality (Pl.1, Fig. 1, 2). Because of its insufficient preservation state, it was very tentatively identified by D.E. Shcherbakov (Paleontological Institute, RAS, Moscow) as Ledrinae, a rather primitive subfamily of the advanced leafhopper family Cicadellidae. Shcherbakov (1992 and pers. com.) indicates the oldest record of Ledrinae as the Aptian (Santana Group of Brazil) and attests the extant Ledrinae as a termophilous group most abundant in the southern continents but entering the northern temperate zone as well, and feeding on tree trunks and branches rather than on leaves as majority of leafhoppers do.

The beetles. Order Coleoptera (= Scarabaeida)

by A.G. Ponomarenko

All beetle fossils encountered in Ora Formation so far represent isolated elytra, two being collected in Qetura locality, and six in Gerofit. Elytra of the post-Jurassic beetles are particularly difficult for identification: they belong to extant families but usually demonstrate deviant morphology. That is why all following considerations should be considered as preliminary.

One of the beetle fossils is the counterpart of right elytron from Gerofit of poor preservation and with part of the elytral base missing. The elytron (Pl. 2, Fig. 1) is 5.05 x 2.25 mm, the disc with 6 sharp impunctate striae meeting apically except for two external striae, adscutellar stria rather long, two adsutural striae roundly, subapically bent out of suture; setigerous pores not apparent. Striation pattern of the elytron is indicative of ground beetles (Carabidae). Similar elytra are known in majority of advanced extant subfamilies making impossible formal description of the fossil. Mesozoic carabid assemblages including the Turoanian ones (e.g., Kzyl Zhar in Kazakhstan) lack elytra of this type.

Two other fossils, one from Qetura (Pl. 2, Fig. 2) and another from Gerofit (Pl. 2, Fig. 3-4), are small smooth elytra with all available characters being indicative of the widespread Mesozoic formal genus *Memptus* Handlirsch, 1906. In all cases when *Memptus* elytra were preserved with identifiable body remains, they show characters of the suborder Adephaga and apparently belong to aquatic beetles. Unfortunately in no case these elytra were possible to be associated with a particular beetle family. Specimen from Qetura is more typical for the genus in size (elytral dimension 2.2 x 1.0 mm) and general ap-

pearance but differs from other species in a wider elytron. Specimen from Gerofit is more distinct, with elytra larger (3.9 x 1.2 mm), convex and elongate. Scutellum is also larger than usual in the genus.

One more small (5.4 x 2.2 mm), smooth elytron from Gerofit (Text-fig. 1) considered in Dobruskina et al. (1997: Pl. X, Fig. 2), was questionably attributed by shape of elytra to a diving beetle (Dytiscidae).

The fourth small elytron from Gerofit (Pl. 2, Fig. 5-6) displays characters of the extant genus *Georissus* Latreille, 1809, although it is big comparing the living species (4.7 x 2.1). *Georissus* is now considered to form a monotypic subfamily of the water beetle family Hydrophilidae Latreille, 1802. Numerous extant species of *Georissus* live on muddy coasts of various fresh water bodies. All of them are under 2 mm long. They have two distinct types of elytral morphology: the present fossil displays a somewhat intermediate structure. The present record is the earliest for the genus and subfamily (the family Hydrophilidae is much older starting from the Early Jurassic).

The fifth elytron in the Gerofit locality is very small (2.4 x 1.0 mm), smooth, and with rounded apex (Pl. 3, Fig. 1). It represents few taxonomically important characters and cannot be attributed to a particular taxon; although it is likely belong to a terrestrial beetle.

The second elytron from Qetura (Pl. 3, Fig. 2; Text-fig. 2) and the fifth one from Gerofit (Pl. 3, Fig. 3; Text-fig. 3) belong to the huge family of weevils (Curculionidae) and also represent near-water beetle that most probably developed on helophytic monocot plants. They are considered in more detail below.



Text-fig. 1. Dytiscidae indet., HU 38331, left elytron, Gerofit (x 18) (Dobruskina et al., 1997: Pl. X, Fig. 2)

Thus the most part of beetle fossils found in the Ora Beds belong to aquatic and semi-aquatic beetles, a unique feature of the present fossil assemblage. Similar to an extent are only oryctocenoses in sediments of ancient oxbow lakes in alluvial series of the Siberian coal-bearing Jurassic deposits – the environment that hardly has much in common with that of Qetura and Gerofit. Composition of the present assemblage is unexpected also in that these hydro- and hygrophilous beetles are known as connected to fresh and not salt water characteristic of mangal environment. Noteworthy is that the only insect known from the Slovakian palaeomangal is a caddisfly developing in fresh water as well (Sukačeva et al. 2006).

Besides the weevil elytra, only the georissid-like one can be reliably assigned now. Concerning elytra of diving beetles, two generic names are available applicable to the Mesozoic Dytiscidae, viz. the Jurassic through Early Cretaceous genus *Palaeodytes* Ponomarenko, 1987, and the Turonian *Cretodytes* Ponomarenko, 1977. Unfortunately, elytral morphology is unknown for the latter genus, therefore selection of one of these names is impossible for the present.

Description of the Upper Cretaceous elytra in *Memptus* does not seem logical because all species attributed to this formal genus so far come from older deposits. Almost no beetle genera cross the Early/Late Cretaceous boundary, so a formal genus extending through that boundary would look impractical. That is why these two fossils are left undescribed until more material is accumulated.

A new morphogenus (as defined by Rasnitsyn, 2006) is introduced here for the *Georissus*-like elytron from Gerofit, which differs from numerous living species of *Georissus* only in its bigger size, so a meaningful comparison with these is impossible. For the same reason, *Georissus magnus* Haupt, 1956 from the Middle Eocene of Geiseltal in Germany is transferred to the new genus as well.

Family Hydrophilidae Latreille, 1802

Subfamily Georissinae Castelnau, 1819

Morphogenus *Georissites* Ponomarenko, morphogen. nov.

N a m e. From genus *Georissus*. Gender masculine.

T y p e s p e c i e s *Georissites negev* Ponomarenko, sp. nov.

D i a g n o s i s. The formal genus is applicable to isolated fossil beetle elytra which are much convex, almost semiglobular when in pair, about twice as long as wide, with external margin much convex, with at least three external punctate striae starting there. Striae eight in number, bearing large punctures elongate longitudinally.

S p e c i e s c o n t e n t. Type species and *Georissus magnus* Haupt, 1956 from the Middle Eocene of Geiseltal.

Georissites negev Ponomarenko, sp. nov.

Pl. 2, Fig. 5-6

Name. After the Negev Desert (noun in apposition).

Holotype. PIN 5068/7; isolate right elytron; Gerofit (Pl. 2, Fig. 5-6).

Diagnosis. Differs from the only congener *G. magnus* Haupt, 1956 from the Middle Eocene of Geiseltal, Germany, in having interspaces rib-like and in larger size (*G. magnus* elytron is 2.5 mm long).

Description. Elytron 4.7 mm long, with three external punctate striae starting at outer elytral margin, six striae ending there. External stria one third as long as medial ones. Strial punctures about as long as interstitial space. Interstitial space rib-like elevated, tuberculate. Elytral apex with flattened area.

Material. Holotype.

Family Curculionidae Latreille, 1802

by V.G. Grachev

Subfamily Eirrhinae Schoenher, 1825**Genus *Echinocnemus* Schoenher, 1843***Echinocnemus qetura* Grachev, sp. nov.

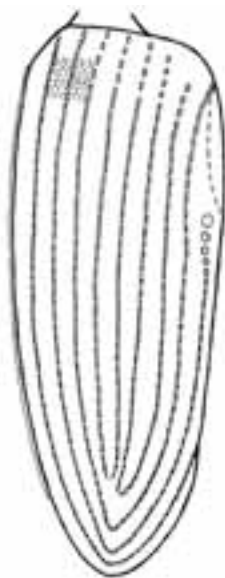
Text-fig. 2, Pl. 3, Fig. 2

Name. After locality Qetura.

Holotype. PIN 5067/2; right isolated elytron; Qetura (Text-fig. 2, Pl. 3, Fig. 2).

Diagnosis. Differs from the only known other fossil *Echinocnemus* described below in larger size, uniform coloration, narrower internals, and punctured 10th stria.

Description. Elytron 5.1 mm long, 2.0 mm wide, heavily sclerotized, densely covered with round scales, smoothly tapering from midlength to apex, 2.6 times as long as wide, entirely dark as preserved, lacking epipleura and adscutellar stria. Outer margin twisted downward between punctate striae 9 and 10, shoulder boss distinct, both preapical elevation and following depression smooth. Punctate striae thin, 10 in number, with punctures distant at least for their diameter. Intervals flat, weakly convex only beyond subapical knob, all of width subequal and about 3 times as wide as intervals. At elytral apex, stria 1 fusing with 10, 2 with 9, 3 with 8. At preapical knob, stria 4 fusing indistinctly with 5, 6 with 7. Striae 6, 7, and apparently 8 lost at shoulder boss not reaching elytral base. Striae 1-5 reaching elytral base. Stria 9 bearing enlarged punctures from elytral midlength baseward. Laterobasally in elytron, widened apical part of internal fold discernible, being weakly bent and probably long (judging from how the outer elytral margin is twisted down). Locking plate of elytral suture narrow, symmetrical, reaching at least apical quarter of elytron.



