The most interesting finds of orthopteroid insects at the end of the 20th century and a new recent genus and species

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Abstract

During the concluding 20 y of the 20th century, numerous interesting finds of Polyneoptera have been made. These include the discoveries of a new higher taxon of recent Ensifera, new genera of relict recent Ensiferan groups, and new genera and species of recent Orthoptera and Dictyoptera with remarkable morphological characteristics. There have been a series of paleontological finds, including new higher taxa, oldest representatives of some other higher taxa, and several interesting problematic and enigmatic fossils. Some of these finds clarify difficult problems of classification and evolution of Polyneoptera. A new genus and species, *Aboiloilomimus sichuanensis*, is described.

Key words

Polyneoptera, taxonomy, paleontology, morphology, discoveries, new taxa

Introduction

Numerous publications about some very interesting new representatives of the infraclass Polyneoptera have been made during the 20 final years of the 20th century. These orthopteroids were discovered in nature as well as in the collections of some museums. They are first representatives of new high taxa (subfamilies, families, superfamilies) and of new genera from relict recent higher taxa, new forms with new unusual adaptations and with new (important for higher taxonomy) morphological characters. They include some intermediate and very ancient fossil representatives of higher taxa, and some forms showing new, remarkable examples of convergence. This period begins in 1980 with descriptions of two new remarkable taxa of recent Ensifera: 1) the family Cooloolidae including one new genus (*Cooloola*) with one new Australian species characterized by its digging habits (Rentz 1980), 2) the genus *Paracyphoderris* with one new species (Fig. 1) from the Far East of Russia (Storozhenko 1980).

Recent discoveries

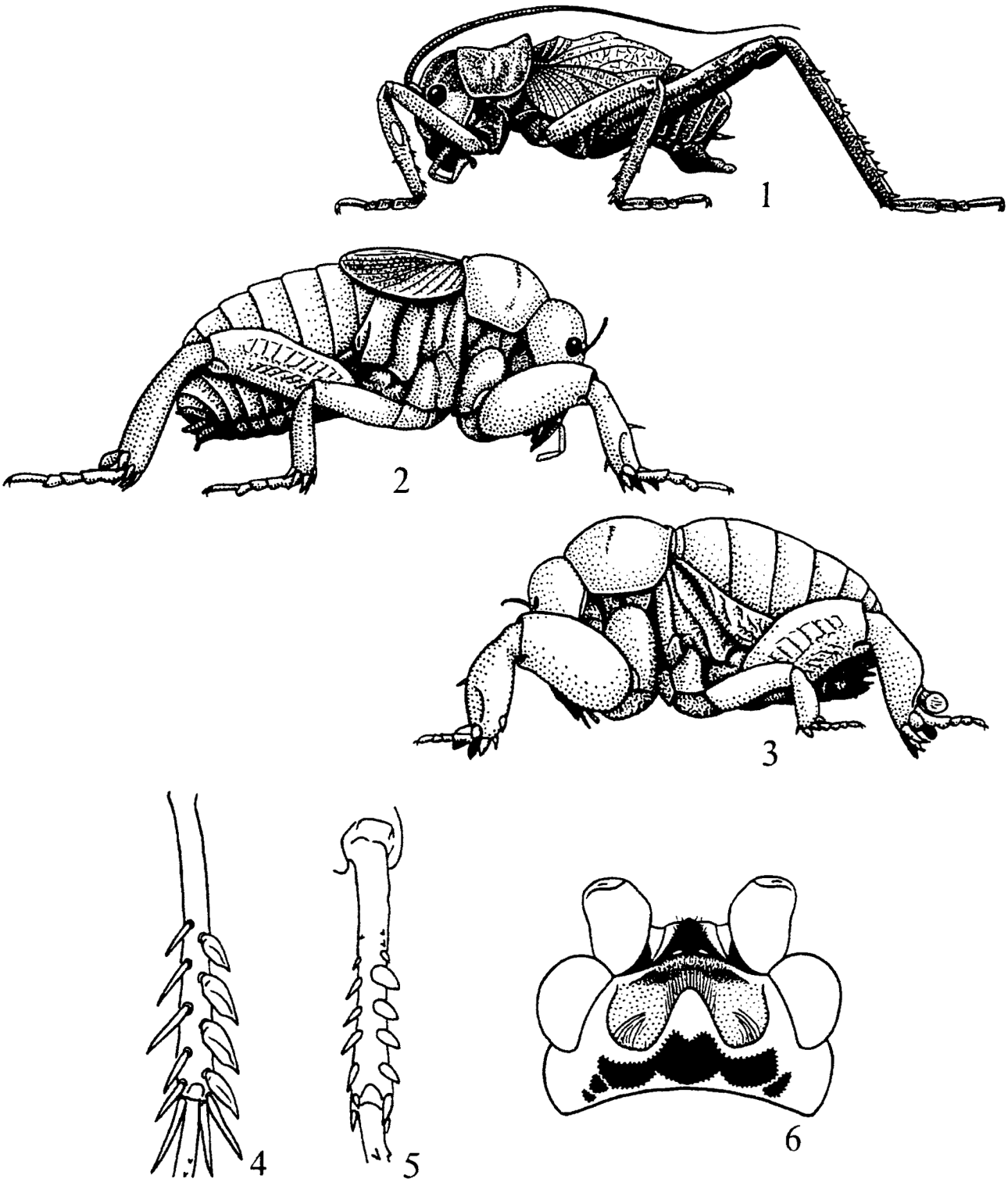
The first taxon is interesting for its strong fossorial adaptations which disguise its systematic position. This taxon, as it seems to me, is most related to the family Anostostomatidae (Stenopelmatoidea) on the basis of the similarity of their male copulatory structures. It may be an isolated subfamily of Anostostomatidae (=Mimnermidae) (Gorochov 1995a, 2001a). Shortly after the discovery of the first species of *Cooloola*, two new Australian species of the same genus (Figs 2, 3) were described (Rentz 1986).

The second taxon (*Paracyphoderris*) is the third genus of very primitive Ensifera from the infraorder Tettigoniidea (Fig. 17). The two previous most primitive genera of this infraorder are 1) *Prophalangopsis* Walker which includes one species described in 1869 for one specimen, with the label "British India" (it is the true representative of the primitive (mainly Mesozoic) superfamily Hagloidea), 2) *Cyphoderris* Uhler known from North America only. The systematic position of the latter genus and the related Asian genus *Paracyphoderris* is rather enigmatic. They were usually placed in Hagloidea near *Prophalangopsis* or some Mesozoic forms, but subsequently, the separate subfamily Cyphoderrinae was described for them (Gorochov 1988b), and the opinion about its possibly belonging to a most primitive family of the superfamily Tettigonioidea advanced (Gorochov 1995a).

The discovery of first recent Gryllidae of the subfamily Euscyrtinae possessing a tegminal stridulatory apparatus (Otte & Alexander 1983, the new Australian genus *Merinella* with three new species) shows that this subfamily, originally described for several genera without this apparatus, originated from singing ancestors [probably from one of the singing groups of Podoscirtinae (Gorochov 1995a), but not from one of their silent groups].

A new recent genus from the very relict order Grylloblattida (it is the fourth genus in this order) with one new species was described from the Altai Mountains (Storozhenko & Oliger 1984, Storozhenko 1988 *Grylloblattella*). It is the first instance of this order almost at the center of Asia: all other genera live near the Pacific coast of Asia and in North America. A second species of the same genus was described from another range of mountains not far from the Altai (Storozhenko 1996a).