Text-fig. 2. *Echinocnemus qetura* Grachev, sp. nov., PIN 5067/2, right elytron, Qetura, line drawing (x 17).

Comments. The form and general appearance of the elytron are strongly indicative of weevils (Curculionidae), as evidenced by 10 punctate striae, presence of locking plate, and absence of both epipleuron and adscutellar stria. Structure of the internal lateral fold, shortened striae 6-8, character of subapical fusion of striae are all indicative of the subfamily Erihriniinae. Dense scale cover is characteristic of the aquatic and semiaquatic Erihriniinae and does not contradict to the above attribution of the fossil. The oldest undescribed Erihriniinae are found in the Bon Tsagan (Lower Cretaceous, probably Aptian, of Mongolia). *Echinocnemus* is not known as fossil yet.

Comparison to extant Erihriniinae has shown that the elytron under description is practically indistinguishable from those in the extant genus *Echinocnemus* Schoenher, 1843. Numerous extant representative of the genus are widespread over the Old World from tropics up to warm temperate regions, and are semiaquatic in habits, feeding on various monocots. Noteworthy is also similarity of the present fossil to some members of the tribes Stenopelmini and Bagoini which belong to the same subfamily and have similar habits. Unfortunately, there are no characters available from the fossil at hand to permit the species level comparison.

Material. Holotype.

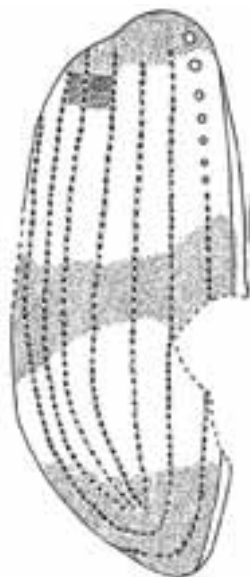
Echinocnemus gerofiticus Grachev, sp. nov.

Text-fig. 3, Pl. 3, Fig. 3

Name. After locality Gerofit.

Holotype. PIN 5067/12; right isolated elytron; Gerofit (Text-fig. 3, Pl. 3, Fig. 3).

Diagnosis. Differs from the above species in having elytron of smaller size and with colour pattern, wider intervals, and stria 10 impunctate.



Text-fig. 3. *Echinocnemus gerofit* Grachev, sp. nov., PIN 5068/12, right elytron, Qetura, line drawing (x 20)

Description. Elytron 4.5 mm long, 2.0 mm wide, heavily sclerotized, densely covered with round scales, tile-like overlaying each other, 2.6 times as long as wide, widest at its apical third, with dark base, apex, and medial oblique stripe (can be alternatively described as dark with two large pale spots). Shoulder boss distinct, both preapical elevation and following depression smooth. Punctate striae thin, 10 in number, with punctures distant at least for their diameter. Intervals flat, weakly convex only beyond subapical knob, intervals about 4 times as wide as striae, interwales 6, 7, 8, and 9 wider than others. At elytral apex, stria 1 fusing with 10, 2 with 9, 3 with 8. At preapical knob, stria 4 fusing indistinctly with 5, 6 with 7. Striae 6, 7, and 8 lost at shoulder boss not reaching elytral base. Striae 1-5 reaching elytral base. Stria 9 bearing enlarged punctures from elytral midlength baseward. Stria 10 thinner than others and lacking punctures.

Comments. Similarity of the present fossil with *E. qetura* sp. nov. in all important characters justifies its attribution to the same genus.

Material. Holotype.

The antlions etc. Order Neuroptera

by A.G. Ponomarenko

Samsonileon medievalis Ponomarenko, 1997 (Text-fig. 4; Dobruskina et al., 1997: 93, Text-fig. 4, Pl. II, Fig. 1) belongs to the extinct antlion family Paleoleontidae whose typical representatives are known otherwise from near the mid-Cretaceous boundary of Labrador (North

America) and the Cretaceous/Paleogene boundary of Kuznetsk Basin (southern Siberia), while the questionable representatives are collected at various stratigraphic levels of the Lower Cretaceous in the eastern Asia (Transbaikalia, Mongolia) and Brazil (l.c.). Cretaceous antlions were most abundant and diverse in the Gondwana tropic zone (Santana, Brazil), and extant Myrmeleontoidea prefer warmer climate as well. However, the known distribution of Paleoleontidae gives no direct indication of their thermophily.

Cockroaches and mantises.

Orders Blattodea (= Blattida) and Mantodea (= Mantida)

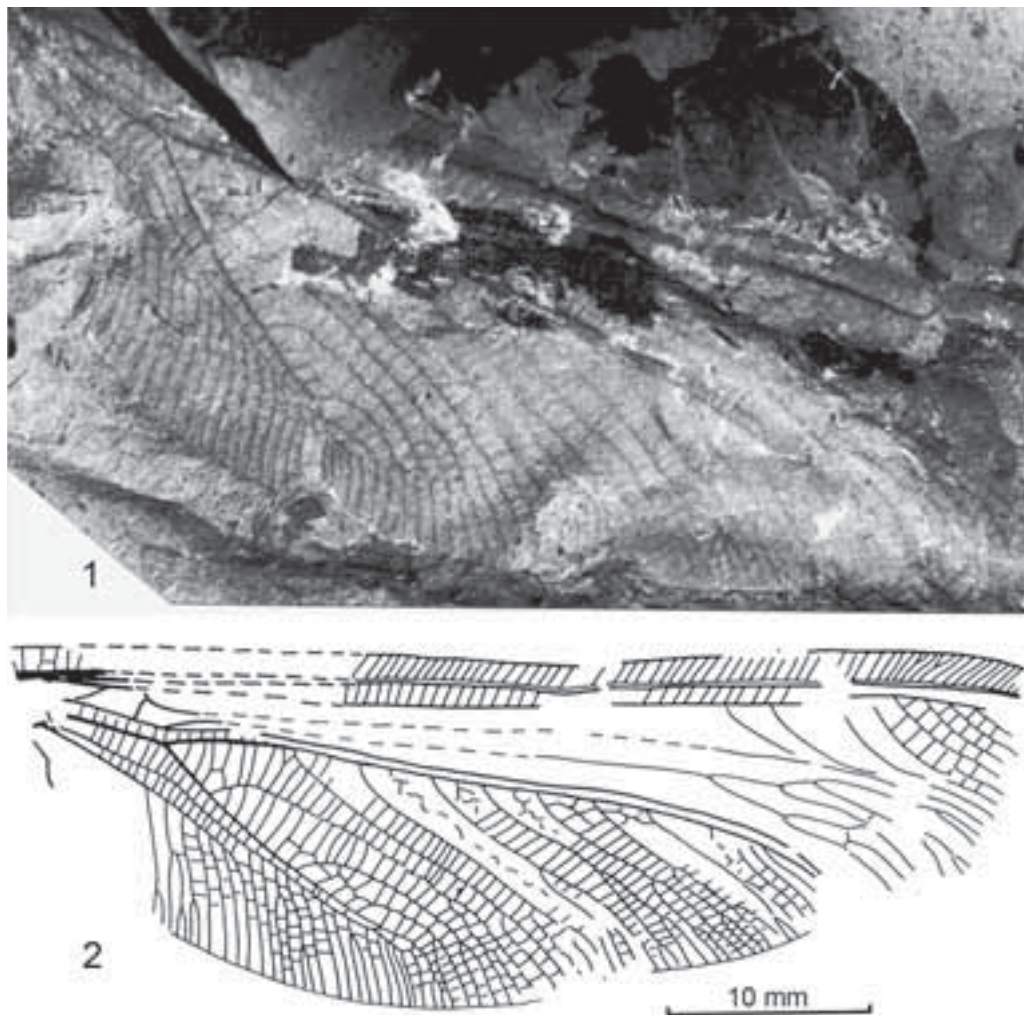
by L.N. Anisyutkin, A.P. Rasnitsyn, P. Vršanský

Cockroaches are found in the locality Gerofit. Two of them are already described (Vršanský, 2004 b).

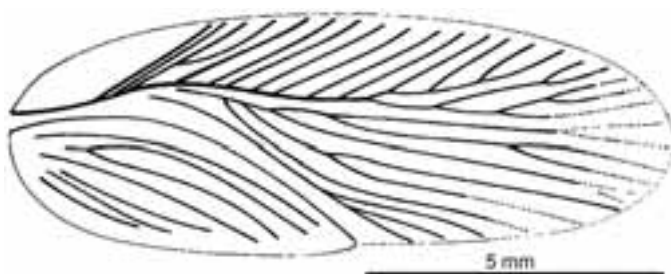
Nehevblattella Vršanský (Vršanský, 2004 b, p. 52) is an indigenous, monotypic genus advanced in the extant family Blattellidae, a widespread group known since the Early Cretaceous and embracing, among others, the common German cockroach. *N. grofitica* Vršanský (Vršanský, 2004 b, p. 52, fig. 2, 7) is known from nowhere but Gerofit yet (Text-fig. 5, Pl. 3, Fig. 4). One of the authors (Vršanský, l. c.) indicated an undescribed genus in the Santana fossil assemblage (the Aptian Crato Member or Formation, Santana Group, in Ceara State of Brazil) as the closest relative of *Nehevblattella*. At the same time, the following features of tegmina as the densely distributed posteriormost branches of R, CuA reduced to terminally branched single vein, and the long clavus are the character unknown in any Mesozoic taxa and closely remind the living genus *Parcoblatta* Hebard, 1917, e. g., the female of *P. pennsylvanica* (De Geer, 1773) from the North America. *Parcoblatta* is a rather archaic member of the Blattellidae (although diverged only after *Euphyllodromia* Shelford, 1908), but its deep sexual dimorphism is a phylogenetic novelty unknown in the Mesozoic (Vršanský, 2003 a), even though some Palaeozoic roaches were deeply dimorphic.

Another roach in the Gerofit assemblage (Text-fig. 6, Pl. 3, Fig. 5) also represents an indigenous, monotypic genus *Turoniblatia* Vršanský (Vršanský, 2004 b, p. 52). *T. israelica* Vršanský (Vršanský, 2004 b, p. 52, figs. 3, 8) belongs to the Mesoblattinidae s.str. (Vršanský, 2000). This new concept of the family restricts the latter to a few genera close to the previously misinterpreted type of *Mesoblattina* Geinitz, 1880, *M. protypa* Geinitz, 1880; while the vast majority of the former Mesoblattinidae are now considered as Caloblattinidae Vršanský et Ansorge in Vršanský, 2000 (Vršanský, Ansorge, 2007). Mesoblattinidae s.str. is a rather advanced group of Mesozoic cockroaches possibly representing only a subfamily within Blattidae. Like *Nehevblattella*, *T. israelica* displays advanced characters unknown in the Mesozoic and shown by some living roaches, viz. irregular Sc and base of R, expanded R which overlaps the whole apex (probably including much of M, like in males of the above mentioned *Parcoblatta*), and unusually rich CuA.

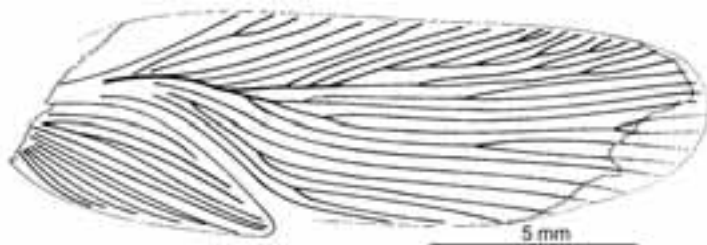
The next four fossils are still less expectable for the Mesozoic deposits, three of them being virtually indistinguishable by wing venation from the extant genera and hardly separable even from some advanced living species.



Text-fig. 4. *Samsonileon medievalis* Ponomarenko, 1997, HU 38330, Gerofit. 1 – holotype, 2 – same, line drawing (x 3.2) (Dobruskina et al., 1997: Pl. X, Fig. 1).



Text-fig. 5. *Nehevblattella grofitica* Vršanský, 2004, HU 38333, Gerofit (Vršanský, P. 2004 b, fig. 7)



Text-fig. 6. *Turoniblatta israelica* Vršanský, 2004, HU 38332, Gerofit (Vršanský, P. 2004 b, fig. 8)

Family Blaberidae Brunner von Wattenwyl, 1865
Subfamily Epilamprinae Brunner von Wattenwyl, 1865

Genus *Paratropes* Serville, 1839

Paratropes fossilis Vršanský et Anisyutkin, sp.nov.

Text-fig. 7, Pl. 4, Fig. 1

N a m e is the Latin for fossil.

H o l o t y p e. PIN 5068/10; isolate right tegmen; Gerofit (Text-fig. 7, Pl. 4, Fig. 1).

D i a g n o s i s. R not fused with M and CuA terminally. Anal venation complete, veins branched. Total number of veins at the margin about 60. Forewing length about 24 mm.

D e s c r i p t i o n. Wing shape with fore and hind margins almost straight except basally, approaching toward obliquely truncated apex. Venation regular. Costal space wide, Sc thick, with comb of branches rounded near base and directed obliquely to wing fore margin, and with one almost straight proximal branch. R free (partially separated from M and Cu), short, differentiated into R1 and RS, with about 25 more or less straight veins at the margin, the basalmost vein richly branched. Free part of M poorly branched, with 6 more or less straight branches; CuA rich, with about 16 veins at margin. Basalmost three branches of CuA separated. CuP sharply curved, reaching about one third of wing. Anal veins present in the whole clavus, A branched, with 11 veins at the margin. Total number of veins at the margin about 60. Forewing length about 24 mm.

C o m p a r i s o n. Except for R not fused with M and CuA which is a strong plesiomorphy (a partial separation of these branches is retained on a single studied exemplar of living *Paratropes* sp. as a subobsolete proximal parts of R, M and CuA), new species is a typical representative of the genus. *Paratropes* is unique within Blattaria in the shape of the forewing which is the widest at the level of distal clavus and with the fore and hind margins near straight, approaching to the obliquely truncated apex; in the wide costal area with Sc branches ascending and rounded basally; and in the last branches of CuA which are separated and running parallel to caudal margin of tegmen (the latter character is less distinct in the present species comparing the living *Paratropes*, that is, probably a plesiomorphy). Characteristic of the genus is also the sharply curved CuP. Except for the above-mentioned difference, the new species

looks similar with living species, e. g., *P. phalerata* Erichson, 1848 from Columbia. Size is essentially the same (tegmen length 24 mm vs. 23 mm in *P. phalerata*; cf. Rehn, 1951: fig. 44), but the forewing is probably without coloration. *P. elegans* (Burmeister, 1838) may reach the same size as well, but its venation is insufficiently known.

C o m m e n t s . The living representatives of the genus are pictured, diurnal, characteristic of tropical forests in the South and Central America.

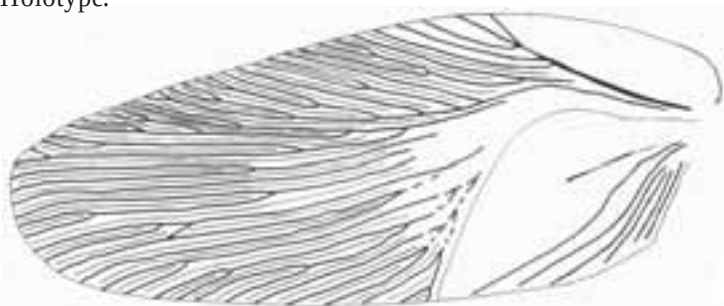
Paratropes was placed in Epilamprinae by Brunner von Wattenwyl (1865) and Rehn (1951). According to Maekawa et al. (2003), Epilamprinae is one of terminal taxa within Blaberidae which diverged only after Panchlorinae, Blaberinae, Perisphaerinae and also Oxyhaloinae. This appears to happen later in the Tertiary. In contrast, Roth (2003) and Princis (1960, 1967, 1971) have placed *Paratropes* within Nyctiborinae (Blattellidae). A placement of *Paratropes* into the ancestral Blattellidae indicates early diversification of the lineage leading to the genus. Our unpublished observations infer a kind of intermediate decision, viz., the basal position of Epilamprinae within Blaberidae. Moreover, the new species along with some undescribed Blaberidae fossils from the earliest Tertiary (Early Danian) of the Russian Far East show characters otherwise unique of some advanced Mesoblattinidae (similar character of branching, branched, tuberculated A, etc.). According to Vršanský (1997), Mesoblattinidae gave birth to Blattellidae. Therefore, according to this author it is possible that Blaberidae have actually evolved directly from the Mesoblattinidae and not from the Blattellidae. This is supported by the fact that the Blaberidae retain the branched A in tegmina which is lost already in the basalmost Blattellidae (Vršanský, Bolotsky, Bugdaeva, Anisyutkin, in preparation).

Paratropes spp. are apparently diurnal, and are thought to might pollinate certain plants in rainforests of Central America (Perry, 1978). Several species such as *Paratropes lycoides* Serville, 1839 (as well as *Eunymbora* sp.) mimicks poison beetles of the family Lycidae.

Paratropes is specialized and comparatively advanced genus of the Blaberidae possessing numerous autapomorphies. Blaberidae itself is an advanced group unknown before the Tertiary which appears to evolve very rapidly. Therefore presence of the advanced living genus of the Blaberidae in the Cretaceous is unexpected (also see below).

The fusion of two branches of M with CuA in the new species is a teratological and not taxonomic character, as has been recently demonstrated for the Upper Jurassic cockroaches in Mongolia (Vršanský, 2004 a, 2005).

M a t e r i a l . Holotype.



Text-fig. 7. *Paratropes fossilis* Vršanský et Anisyutkin, sp. nov., PIN 5068/10; Gerofit (x 5.4)

Family Anaplectidae Walker, 1868

Genus *Pseudoplecta* Vršanský et Anisyutkin, gen. nov.