Another new genus of recent Gryllidae (Gryllinae) with one new species, living on the forest floor of Vietnam (Gorochov 1994a, *Gialaia*) gives a new remarkable example of convergence with the genus *Odontogryllodes* Chop. (Gryllidae: Landrevinae). The two genera have very different modes of life (*Odontogryllodes* lives on trunks and branches above the forest floor), but in both their males are provided with a row of distinctly inflated (glandular) inner spines of



Figs 1-6. 1. *Paracyphoderris erebeus* Stor. ♂; **2.** *Cooloola ziljan* Rentz ♂; **3.** *C. ziljan* ♀; **4.** *Gialaia ottei* Gor. ♂; **5.** *Odontogryllodes stenus* Gor. ♂; **6.** *Mikluchomaklaia phantastica* Gor. ♂. 1-3, general appearance from side; 4, 5, left hind tibia from above; 6, head from above.

the hind tibiae (Figs 4, 5) used during copulation (the female probably consumes their secretion). After this publication, nine new species of *Gialaia* were described from Indo-China, New Guinea, and Tanzania (Gorochov & Kostia 1999, Gorochov 2001c); the African species is characterized by the presence of two rows (inner and outer) of glandular spines.

An analogous function is very likely for the unusual gland of *Mikluchomaklaia phantastica* (Gryllidae: Phalangopsinae) described from New Guinea (Gorochov 1996). All such glands in recent Gryllidae are situated on the tergites of the pterothorax or abdomen, on different places on the tegmina (many species of *Adenopterus* Chop., all other known species of *Mikluchomaklaia* Gor., including *M. phantastica* which also has a partly reduced tegminal gland), or in inflated tibial spines. But the gland of *M. phantastica* is unique – it is situated on the upper part of the head between the eyes, in the form of very deep concavity extending to almost the center of the epicranium (Fig. 6).

Very unusual copulatory adaptations were found in a new genus with one new Australian species of recent Gryllacridinae (Stenopelmatidae) (Rentz 1997, *Urogryllacris*). This unique insect has the male genital plate in the form of a very long and narrow tube curved upward. During copulation, this tube is inserted into the genital chamber of the female through the distal part of its ovipositor.

The discovery of luminescence in Polyneoptera was made by Zompro & Fritzsche (1999). A new genus, (*Lucihormetica*) with one new and eight old species belonging to the subfamily Blaberinae (Blaberidae), has a pair of luminescent spots on the male pronotum. These surprising cockroaches are distributed in Brazil, Venezuela and Colombia.

Paleontological discoveries

The majority of the most interesting finds of Polyneoptera were made by paleontologists but there is no need to mention all higher taxa of fossil insects described or included in Polyneoptera. Many of these taxa are described on the basis of very unclear material or only small fragments. In some instances, it is possible these fossils do not belong to Polyneoptera. Nevertheless, many of them provide very important information, necessary for the understanding of classification, phylogeny and evolutionary trends. The most important finds (during the period under review) of these fossils, as well as some remarkably enigmatic extinct Polyneoptera, are briefly discussed below.

Orthoptera

In 1985, a new genus with one new species was described from the Lower Jurassic of England as a representative of Hagloidea (Whalley 1985, *Regiata*). Comparison of the venation of its tegmina with that of the Cretaceous subfamily Mongoloxyinae (Tridactyloidea) showed that this genus is a primitive representative of the infraorder Tridactylidea (Figs 7, 8) which must be included in a new family, possibly ancestral, for all other known Tridactyloidea (Gorochov 1995b, Regiatidae). This find gives some slight connection of Tridactylidea with the very peculiar and enigmatic family Dzhajloutshellidae (possibly a second superfamily of Tridactylidea, Fig. 9), described for two new genera and two new species from the Triassic of Middle Asia (Gorochov 1994b). Regiatidae also possibly connects with Locustavidae, a primitive Triassic family of the infraorder Acrididea, and with the rather enigmatic Triassic family Xenopteridae, usually included in Ensifera.

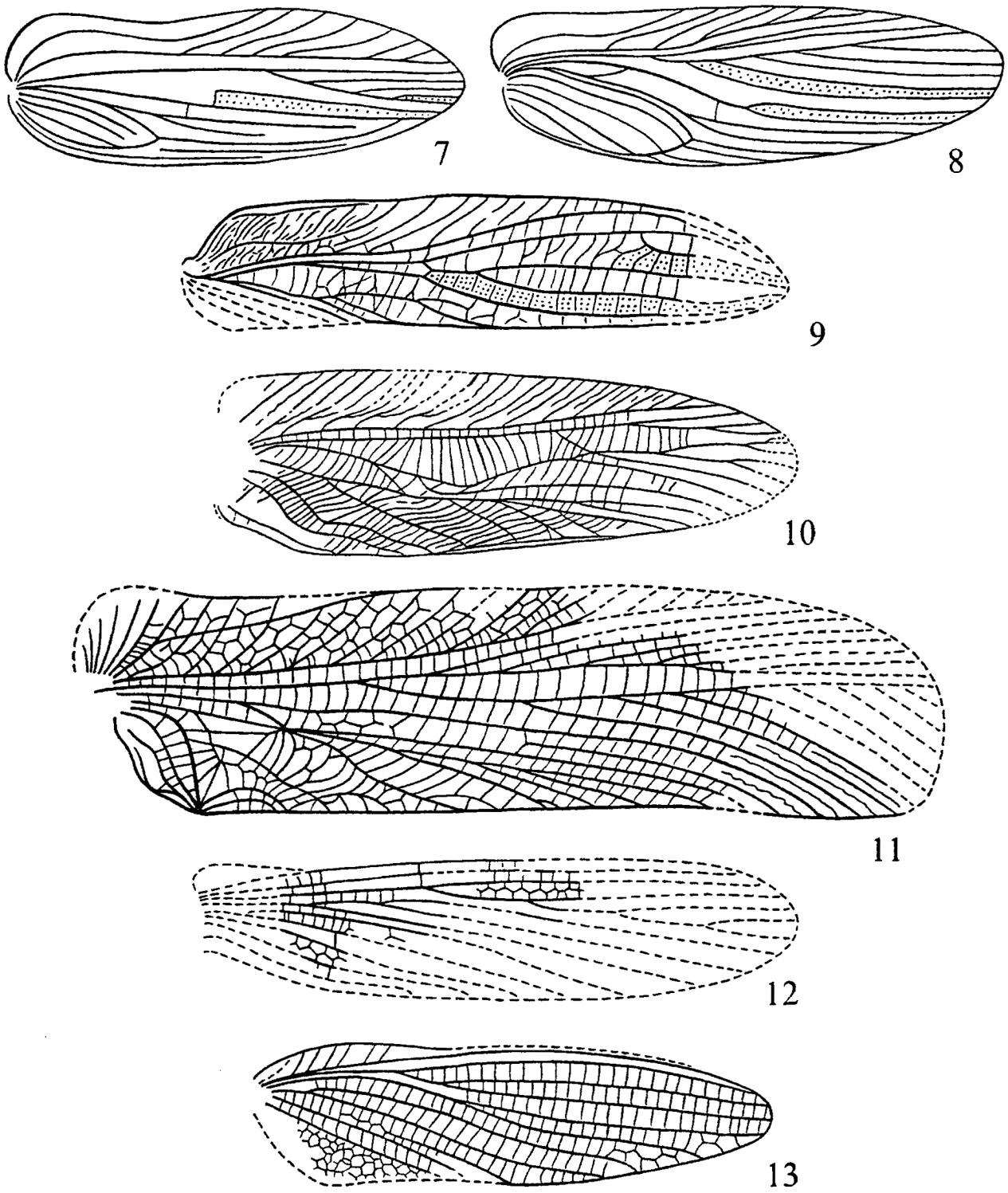
An interesting fossil find among the almost extinct superfamily Hagloidea is *Hagloedischia*, a new genus with one new species from the Triassic of Middle Asia, characterized by the most primitive tegminal stridulatory apparatus of all known Ensifera (Gorochov 1986). The structure of its male tegmina (Fig.10) is intermediate between that of the Permian representatives of Oedischiidea and all other Hagloidea. This fact is an important clue in the origin of Hagloidea (Triassic to recent) and of their probable descendants (all recent superfamilies of Ensifera) from the most ancient infraorder Oedischiidea. (The latter infraorder was without any tegminal stridulatory apparatus, excepting the Triassic Mesoedischiidae which had their construction of the tegminal stridulatory apparatus as a result of convergence to primitive Hagloidea). A new family was described for *Hagloedischia* in the same paper.

Another interesting fossil of Ensifera is *Haglotettigonia* – the most primitive representative of the superfamily Tettigonioidea. This genus with one new species was described from the Lower Cretaceous of Siberia (Gorochov 1988a). The venation of its male tegmina (including stridulatory apparatus) shows the intermediate condition between Hagloidea and all known Tettigonioidea (Fig. 11). It is new evidence of the origin of Tettigonioidea from Hagloidea. This find also indicates a possible age of the origin of Tettigonioidea – at the border between the Jurassic and Cretaceous or near it. For *Haglotettigonia* a new family was described in the above-mentioned paper, and subsequently, the possibility of the recent subfamily Cyphoderrinae belonging to this family was published (Gorochov 1995a).

A most important find of fossil Grylloidea is the discovery of a very primitive representative of Gryllotalpidae from the Lower Cretaceous of Brazil (Martins-Neto 1995, 1997; *Tetraspinus* replaced by *Cratotetraspinus* because of homonymy). This new monotypic genus is evidently a representative of some new subfamily ancestral for all known fossil and recent Gryllotalpidae. It is remarkable because of the structure of its body and especially its legs, which have an intermediate condition between Protogryllidae (similar to recent Gryllidae in general appearance) and Cenozoic Gryllotalpidae. This find shows how morphological changes could arise as an adaptation to a digging mode of life, leading from Protogryllidae to recent Gryllotalpidae.

Phasmatoptera

The question of the origin of this order is rather difficult, as any finds of well-preserved Phasmatoptera from the Paleozoic are absent: this fact was the basis of opinion about the origin of stick-insects from Orthoptera in the Early Triassic or Late Permian (Sharov 1968). But Phasmatoptera have the primitive position of nymphal wings: they are not



Figs 7-13. 7. Tegmen of *Mongoloxya ponomarenkoi* Gor. (schematic), **8.** *Regiata scutra* Whalley (schematic), **9.** *Dzhajloutshella arcanum* Gor., **10.** *Hagloedischia primitiva* Gor. ♂, **11.** *Haglotettigonia egregia* Gor. ♂, **12.** *Permophasma kovalevi* Gor., and **13.** *Prosusumania semenica* Gor.

reversed in them as in all other Polyneoptera (excepting Orthoptera which have reversed nymphal wings). The finding of a fragment of a possible tegmen of Phasmatoptera (Fig. 12) in the Upper Permian of Mongolia (Gorochov 1992, *Permophasma*) and of a fore part of the body, possibly belonging to this order, in the Lower Permian of the Ural Mountains (Gorochov 1994c) supports the hypothesis of the origin of Phasmatoptera from a more primitive order than Orthoptera. For the above-mentioned tegmen, a new genus with one new species and a new family were described.

Remarkable finds were made of well-preserved bodies with wings from the Cretaceous of China (Ren 1997, Hagiphasmatidae). These fossils were described as representatives of a new family of stick-insects, but there is an older name - Susumaniidae, described as a subfamily for the wings only (Fig. 13). The latter wings were included in Orthoptera in the extinct Ensiferan superfamily (or family) Phasmomimoidea (Sharov 1968, Gorochov 1988c). Sharov and his followers mistakenly included in this taxon the representatives of two orders: Phasmomimoidea (true Orthoptera known only from the Jurassic) and Susumanioidea (true Phasmatoptera known from Late Jurassic to Paleocene) (Gorochov 2000). These remarkable Chinese discoveries help us to understand that Susumaniidae are the most probable intermediate group between recent Phasmatoptera (consisting of Phasmatoidea and Timematoidea possibly related to Phasmatoidea) and some of the other extinct groups of this order.

Dictyoptera

Information about the first finds of the most ancient mantises (the suborder Mantina) was published in 1993 (Gratshev & Zherikhin 1993).

Two new families, Baissomantidae and Cretomantidae, and several possible representatives of some recent families were described from the Lower Cretaceous of Siberia (all finds are new genera and species; some of them are described from the wings, but the others - from other body parts, including the very characteristic forelegs; (Fig. 14). They are the first discovery of true Mesozoic Mantina showing the intermediate condition of wing structure between that of Jurassic cockroaches from the suborder Blattina and Cenozoic mantises, as well as the possible time of origin of Mantina (Late Jurassic).

The other very interesting find is several well-preserved body imprints of a new genus (with one new species) of Early Cretaceous Brazilian Dictyoptera with more or less sclerotized tegmina, almost as in Coleoptera (Vrsansky 1998, *Ponopterix* Vrsansky & Grimaldi). In this paper, *Ponopterix* was included in the enigmatic family Umenocoleidae, described for fragmentary material from the Lower Cretaceous of China and originally included in Coleoptera (Sicien & Chuan-chieh 1973). Vrsansky considers that Umenocoleoidea are an aberrant superfamily of the suborder "Blattoidea" (Blattina + Mylacridina only), but I cannot exclude that *Ponopterix* and possibly *Umenocoleus* are representatives of a second-oldest branch of Mantina, having a shape of head and pronotum as well as almost raptorial forelegs, similar to mantises (Fig. 15).