Name. Modified from *Anaplecta* and *Prosoplecta* Saussure, 1864, with *pseudo* being the Greek for false. Gender feminine.

Type species: *P. krassilovi* Vršanský et Anisyutkin, sp. nov.

Species content. Type species.

Diagnosis. Similar to *Areolaria fieberi* Brunner von Wattenwyl, 1865, the type species of genus *Areolaria*, in elongate shape and somewhat reduced venation of elytra (Brunner von Wattenwyl, 1865, Tab. 6, Fig. 27, B), but differs in branched and not sinuate Sc (Sc of *A. fieberi* is long, simple and sinuate, cf. Brunner von Wattenwyl, 1865, Tab. 6, Fig. 27, B). Differs from the living genus *Prosoplecta* Saussure, 1864, and particularly from the type species *P. coccinella* Saussure, 1864, in distinctly elongated elytron and greatly reduced venation (venation is apparent in *P. coccinella*, cf. Shelford, 1912, Pl. 48, Fig. 5). Differs from *Anaplecta lateralis* Burmeister, 1838, the type species of the genus *Anaplecta*, in poorly expressed venation (cf. Brunner von Wattenwyl, 1865, Tab. 1, Fig. 2, A, B).

Description. Beetle-like cockroaches. Elytra (forewings) distinctly elongated and strongly sclerotized, with numerous cup-like structures called bunky, with anterior margin more or less prominent, posterior one nearly straight, with no color pattern preserved. Venation simplified, mostly obsolete; Sc short, secondarily branched, R secondarily branched, M and CuA reduced, with parallel, simple and straight veins (M+CuA together with only about 7 veins).

Comments. McKittrick (1964) and Roth (2003) placed Anaplectinae into the Blattellidae (Anaplectinae). However, Anaplectinae sensu McKittrick, 1964 are found polyphyletic, with *Anaplecta* showing the polyphagoid type of male genitalia (Roth, 1996), while *Prosoplecta* (including *Areolaria*) displays the blattellid-type male genitalia (Roth, 1994). A special publication will be addressed to this problem (L. Anisyutkin, P. Vršanský, in preparation).

The new genus displays strong similarity to the Anaplectidae s.str. (the type genus *Anaplecta* Burmeister, 1838), such as elongated elytra with more extensive venation, and characteristic parallel simple straight branches.

The similarity of the terminalia of *Anaplecta* to those of the family Polyphagidae are actually in the concordance with the polyphagoid character of the venation, including the coloration which is virtually characteristic for the Jurassic Liberiblattinidae. In some species of *Anaplecta* this similarity is so apparent (and unusual) that it has been compared, and found (in "*Prosoplecta cocareloides*" = *P. coccinelloides*) virtually identical to, the Umenocoleidae – another descendant of the Liberiblattinidae (Vršanský, 2003 b). Thus it appears very probable that Anaplectidae has originated directly from the Liberiblattinidae, or more probably from the early Polyphagidae (similar to *Eucorydia* Hebard, 1929) which probably retained the character of venation and coloration of the Liberiblattinidae such as *L. ihringovae* Vršanský, 2002.

The representatives of apparently related genera *Prosoplecta*, *Areolaria* and *Anaplecta* inhabit wet tropical regions, presumably primary rainforests of New and Old World.

Pseudoplecta krassilovi Vršanský et Anisyutkin, sp. nov.

Text-fig. 8, Pl. 4, Fig. 2-3

Name. After Professor Valentine A. Krassilov, collector of the material.

Holotype. PIN 5068/4; isolate right elytron; Gerofit (Text-fig. 8, Pl. 4, Fig. 2-3).

Description. As for the genus. Elytra (forewings) distinctly elongate with venation simplified - secondarily branched R only with about 8 veins, M and CuA together with only about 7 veins. Forewing length about 13 mm.

Material. Holotype.

Family Polyphagidae Walker, 1868

Subfamily ?Polyphaginae Walker, 1868

Genus *Netherea* Vršanský et Anisyutkin, gen. nov.

Name. Genus name *Therea* with the prefix *ne-* (Slavic for *not*). Gender feminine.

Type species. *Netherea haatika* Vršanský et Anisyutkin, sp. nov.

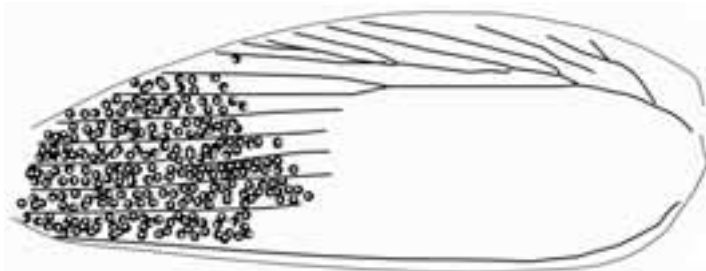
Species content. Type species.

Diagnosis. Forewing short and wide, costal space comparatively narrow, with most branches running longitudinally. M almost completely reduced. Intercalaries not visible. Anal veins apparent, branched. Wing apex not acute.

Description. Forewing leathery, short and wide, with the posterior margin straight, anterior margin widening towards the medial part of the wing. Costal space long and narrow, with Sc branched terminally. R and M fused and extremely reduced. M shifted anterior; CuA S-shaped, expanded. CuA and M running parallel near the basis; CuP sharply curved; A apparent, branched. Intercalaries not visible.

Comments. The new genus appears to represent a lineage ancestral to *Therea* Billberg, 1820. Strong synapomorphies include the shape and leathery character of the forewing, with Sc richly branched, M and R reduced and fused, CuA expanded.

Netherea is plesiomorphic, when compared with *T. petiveriana* (Linne, 1758), the type species of *Therea*, and *T. nuptialis* (Gerstacker, 1861) from the Presidency Madras, India, in



Text-fig. 8. *Pseudoplecta krassilovi* Vršanský et Anisyutkin sp. nov., left tegmen, PIN 5068/4, part; Gerofit (x 9.5)

having costal space comparatively narrow and Sc less expanded and with branches running more longitudinally, and in apparent anal veins.

New genus is generally similar also to females of the dimorphic genus *Ergaula* Walker, 1868 in the wing structure, except that *Ergaula* has its wing apex characteristically acute.

Occurrence of a genus closely related to *Therea* in the fossil record supports the suggestion by Rehn (1951) that this branch has diverged from a basalmost branch of the Polyphagidae. This group appears plesiomorphic in respect to the Polyphagini in that females are alate, while the rest Polyphaginae are apomorphic in that they express profound sexual dimorphism, with males having developed tegmina and wings, while females have both shortened or lost. On the other hand, the genus *Therea* is also noticeably specialized, due to greatly sclerotized tegmina with reduction of its venation in most of representatives of the genus.

Representatives of the closely related genus *Therea* are forest species, which hastily hides in the roots when worried (Vidlička, 2001).

After Vršanský (2003 a) has recognised the family rank of the Holocompsidae and excluded Vitisminae from the Polyphagidae, the latter family in the new, restricted sense became an essentially Ceinozoic group, except the present fossil, the only possible Mesozoic record of the family. *Therea* is an early off-shoot of Polyphagidae (Rehn, 1951) *sensu stricto*. The new species assumes a basal position in respect to the genus *Therea*, so this find does not imply much earlier origin of the family and hence does not contradict its comparatively young age.

Unfortunately deep modification of the wing obscures phylogeny of the Polyphagidae and identification of its stem group: the most probable candidate for this appears to be the polyphagoid family Liberiblattinidae with branched Sc and A (unlike Blattellidae with these branches simple even in the oldest representatives and in the advanced Mesoblattinidae that have also simple A).

Liberiblattinidae are rare in the Cretaceous, but their descendants are present both in Laurasia (mantodeans since the Tithonian, Vitisminae since the Kimmeridgian and Euthyrhaphidae since the Turonian) and Gondwana (the mantodeans since the Aptian).

These inferences together with the origin of the Anaplectidae (represented by *Pseudoplecta* gen. nov.) from the Liberiblattinidae or directly from the Polyphagidae implies that the Liberiblattinidae persisted during the Early and Late Cretaceous or, alternatively, the Polyphagidae originated before that time. The latter hypothesis is less likely because of the basal position of *Therea* within the Polyphagidae.

Netherea haatika Vršanský et Anisyutkin, sp.nov.

Text-fig. 9, Pl. 5, Fig. 1

N a m e. Heb. *haatika*, ancient.

H o l o t y p e. PIN 5068/6; isolate right elytron; Israel, S. Negev, left side of Vadi Gerofit next to its exit to Arava Valley; Ora Formation (Text-fig. 9, Pl. 5, Fig. 1).

D e s c r i p t i o n. Costal space narrow, Sc with 7 veins at the margin; R and M fused and extremely reduced (R with 4, M with only 2 branches). M shifted anterior; CuA S-shaped, expanded - with 8 branches. CuA and M running parallel near the basis; CuP sharply curved; A apparent, branched. Intercalaries not visible. Forewing length ca. 10 mm.