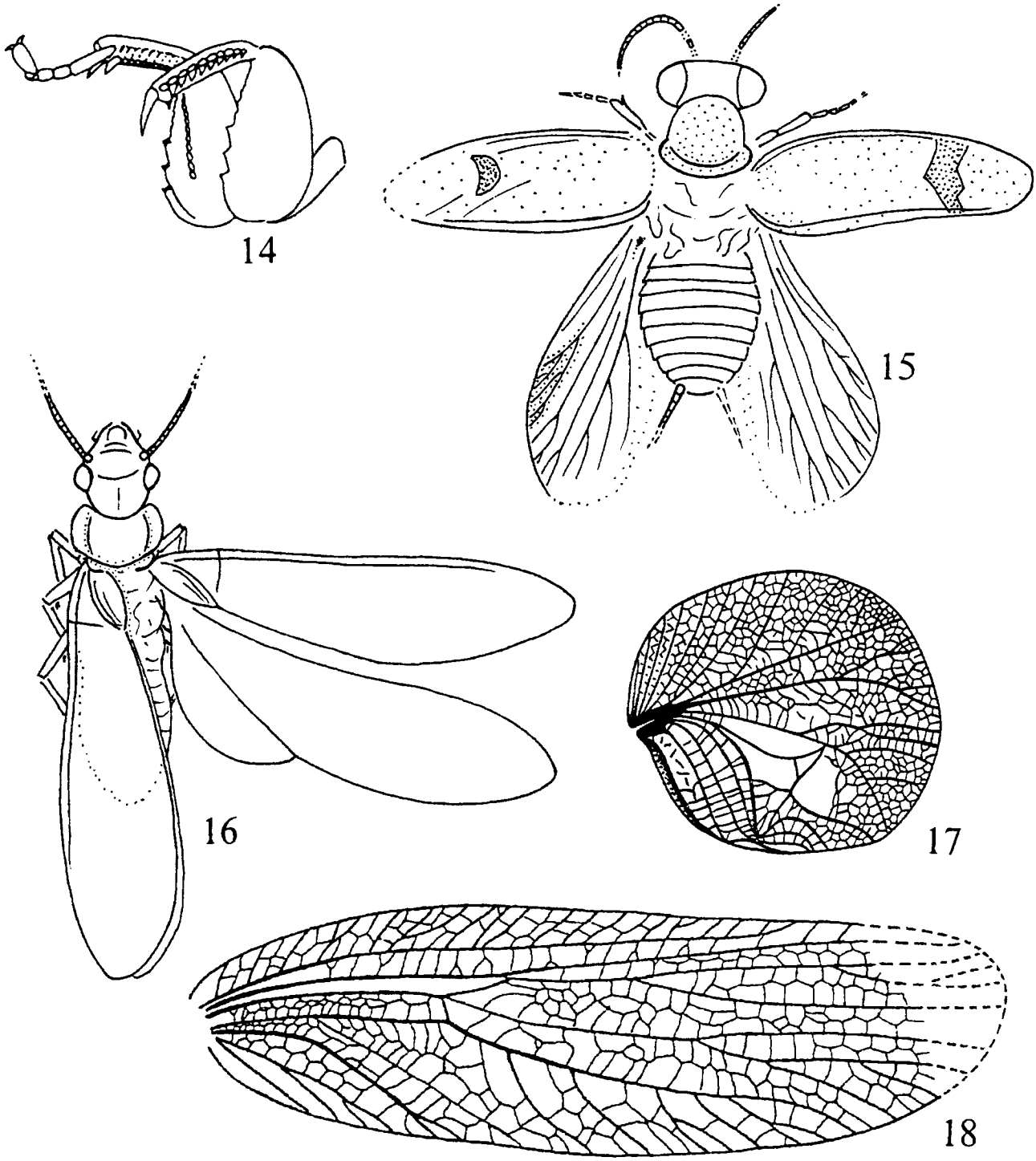
The discoveries of the two oldest Early Cretaceous termites (Jarzembowski 1981, *Valditermes*, England; Lacasa & Martinez 1986, *Meiatermes*, Spain) show that the possible time of origin of this suborder (Termitina) is also Late Jurassic. All these finds were described as new genera and new species. They were included by these authors in the family Hodotermitidae, but the similarity in wing venation of these oldest Termitina to the venation of recent specialized Hodotermitidae is probably superficial, as they have a very primitively structured pronotum (with distinct paranotal lobes) and hind wings (with a widened anal lobe). These characters, as well as their general appearance (Fig. 16), show a great affinity to Cenozoic Mastotermitidae. Moreover, there is no reliable evidence against the inclusion of both these groups in the ancestral superfamily Mastotermitoidea. In this case, Mastotermitidae are a relict of Mastotermitoidea which differ from its ancestors and all other termites in the acquisition of some additional veins. This interpretation of ancestral wing venation of Termitina will allow us to begin a new search for their ancestors among Jurassic Blattina.

Grylloblattida

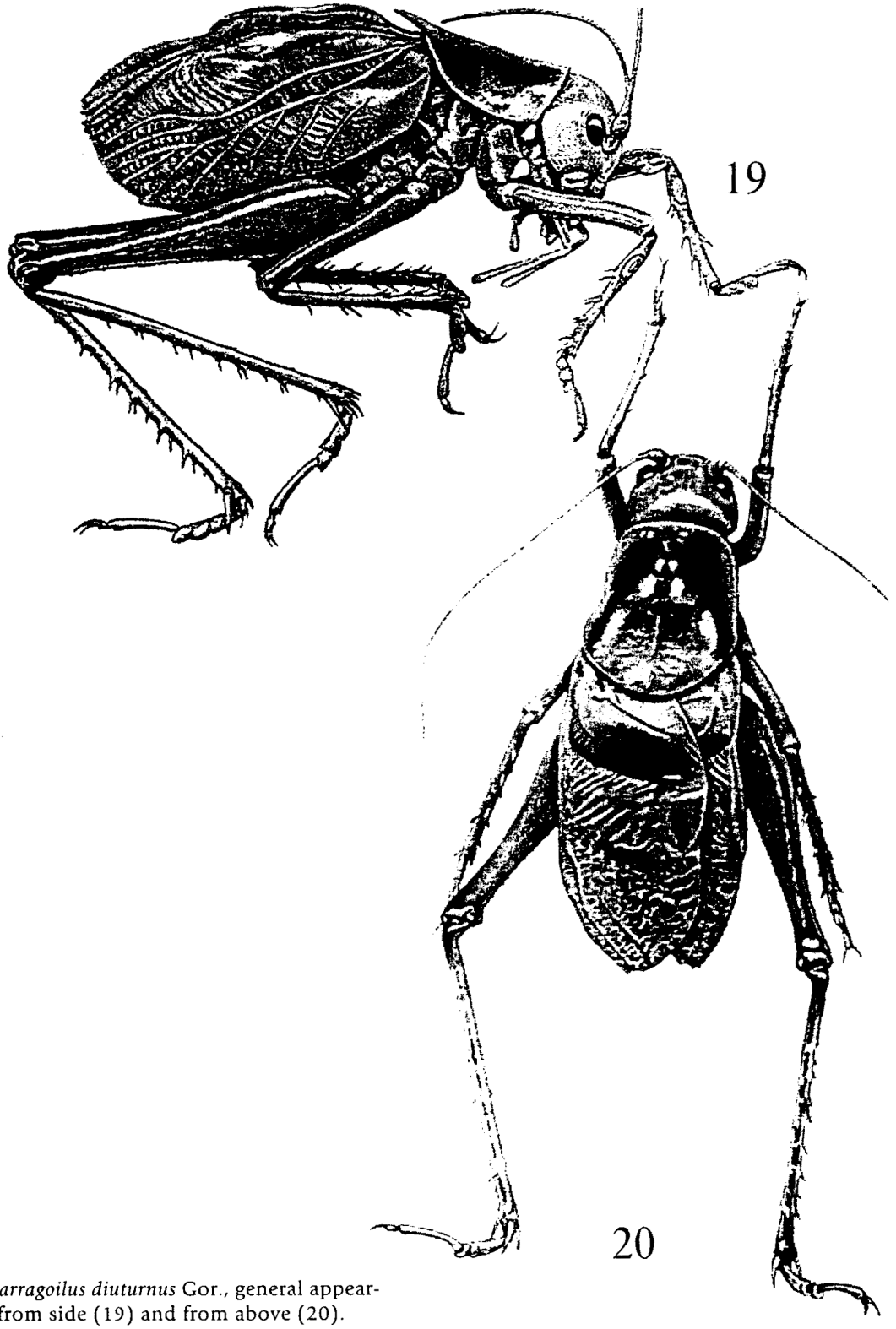
After the discovery that the fossil family Blattogryllidae almost certainly includes Grylloblattida with well-developed wings (Rasnitsyn 1976), numerous and diverse primitive fossil Polyneoptera (or possible Polyneoptera) with a rather unclear systematic position began to be included in this order (Rasnitsyn 1980, Storozhenko 1998). Some of them had a wing venation sufficiently primitive to be considered the possible ancestors of different polyneopteran stocks. The best collection of possible wing plesiomorphies was found in the new family Daldubidae (Fig. 18) described for two new genera with two new species from the Upper Carboniferous of Siberia (Storozhenko 1996b). Its author considers that this family is the most probable ancestral group of the superorder Plecopteroidea sensu Rasnitsyn (1980) and Storozhenko (1998) (Grylloblattida + Plecoptera + Dermaptera + Embioptera). This opinion is insufficiently founded, but Daldubidae are undoubtedly a very interesting and very primitive group of Polyneoptera which helps to understand some of the earliest stages of the polyneopteran wing evolution.

The New Century promises to add many new interesting finds of Polyneoptera. Some information about them published (or unpublished) in 2000-2001 is given below.

A new fossil family for one new genus and two new species from the Upper Jurassic of Kazakhstan (Brachyphyllophagidae) is described in the paper by Rasnitsyn & Krassilov (2000). These enigmatic, comparatively large and phytophagous insects had a gula-like structure at the base of their labium and tegminal venation similar to that of Polyneoptera, therefore this family was provisionally included in Embioptera. If it indeed belongs to this order, we realize the possibility of a further search for its fossil relatives and the reconstruction of the unknown history of Embioptera, as all previous fossils included in this order have given no acceptable evidence of this relationship.



Figs 14-18. 14. *Cretomantis larvalis* Gratsh. & Zher., forelegs; **15.** *Ponopterix axelrodi* Vrsansky & Grim., body with wings; **16.** *Valditermes* sp., reconstruction of general appearance; **17.** *Paracyphoderris erebeus* Stor. ♂, tegmen; **18.** *Dalduba faticana* Stor., tegmen.



Figs 19, 20. *Tarragoilus diuturnus* Gor., general appearance of male from side (19) and from above (20).

Problematical information about some very enigmatic insects (mainly nymphs) from the Baltic amber (Eocene) was published by Arillo, Ortuno & Nel (1997) and Zompro (2001). The latter author found an adult male of these insects, and for them he described the new genus *Raptophasma* (with one new species) included by him in "Orthoptera incertae sedis". In the same paper, Zompro writes that this genus may belong to a new order, and that he found two recent specimens related to *Raptophasma*. The amber insects are somewhat similar to small apterous mantises, but with the distinct "raptorial" fore legs in imago only (these legs are without raptorial spines, with dilated femora and comparatively long tibiae, which are not shorter than the femora) and genital (subgenital) plate produced by the 8th abdominal sternite. Unfortunately, Zompro does not indicate the sex of the specimens with this genital plate: if they are males, Zompro's homology is probably erroneous, since there are no Polyneoptera with the same origin as this plate, but if they are females, these insects may be related to Orthoptera and Phasmatoptera since these orders have a female genital plate produced by the special lobe between 7th and 8th sternites. It is necessary to note that we know of an extinct order related to Orthoptera and Phasmatoptera and having raptorial fore legs: it is the Triassic and possibly Paleozoic Titanoptera (Sharov 1968, Gorochov 2001d).

Some undescribed Permian Protelytridae clearly show hind wings folded in three, as in recent Dermaptera. These unpublished data support the opinion that numerous representatives of the former Paleozoic order Protelytroptera may reasonably be included in the order Dermaptera (Gorochov & Anisyutkin 1998). These data also indicate a possible evolutionary path from the Paleozoic ancestors to the Mesozoic-Cenozoic forms.

There are also some interesting finds among recent Polyneoptera. One of them is the description of a new genus *Aerotegmina* (Orthoptera: Tettigoniidae) with one new African species (Hemp 2001). This representative, belonging to the tribe Hexacentrini (Hemp includes this tribe in Listroscelidinae, but Hexacentrini are, as it seems to me, one of the tribes of Conocephalinae), has a remarkable construction of the male tegmina which has changed into a very large, almost globular, stridulatory apparatus.

Another find is the discovery of a second (new) genus (with one new species) of true recent Hagloidea (Prophalangopsidae) belonging to the relict subfamily Prophalangopsinae (see the paragraph about *Paracyphoderris* at the beginning of this paper). This remarkable insect (Figs 19, 20, 30, 31) lives in the high mountains of the Chinese province Sichuan (Gorochov 2001b, *Tarragoilus*). Brief information about its mode of life and the first description of the early unknown (for this subfamily) female with reduced ovipositor (or subadult nymph of female) are also given in that paper.

Finally, a new (third) genus with one new species of the same subfamily (Prophalangopsinae) was found in the collection of the Institute of Zoology, Chinese Academy of Sciences, Beijing. Its description and a discussion of its systematic position are given below.

Genus *Aboilomimus* gen. n.
(Table 1)

Type species.— *Aboilomimus sichuanensis* sp. n.

Diagnosis.— This new genus is rather similar to both previous genera of Prophalangopsinae in general appearance. Head smooth (Fig. 21), rounded in profile, without angular rostrum, but with a pair of low keels from lateral to median ocelli. Lateral ocelli situated on outer sides of upper parts of these keels, median ocellus situated between lower parts of them. Third antennal segment long (almost as long as scape), approximately twice as long as 2nd or 4th antennal segments (other segments of flagellum distinctly shorter than 2nd or 4th antennal segments); mouthparts clearly shorter than height of epicranium (almost as in *Tarragoilus*); distance between antennal cavities almost equal to width of scape; apical segment of maxillary palpi slightly longer than subapical (4th) or 3rd segments, which are almost equal to each other.

Male pronotum smooth, rounded in transverse section, with more or less rounded posterior and lateral lobes (Figs 21, 22); lateral lobes distinctly longer than in *Prophalangopsis* and somewhat shorter than in *Tarragoilus*; posterior lobe clearly shorter than in *Prophalangopsis* and slightly longer than in *Tarragoilus* (but this lobe much narrower than in *Tarragoilus*).

Fore coxae with distinct, rather short, spine-like angular process; fore femora distinctly longer than pronotum (as in *Prophalangopsis*; slightly shorter than pronotum in *Tarragoilus*), without spines and spurs (apical spines); fore tibiae with a pair of oval open tympana which are rather large, but tympanal region of tibiae is scarcely widened (Fig. 23), four pairs of lower spines, one (unpaired) upper inner spine (all spines rather long, articulated, and situated distad of tympanal area) and two pairs of articulated and rather long spurs; middle femora and tibiae similar to those of forelegs, but slightly longer and with more numerous tibial spines: four pairs of lower spines, three inner and two outer upper spines (structure of tibial spines and spurs as in forelegs); hind femora (Fig. 24) with more or less dilated base (adapted to jumping as in *Tarragoilus*; not as in *Prophalangopsis*), with rudimentary relief of outer surface more or less analogous to that of Anostostomatidae (Stenopelmatoidea), with several very small unarticulated lower spines and without spurs; hind tibiae with rather numerous upper (unarticulated) and several lower (articulated) spines (all these spines more or less short), three pairs of rather long spurs: upper pair longest, middle pair slightly shorter, lower pair much shorter than previous pairs, inner spurs hardly longer than outer ones. All tarsi (Fig. 25) narrow, with narrow pulvillae on sole, short proximal segments (as in *Tarragoilus*; not as in *Prophalangopsis*), and distinct separation of 1st and 2nd segments from each other, but these segments almost relatively immovable; in both other genera of Prophalangopsinae, these segments partly fused with each other.