Text-fig. 9. *Netherea haatika* Vršanský et Anisytukin, sp. nov., right elytron, PIN 5068/6, Gerofit (x 13)

Comments. The representatives of the sister living genus *Therea* as well as the related (possibly ancestral) genus *Eucorydia* Hebard, 1929 are characterised by yellow spots on the dark blue tegmina and also short antennae characteristic of cryptobiotic cockroaches (e. g., many Panesthiinae). The spots are not apparent at the new fossil species.

Material. Holotype.

Genus *Ergaula* Walker, 1868

Type species: *Corydia carunculigera* Gerstaecker, 1861, living in Phillipines.

Comments. Living representatives of the genus are widely distributed. Besides the type species frequented Phillipines, there are species known from the Cambodia (*E. silphoides* Walker, 1868); Borneo (*E. funebris* Hanitsch, 1933); Myanmar (*E. capucina* Brunner von Wattenwill, 1893); Sumatra, Malacca and Borneo (*E. pilosa* Walker, 1868); Nepal and Myanmar (*E. nepalensis* Saussure, 1893). There are some additional, apparently new species from Thailand in the collection of the Zoological Institute SAS, Bratislava. Particularly distinctive is the wide distribution of *E. capensis* (Saussure, 1893) in Africa, namely in Nigeria, Cameroon, Kongo, Uganda, Kenia, Tanzania, Rhodesia and Angola (possibly a group of species, because such wide distribution is unusual for geophylous cockroaches), which have quite interesting ecology. According to Grandcolas (1997) this species inhabited tree holes or holes in termite nests at the bases of trees in the Gabonese rainforest. Populations are scattered in less than 16% of available treeholes and not very permanent over several years. As a mean, 8.8 nymphs and sometimes one adult female were aggregated and burrowed in the dry dust at the bottom of a cavity. The oothecae were deposited at the same place. Both the density of this species and the nymphal survival were very low. Males seem less sedentary than females, and one observation suggests that couples stay together before females found colonies in cavities.

The living *Ergaula* species display a considerable sexual dimorphism. The fossil described below apparently corresponds to the male type, while the females are brachypterous, with reduced hindwings, and notably similar to the fossil described above as *Netherea* gen. nov., except for the acute wing apex. The sexual dimorphism of *Ergaula* can be transitional to the Polyphagini whose females are apterous and the males fully winged.

Like in some other cases, the occurrence of the advanced living genus is anomalous for Cretaceous fauna.

Ergaula atica Vršanský et Anisyutkin, sp. nov.

Pl. 5, Fig. 2

Name. Heb. *atica*, ancient.

Holotype. PIN 5068/11; isolate right male elytron. Ora Formation. South Negev, left side of Vadi Gerofit next to its exit to Arava Valley, Israel (Pl. 5, Fig. 2).

Diagnosis. Forewing fore margin distinctly arcuate, veins long, terminal bifurcations reduced except for Sc, which is rich. Intercalaries distinct. Length/width ca. 35 mm/12 mm.

Description. Forewing transparent, long, with fore margin arcuate. Veins, intercalaries and numerous cross-veins distinct. Coloration as in Pl. 8, Fig. 3. Costal space long and wide, with subcosta branched terminally. R with dense venation, main veins often fused. M closely approximating R, with long, parallel, curved veins. Numerous CuA branches long, slightly curved. CuP sharply curved; A apparent, branched, ending at the anterior margin of CuA or in the posterior margin of the wing. Common vein fusions are present in radial field, where distances between veins are not constant, and in M and CuA with constant distances between veins.

Comments. The new species differs from all living congeners only in having more distinct intercalaries (plesiomorphy).

Anterior part of the wing of new species shows vein fusions and varying distances between veins. These features are unknown in the Mesozoic cockroaches in this wing area. In contrast, both vein fusions and varying interveinal distances are characteristic of the anterior wing part of those living cockroaches which show lower flight ability. This is understandable because the anterior wing half is thought to be particularly aerodynamically controlled, so that reduction of the flight function can permit some extent of disorganization of the venation there.

General comment on Blattodea

Notably, from the six cockroach species in Gerofit, three are represented by very unusual taxa. Living *Paratropes* possess unique form and venation of elytra, and sophisticatedly shaped pronotum; *Pseudoplecta* are beetle-like cockroaches, and all the known relatives of the *Netherea* are cockroaches with short antenna, unusual pronotum and blue-colored with yellow spots.

The roach fossils of Gerofit, like the majority of the other insect fossils including those inferred from many plant damages (see pt I of this book), show affinities mainly to living and not to known Early and Late Cretaceous cockroaches. At the same time, their Turonian age is hardly questionable being testified by ammonites found both in the underlying and overlying marine deposits. We cannot resolve this contradiction and have to leave it to future researches.

Dictyoptera incertae sedis

Trace fossils of an unidentified cockroach or praying mantis

Genus *Oothecichnus* Anisyutkin et Rasnitsyn, ichnogenus nov.

Name. A combination of *ootheca*, the Greek for egg case, and *ichnos*, the Greek for trace. Gender masculine.

Type genus *O. negevanus* Anisyutkin et Rasnitsyn, ichnosp. nov.

Composition: Type species.

Diagnosis. The new genus is proposed for fossil egg cases (oothecae) of roach-like insects, particularly of cockroaches and praying mantises.

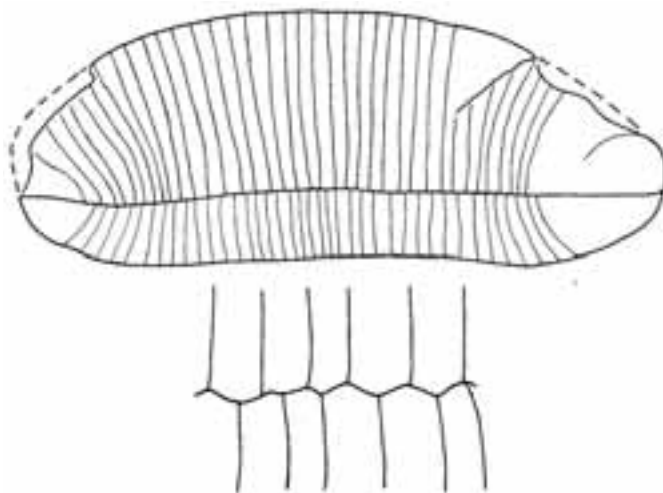
Oothecichnus negevanus Anisyutkin et Rasnitsyn, ichnospecies nov.

Text-fig. 10, Pl. 5, Fig. 3

Name. After the Negev Desert.

Holotype. PIN 5068/9, slightly deformed ootheca; Gerofit (Text-fig. 10, Pl. 5, Fig. 3).

Description. Irregularly elongate oval fossil 11.4 mm long, 4.4 mm wide, with rounded narrow ends, with one longer side (upper one as illustrated) widely rounded and another nearly straight, with longitudinal zigzag suture displaced toward straight side of impression and reaching lateral ends of fossil. Most part of fossil covered with numerous transverse lines more thin than zigzag suture and joining it, in imperfect alternating order from both sides of suture, to form Y-like figures at junctions. Thin lines really transverse over middle one third of fossil length, and increasingly slanting in opposite directions toward ends of fossil. Number of discernible transverse lines differing in different halves of fossils (about 34-36 preserved on convex side and 37-40 on straight one). Narrow ends of fossil roughly symmetrical and apparently crumpled as preserved, with transverse lines turning increasingly obsolete toward apices.



Text-fig. 10. *Oothecichnus negevanus* Anisyutkin et Rasnitsyn, ichnospecies nov., PIN 5068/9, Gerofit: general view (x 10.9) and fragment of the keel and transverse furrows, enlarged

Comments. The fossil could be interpreted as a slightly deformed ootheca of a certain representative of cockroaches or praying mantises. The ootheca was apparently fossilized in oblique dorso-ventral position. Accepting this hypothesis, the longitudinal suture can be interpreted as a weakly developed keel of ootheca, and the transverse lines as a striation of the ootheca surface or reflecting position of eggs inside ootheca.

Three types of oviposition can be distinguished in the superorder Dictyoptera (= Blattidea). The mainly Paleozoic cockroaches of the superfamilies Mylacridoidea, Phylloblattoidae, and a group of families related to the Mesozoic Caloblattidae, Blattulidae and Umecoleidae (each probably deserving a superfamily rank) had long (medium-sized in Umecoleidae and Blattulidae) external ovipositor and laid their eggs directly into substrate, that is with no ootheca (Vršanský, 1999, 2003 b; Anisyutkin, Gorochov, 2005).

The mantises, termites and the modern type roaches possess reduced, even if external, ovipositor and a primitive ootheca, that is the eggs aggregation covered with secretions of accessory glands of female (Vršanský, 1999, 2003 b; Anisyutkin, Gorochov, 2005). Origin of the primitive ootheca could be connected with transition to phytophylous habits (Gorochov, 2001, Anisyutkin, Gorochov, 2005). This type of ootheca is formed outside of the female abdomen using the shortened, but outer ovipositor. This type of oviposition is characteristic of mantises and some extinct cockroaches. It was suggested to consider cockroaches with such type of ovipositor as superfamily (or infraorder) Raphidiomimoidea (Gorochov, 2001; Anisyutkin, Gorochov, 2005). According to Nalepa and Lenz (2000), the synapomorphy of more specialized cockroaches and termites is an advanced type of ootheca. The ootheca of advanced type is formed within female abdomen, in the genital pouch which encloses the reduced ovipositor as an internal organ.