Male tegmina (Fig. 34) somewhat shortened (probably extending to abdominal apex or slightly longer in living specimen), with almost truncate apex and slightly concave

distal part of costal edge (shape of tegmina in *Prophalangopsis* and *Tarragoilus* clearly different); costal area distinctly wider, with more oblique and less numerous branches of **Sc** than in *Prophalangopsis*, but longer and with less S-shaped stalk of **Sc** than in *Tarragoilus*; secondary **C** distinct (indistinct in *Tarragoilus*), but slightly reduced (well developed in *Prophalangopsis*); **RA** single (with numerous branches in both other genera of this subfamily); **RS** probably also single (single in *Tarragoilus*, with three branches in *Prophalangopsis*); **MP+CuA1** with less numerous branches (4) than in *Prophalangopsis* (10) and *Tarragoilus* (8); last branch of this vein well separated from its other branches as in *Prophalangopsis* (not as in *Tarragoilus*), but less S-shaped and extending to apical part of tegmen (this branch distinctly S-shaped and shorter in *Prophalangopsis*, almost straight and very short in *Tarragoilus*); dorsal part of tegmina, from **CuA** to anal edge, much narrower than in both recent genera of true Prophalangopsidae (almost as in *Aboilus* Mart. from Mesozoic subfamily Aboilinae); area between **MP+CuA1** and **CuA2** distinctly widened (mirror) almost as in *Prophalangopsis*, but proximal part of this widened area with large membranous cells (with numerous small cells in *Prophalangopsis*; in *Tarragoilus*, this area rather narrow and with small cells); area between **CuA2** and **CuP** distinctly widened also (almost as mirror) (in *Tarragoilus* this area is the main stridulatory area, as it is much wider than area homologous to the mirror, but in *Prophalangopsis*, the main stridulatory area is the mirror, as it is distinctly wider than area between **CuA2** and **CuP**); stridulatory vein shorter and less transverse than in both other genera of Prophalangopsinae; chords without fusion of their distal parts (apices of **CuP** and **1A** not fused with each other) as in *Prophalangopsis* (with fusion in *Tarragoilus*); area of chords much narrower than in *Tarragoilus* and without transverse venation (this venation especially developed in *Prophalangopsis*; for comparison see Figs 30, 32, 34).

Male hind wings (Fig. 35) slightly shorter than tegmina, almost round, distinctly wider than tegmina (elongated and narrower than tegmina in *Prophalangopsis* and *Tarragoilus*), with venation typical of *Prophalangopsis* and fossil Prophalangiopsidae (venation of *Tarragoilus* hind wings modified, more similar to that of tegmina); **Sc** shorter than in *Tarragoilus* and comparatively longer than in *Prophalangopsis*; subcostal area somewhat narrower than in *Tarragoilus*, but with similar branches of **Sc**: not numerous, long, and clearly oblique, and wider than in *Prophalangopsis* (branches of **Sc** in *Prophalangopsis* more numerous, short, and almost not oblique); **RA** single (not as in *Tarragoilus* and *Prophalangopsis*); **RS** also single and with base at distal half of wing (**RS** not single and with base at middle part or proximal half of wing in both other genera of Prophalangopsinae); **MP+CuA1** with lost distal part and well-developed additional longitudinal vein connecting proximal part of **MP+CuA1** with apical part of **CuA2**, a condition analogous to that of primitive Stenopelmatoidea (Anabropsinae) and some Tettigonioidea (Scambophyllinae, Pterochrozinae and others), but not to that of *Prophalangopsis* and fossil Prophalangopsidae ehich have both the proximal part of single **MP+CuA1** and mentioned additional vein (in *Tarragoilus*, distal part of **MP+CuA1** with three branches, and distinct additional vein absent); lengths of **CuA2**, **CuP**, **1A**, and 1st branch of **2A** almost equal to those of **R** and **M** (not equal in *Prophalangopsis* and *Tarragoilus*); branches of **2A** numerous, forming rather wide fan as in *Prophalangopsis* and fossil Prophalangopsidae (in *Tarragoilus*, these branches not numerous, forming only small rudiment of fan; for comparison see Figs 31, 33, 35).

Male abdomen (Figs 26-28) with more simple tergites lacking any hind lobes (in other Prophalangopsinae, 7th and 8th tergites with distinct hind lobes); 10th tergite and epiproct fused with each other as in *Prophalangopsis* (separated from each other in *Tarragoilus*); paraprocts with hooks directed upward, similar to those of other Prophalangopsinae; these hooks medium-sized (shorter than in *Prophalangopsis*, but longer than in *Tarragoilus*); cerci rather short, with small membranous apical inflation; genital plate typical of this subfamily, rather short, with hind median notch and well-developed styli (Fig. 29). Male genitalia completely membranous.

Included species.— Type species only.