The fossil under description could be rather attributed to mantis type of ootheca for the following reasons. The comparatively weak keel is not a feature of less advanced roaches (Cryptocercidae, Blattidae, Polyphagidae) which have oothecae with well developed keel (Roth, 1968, 1971). Weak keel is common in specialized cockroaches (viviparous Blaberidae, some Blattellidae) like some of those found together with the present fossil. The mantis oothecae are variable in such structures (Shelford, 1909, Beier, 1968). Similarly, the dense transverse striation of ootheca wall is not uncommon in mantises (and, by inference, in primitive roach ootheca) and, as external reflection of numerous narrow eggs enclosed, in advanced Blaberidae and Blattellidae.

The assignment of above described ootheca to a representative of Blaberidae seems less probable because the internally incubated oothecae of blaberid type are usually more elongated, while ones of Blattellidae are relatively short (Roth, 1968). There is little probability for fossilization of blaberid ootheca due to a short time interval between the ootheca extraction from the brood sac of female and hatching of the larvae (although this might not be true for the ancient Blaberidae). The empty ootheca usually is eaten by the larvae directly after hatching. The abortive oothecae are rapidly destroyed after extraction, frequently by the female herself.

3. Conclusion

The insect assemblage of Gerofit, southern Israel, includes only 17 fossils, perhaps not enough for a comprehensive analysis. Nevertheless its composition shows some features of general interest.

Eleven insect families are recognized in the assemblage, two of them (Palaeoleontidae and Mesoblattinidae) extinct, and nine (Cicadellidae, Carabidae, Dytiscidae, Hydrophilidae, Curculionidae, Blaberidae, Polyphagidae, Blattellidae, and Anaplectidae) extant.

Taxonomic composition of the assemblage is strikingly unusual. The majority of the cockroaches found in the Ora Formation are highly advanced. They include at least two living genera (*Paratropes* and *Ergaula*) and some structures hitherto unknown in the Mesozoic roaches, hence being of a Cenozoic rather than Cretaceous aspect. The extant beetle genus *Echinocnemus*, and *Georissites negev* sp. nov. closest to *G. major* from the Eocene of Geiseltal, comply with this conclusion, as well as the ground beetle (Carabidae) of advanced (Cenozoic) affinities. In contrast, the antlion and one of cockroaches (*Turoniblattea israelica*) belong to extinct families of unambiguous Cretaceous affinities, although the latter shows similarity also with extant blattellid genus *Parcoblatta*.

The study of plant damages also revealed a number of structures characteristic of modern insect groups (Pt. I). The very abundance of the phyllostigmas is particularly characteristic of at least some Turonian deposits (e.g., Kzyl Zhar in Kazakhstan). However, some of their insect producers are compared by their habits with relatively modern, essentially Cenozoic, groups, such as the higher flies of the families Agromyzidae and Anthomyiidae. Also the revealed predators of the mining insect larvae are enigmatic, because their works most recall those of ants and birds. Ants are known in the Turonian (Dlussky in Rasnitsyn, 1975; Dlussky et al., 2004). However, they are rather archaic and rare there and so could be hardly responsible for the rather high proportion of the operated mines recorded. The passerine birds with sophisticated mine opening behavior are as yet unknown in the Turonian.

Geographic aspect of Gerofit insect assemblage is interesting as well. Few fossils at hand are geographically significant, and the available information is contradictory to an extent. Biogeographic affinities of the only leafhopper is with southern continents (without further specification), *Echinocnemus* weevil – with the Old World, antlion – apparently with northern Asia and both Americas, *Nehevblattella*, *Paratropes* – with South and Central America, *Pseudoplecta* – with the New and Old World tropics, and the descendants of *Netherea* – with India. Surprisingly, none has African affinities, although before Neogene the present day Near East was situated on the northernmost extremity of Africa (cf. Rasnitsyn & Quicke, 2002: figs. 501, 502).

Most of more precisely identified fossils belong to thermophilous (warm temperate to tropical) groups, viz., the Ledorinae leafhopper, the antlion, all roaches and probably a producer of the ootheca (either a praying mantis or a cockroach). At the same time, no exclu-

sively temperate or psychrophilous insects are found. This does not contradict mangrove habitats (there are extratropical mangroves), although no insect groups is presently confined to this type vegetation (ants, bees, mosquitoes, and lampyrid beetles are among the frequently recorded insects in the mangroves, cf. Hoggarth, 1999).

Insect life was very active in the extinct mangroves of Israel, as the abundance of leaf damage witnesses. In contrast, the insect fossils are found to be scanty in spite of rather intense collecting, and apparently include no one guilty of the damage observed. At least in part this results from the taphonomic conditions. All fossils are fragmentary and represented mainly by the most durable body parts – beetle elytra and roach tegmina, elytra and ootheca. The only fossil specimen represented by more than a single fragment is the leafhopper preserved as incomplete fore and hind wings buried about a centimeter apart. The only less durable fossils are the antlion wing and the leafhopper hind wing. In spite of undoubted abundance of the aphids and nematoceran Diptera in the source biota, as implied by the plant damages (pt. I), not a single of their delicate fossils is preserved. This indicates a taphonomically aggressive environment which prevents fossilization of less durable insect fossils. Insect corps might be dismembered, and their less durable parts destroyed either mechanically (by wave action), or biologically (providing quick decomposition and fragmentation of insect corpses). However, this hypothesis is limited in its explanatory power, for neither high energy of water, nor particularly intense biodegradation agents look consistent with the perfect preservation state of plant fossils both in Gerofit and Qetura localities. The observation that only mangrove leaves are perfectly preserved, which are known to possess resistance to excessive salt content (Pt. I), gives no complete explanation as well, because the insect fossils in marine deposits are not uncommon to display perfect preservation state. The only plausible alternative is action of a very specific biodegradation agent that would selectively prevent insect and not plant burial. Very hypothetically, it might be supposed, that mangal waters in contrast to fresh and non-mangal salt ones might be poor in bacteria which degrade the hydrophobous epicuticula of the insect corps and so open them way under the water surface toward the burial site (see Zherikhin, 2002, for details). This purely *ad hoc* hypothesis has no evidence thus far, but at least it is open for falsification, and hopefully it is not the only possible explanation of the puzzle observed. Evidently more research is necessary to resolve this contradiction.

Abundance of aquatic and subaquatic beetles, which are not known to be particularly adherent to salt water, is easier to explain. The belt of mangrove is normally fringed landward with marshes, ponds, and other freshwater-reach environments, and crossed with canals bringing freshwater at least at the low tide. These streams could easily bring dismembered and reworked insect corps to the burial sites in the mangal in precisely that state that we can see now in the material at hand, as well as in the case of the Slovakian mangal (Sukačeva et al., 2006). However, this raises another question: the contemporary mangal biotopes are rich in a variety of insects including those armed with durable skeleton such as beetles, wasps, bees, ants, and cockroaches (Hoggarth, 1999). Ants and bees were rare at best during the Cretaceous, but this was not the case of wasps, and yet not a single of them is found fossilised there. Comparatively many cockroach fossils are found in the Ora Beds, but we have no idea if any

of them was a mangal dweller: nothing is currently known about specificity of the roach fauna of mangroves (Hoggarth, 1999). There are many non-aquatic beetles that are common in mangals, including Chrysomelidae which were not very rare in the Late Cretaceous (the more so in Cenozoic) and yet completely absent from the assemblage at hand. Again, the observations suggest absence of the mangal resident insects from the assemblage at hand which might consist entirely of the allochthonous insects frequented farther landward environments.

The above considerations make us possible to conclude finally that the insect fossil assemblage of the Ora Formation, however small, is strikingly unusual and contradictory in its taxonomical, ecological and geographical composition. This utter originality is the only feature of the assemblage that stands in parallel with the equally original plant assemblage which is unique due to evidence of the oldest known angiosperm mangroves (Pt. I).

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PLATES

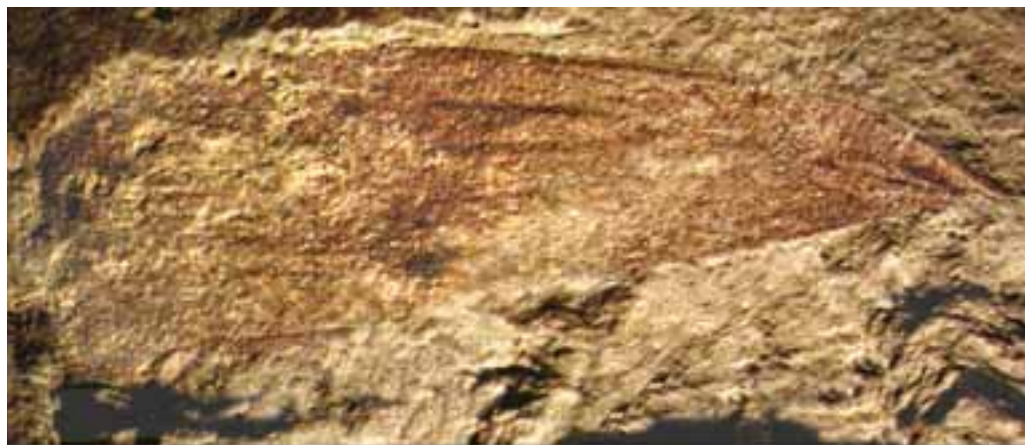


Plate 1. Fig. 1. Cicadellidae: Ledrinae? indet., PIN 5068/8, fore wing, Gerofit (x 8.5); Fig. 2. Same, hind wing.