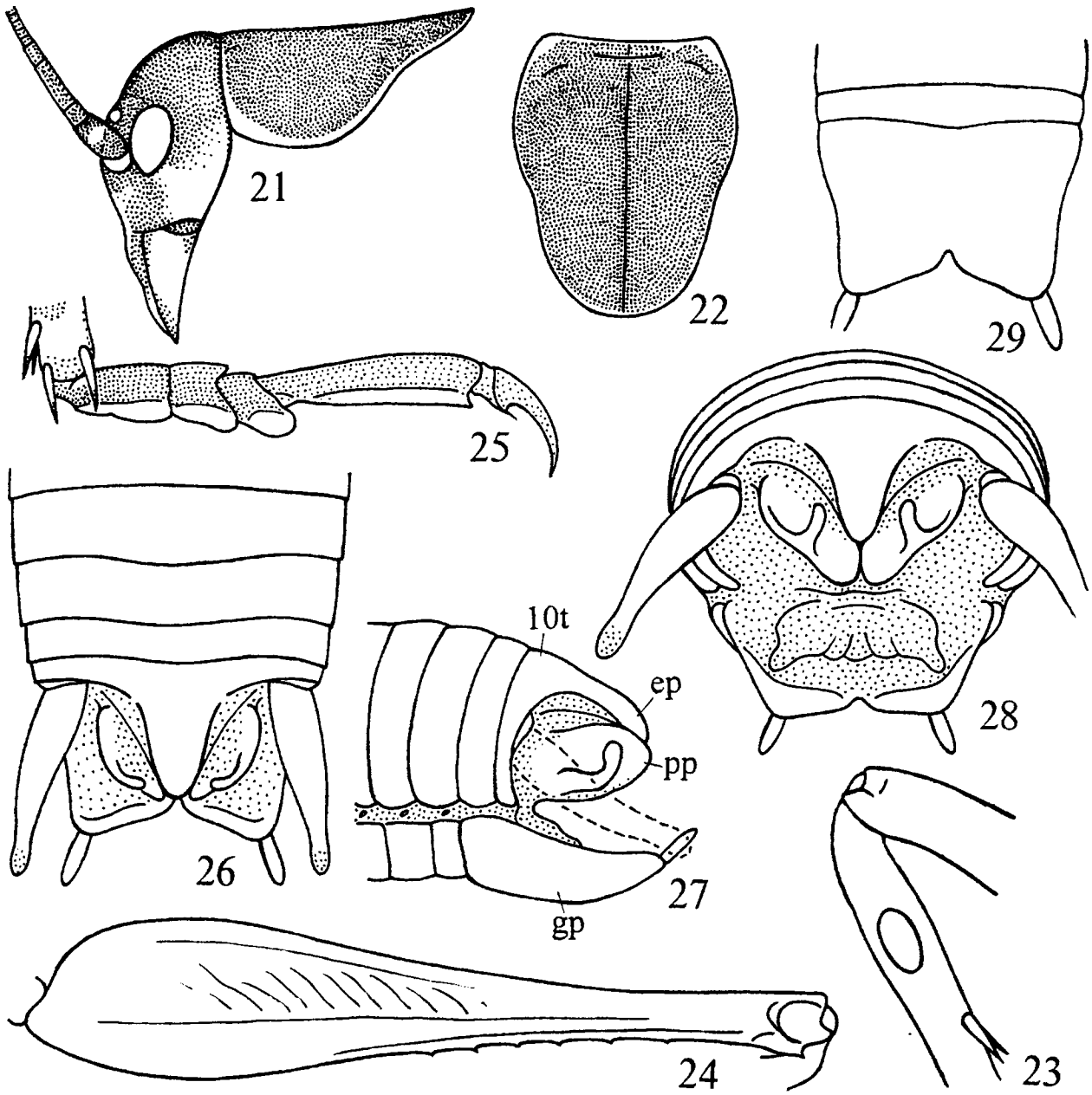
Note: the new genus has some characters similar to those of *Prophalangopsis*, but other ones similar to those of *Tarragoilus*. Nevertheless, *Prophalangopsis* and *Tarragoilus* are united by two more or less likely synapomorphies, distinguishing them from all other representatives of Prophalangopsidae, fossil and recent: the partial fusion of 1st and 2nd tarsal segments and the very wide area between **CuA1** and the anal edge of the male tegmina. In this case, *Aboilomimus* gen. n., characterized by this tarsal fusion and the rather narrow above-mentioned tegminal area (plesiomorphies), is the most primitive representative of recent Ensifera.

Aboilomimus sichuanensis sp. n.
(Figs 21-29, 34, 35)

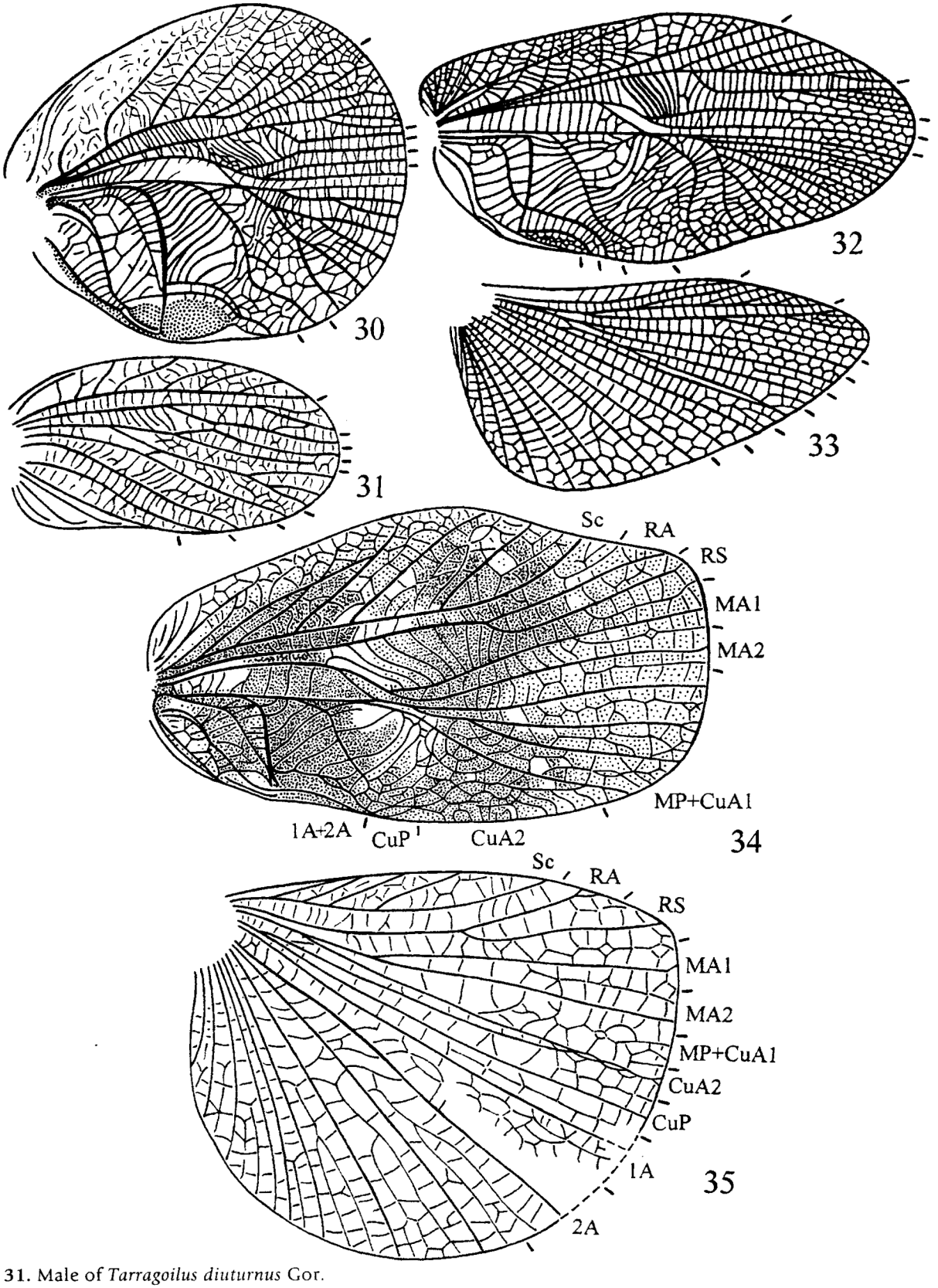
Holotype.— ♂, China, prov. Sichuan, Fenchuan [Wen Chuan], Xingxiu [Ying Xiu], 900 m (Giuding Shan), 14.IX.1983, collector Wang Ruiqi [Wang Rai Chi].

Paratype.— ♂, same data as in holotype. Holotype and paratype in Institute of Zoology, Beijing.