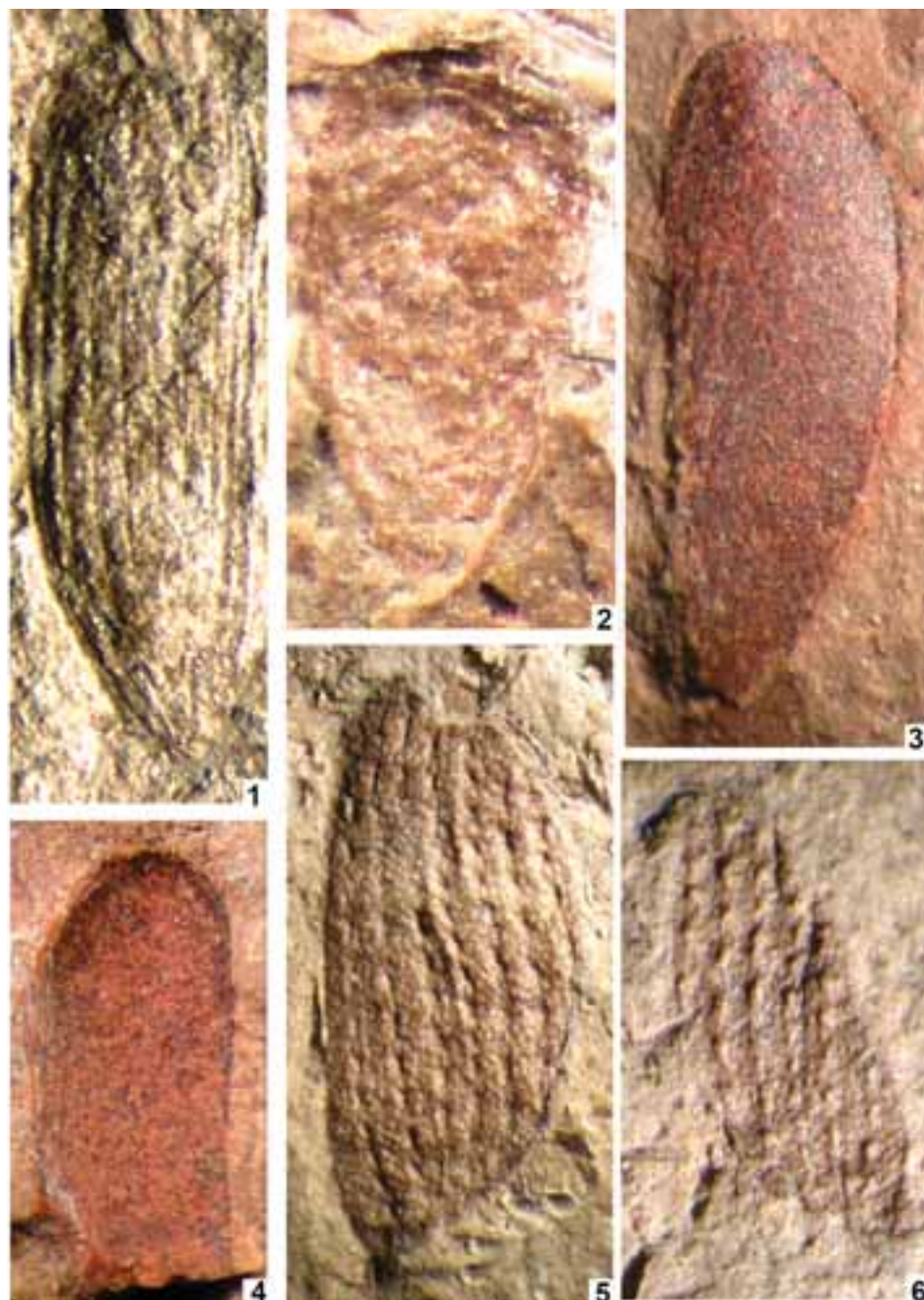


Plate 2. Fig. 1. Carabidae indet., IEUH 101-1311, right elytron, Gerofit, (x 21); Fig. 2. *Memptus* sp. 1, PIN 5067/1, right elytron, Qetura (x 40); Fig. 3. *Memptus* sp. 2, PIN 5068/5, right elytron, part; Gerofit (x 30); Fig. 4. Same, counterpart; Fig. 5. *Georyssites negev* sp. nov., PIN 5068/7, right elytron, part and counterpart; Gerofit (x 18); Fig. 6. Same, counterpart

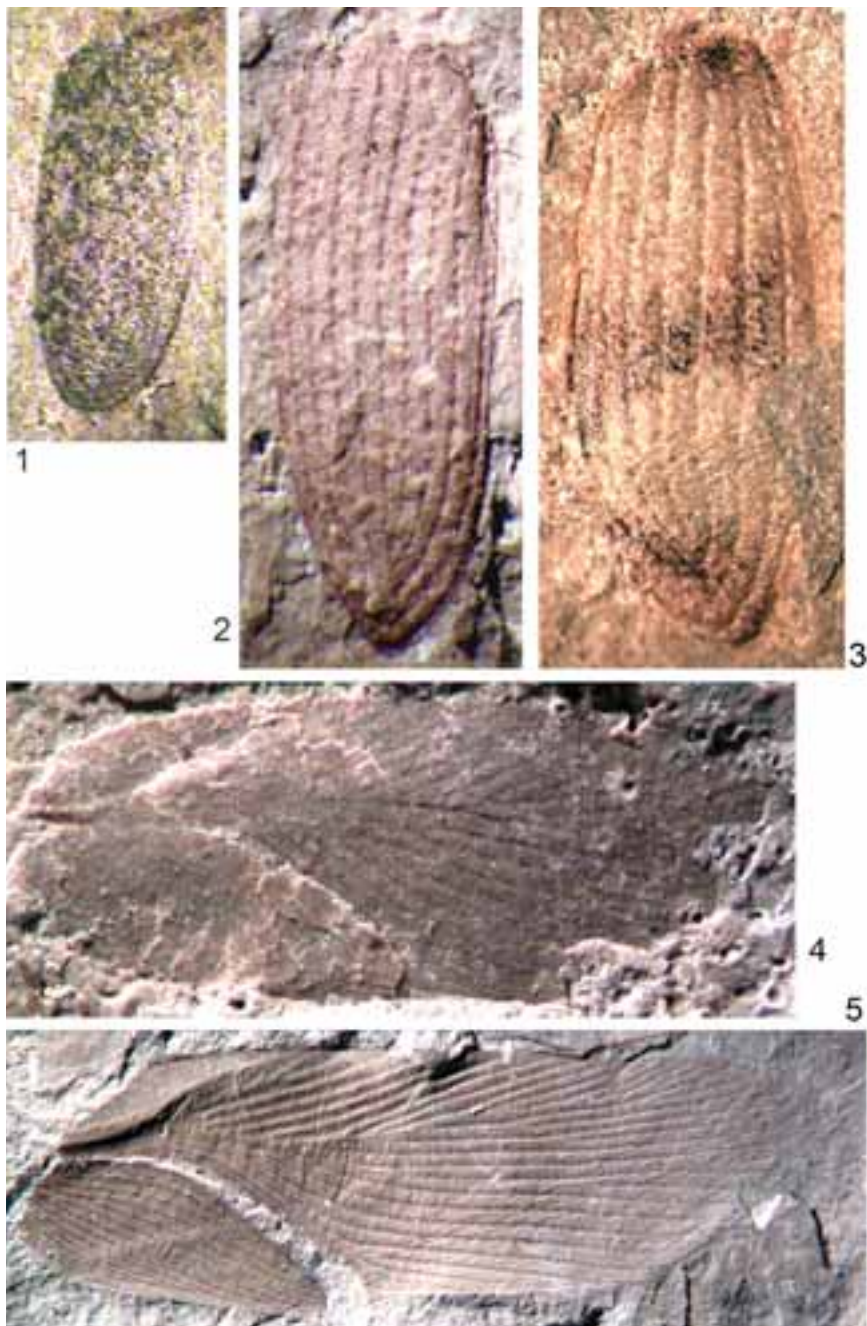


Plate 3. Fig. 1. Unidentified terrestrial beetle, IEUH 161-284C, left elytron, Gerofit (x 21); Fig. 2. *Echinocnemus qetura* Grachev, sp. nov., PIN 5067/2, right elytron, Qetura (x 17); Fig. 3. *Echinocnemus gerofit* Grachev, sp. nov., PIN 5068/12, right elytron, Gerofit (x 20); Fig. 4. *Nehevblattella grofitica* Vršanský, 2004, HU 38333, Gerofit (x 11); Fig. 5. *Turoniblatta israelica* Vršanský, 2004, HU 38332, Gerofit (x 7)

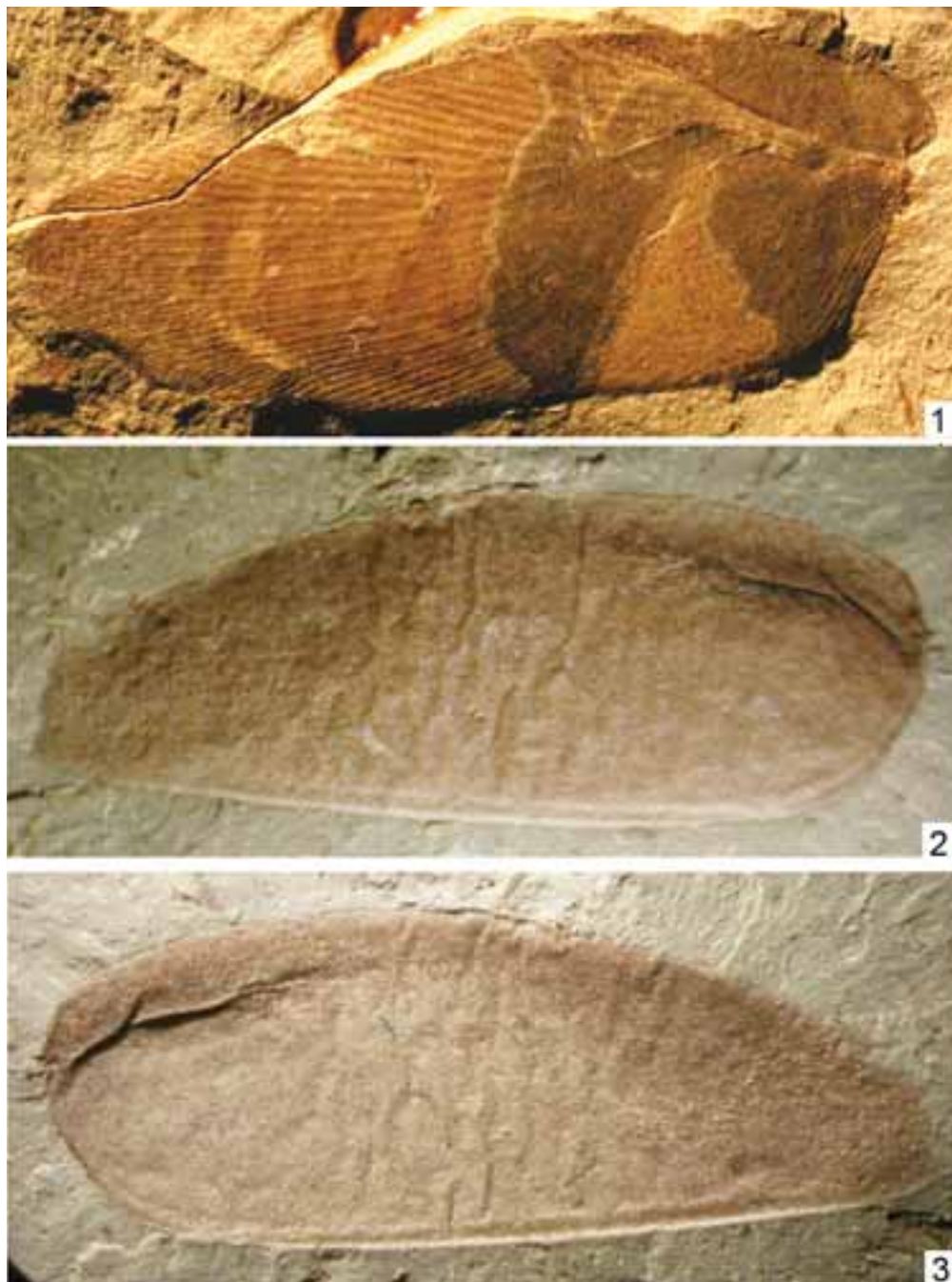


Plate 4. Fig. 1. *Paratropes fossilis* Vršanský et Anisyutkin, sp. nov., PIN 5068/10; Gerofit (x 5.4); Fig. 2. *Pseudoplecta krassilovi* Vršanský et Anisyutkin sp. nov., left tegmen, PIN 5068/4, part; Gerofit (x 9.5); Fig. 3. Same, counterpart.

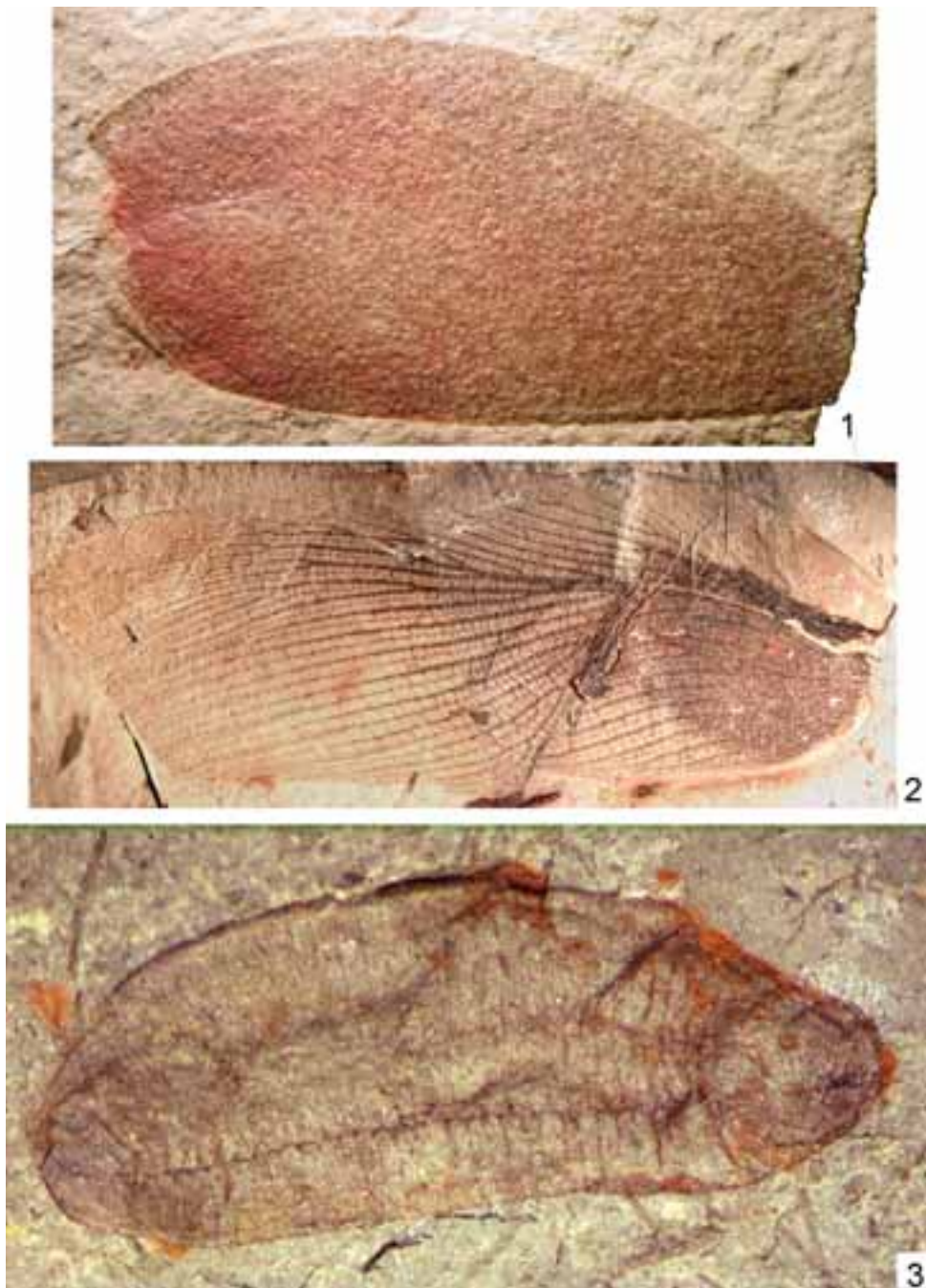


Plate 5. Fig. 1. *Netherea haatika* Vršanský et Anisyutkin, sp. nov., right elytron, PIN 5068/6, Gerofit (x 13); Fig. 2. *Ergaula atica* Vršanský et Anisyutkin, sp. nov., right elytron, PIN 5068/11, Gerofit (x 3.6); Fig. 3. *Oothecichnis negevanus* Anisyutkin et Rasnitsyn, ichnospecies nov., PIN 5068/9, Gerofit (x 10.9)

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Editors

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&

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Sofia – Moscow

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