Description.— **Male** (holotype). Head shining; epicranium dark, greyish brown, almost blackish, but with light, almost whitish, ocelli, genae, and large transverse spot near clypeus; mouthparts also almost whitish with greyish brown lateral parts of clypeus, subgenae, and two spots on base of mandibles (excepting their darkened apical part); antennae dark with whitish spot on outer side of scape; palpi light with somewhat darkened proximal segments (1st, 2nd, 3rd in maxillary palpi and only 1st in labial ones). Pronotum also shining, blackish with whitish narrow edges (Figs 21, 22). Legs dark, greyish brown, but with lightish bases from coxae to base of femora, lower part of proximal half of hind femora; small slight spots on upper part of all femora, apical part of all tibiae, all spines and spurs (apices of them darkened), spots near their bases, and membranous sole of all tarsi (Fig. 25); shape of tympana and hind femora as in



Figs 21-25. *Aboilomimus sichuanensis* sp. n., male: holotype. **21.** Head and pronotum from side; **22.** Pronotum from above; **23.** Tympanal organ from side; **24.** Hind femora from side; **25.** Hind tarsus from side. **Figs 26-29.** *Aboilomimus sichuanensis* sp. n. Paratype. (26-28, abdominal apex) **26.** from above, **27.** from side, and **28.** from behind; **29.** Genital plate from below. 10th abdominal tergite; ep - epiproct; gp - genital plate; pp - paraproct.



Figs 30, 31. Male of *Tarragoilus diuturnus* Gor.
Figs 32, 33. *Prophalangopsis obscura* Walk.
Figs 34, 35. *Aboilomimus sichuanensis* sp. n.
(Figs 30, 32, 34, tegmen; 31, 33, 35, hind wing.)

Table 1. Comparison of males of three known genera of Prophalangopsinae.

	Aboilomimus	*Prophalangopsis*	*Tarragoilus*
Lobes of pronotum (Figs 19-22)	Lateral lobes slightly longer than posterior lobe	Lateral lobes distinctly shorter than posterior lobe	Lateral lobes distinctly longer than posterior lobe
	Base of posterior lobe distinctly narrower than middle part of pronotal disc	Base of posterior lobe slightly wider than middle part of pronotal disc	Base of posterior lobe slightly wider than middle part of pronotal disc
Legs (Figs 19, 20, 24, 25)	Fore femora distinctly longer than pronotum	Fore femora distinctly longer than pronotum	Fore femora slightly shorter than pronotum
	Base of hind femora clearly dilated	Base of hind femora almost not dilated	Base of hind femora clearly dilated
	1st tarsal segment, separated from 2nd; both these segments together slightly shorter than 4th tarsal segment (without claws)	1st tarsal segment partly fused with 2nd; both these segments together clearly longer than 4th tarsal segment (without claws)	1st tarsal segment partly fused with 2nd; both these segments together slightly shorter than 4th tarsal segment (without claws)
Tegmina (Figs 30, 32, 34)	Tegmen extending to abdominal apex or slightly longer, oval with truncate apex	Tegmen clearly longer than pterothorax and abdomen together, oval with narrowly rounded apex	Tegmen almost extending to abdominal apex, practically round
	Secondary C partly reduced	Secondary C distinct	Secondary C indistinct
	Costal area wide, with straight stalk and without numerous branches of Sc	Costal area narrow, with straight stalk and numerous branches of Sc	Costal area wide, with S-shaped stalk and without numerous branches of Sc
	RA single	RA with 6 branches	RA with 5 branches
	RS probably single	RS with 3 branches	RS single
	MP+CuA1 with 4 branches; last branch slightly S-shaped, very long (not quite extending to tegminal apex), and well separated from other branches	MP+CuA1 with 10 branches; last branch strongly S-shaped, not long (not quite extending to tegminal apex), well separated from other branches	MP+CuA1 with 8 branches; last branch almost straight, very short (only slightly not extending to tegminal apex), not separated from other branches
	Dorsal part of tegmen (from CuA to anal edge) distinctly narrower than half width of tegmen	Dorsal part of tegmen (from CuA to anal edge) not narrower than half width of tegmen	Dorsal part of tegmen (from CuA to anal edge) not narrower than half width of tegmen
	Area between MP+CuA1 and CuA2 distinctly widened (mirror); its proximal part with large cells	Area between MP+CuA1 and CuA2 strongly widened (mirror); its proximal part with numerous small cells	Area between MP+CuA1 and CuA2 rather narrow; its proximal part with small cells

Table 1. Continuation.

	Aboilomimus	*Prophalangopsis*	*Tarragoilus*
Tegmina (Figs 30, 32, 34) continuation	Area between **CuA2** and **CuP** distinctly widened (almost as mirror), with rather sparse crossveins	Area between **CuA2** and **CuP** slightly widened (clearly smaller than mirror), with numerous crossveins	Area between **CuA2** and **CuP** distinctly widened (clearly larger than previous area), with numerous crossveins
	Chords without fusion of their distal parts (apices of **CuP** and **1A**); area of chords narrow, without crossveins	Chords without fusion of their distal parts (apices of **CuP** and **1A**); area of chords narrow, with numerous crossveins	Chords with fusion of their distal parts (apices of **CuP** and **1A**); area of chords narrow, crossveins not numerous
Hind wings (Figs 31, 33, 35)	Hind wing distinctly wider than tegmen, almost round	Hind wing slightly narrower than tegmen, clearly elongated	Hind wing much narrower than tegmen, clearly elongated
	Costal area moderately widened; **Sc** not long (distinctly not extending to tegminal apex), with clearly oblique, not numerous, rather long branches	Costal area narrow; Sc short (falss far short of extending to tegminal apex), with slightly oblique, rather numerous, short branches	Costal area well widened; Sc long (only slightly short of extending to tegminal apex), with clearly oblique, not numerous, rather long branches
	RA and **RS** single; base of **RS** at distal half of wing	**RA** with 5 and **RS** with 4 branches; base of **RS** at proximal half of wing	**RA** with 2 branches and **RS** single; base of **RS** at middle part of wing
	MP+CuA1 single, with lost distal part and well-developed additional longitudinal vein connecting proximal part of **MP+CuA1** with apical part of **CuA2**	**MP+CuA1** single, with well-developed distal part and additional longitudinal vein connecting proximal part of **MP+CuA1** with apical part of **CuA2**	**MP+CuA1** with 3 well-developed distal branches and without additional longitudinal vein connecting proximal part of **MP+CuA1** with apical part of **CuA2**
	Lengths of **CuA2**, **CuP**, **1A**, and 1st branch of **2A** almost equal to those of **R** and **M**; branches of **2A** numerous, forming large fan	Lengths of **CuA2**, **CuP**, **1A**, and 1st branch of **2A** slightly unequal to those of **R** and **M**; branches of **2A** numerous, forming large fan	Lengths of **CuA2**, **CuP**, **1A**, and 1st branch of **2A** distinctly not equal to those of **R** and **M**; branches of **2A** numerous, forming small fan
Abdomen (Figs 26-29)	Tergites without any hind lobes	7th and 8th tergites with distinct hind lobes	7th and 8th tergites with distinct hind lobes
	10th tergite and epiproct fused with each other	10th tergite and epiproct fused with each other	10th tergite and epiproct separated from each other
	Paraprocts with medium-sized hooks	Paraprocts with long hooks	Paraprocts with short hooks

Figs 23, 24; hind femora with 5-7 outer and 1-2 inner lower denticles (small unarticulated spines); hind tibiae with 8-11 inner and 8-11 outer upper denticles (size of these denticles rather diverse), 2-3 outer and two inner lower spines short, but articulated. Shape and venation of wings as in Figs 34, 35; coloration of tegmina spotted, with dark (greyish brown) and light (yellowish, semitransparent) spots and bands as in Fig. 34; stridulatory vein and many transverse veinlets whitish; hind wings greyish, slightly darkened with dark longitudinal veins and majority of transverse veinlets whitish. Lower part of thorax and abdomen whitish yellow; all other parts of them darkened, greyish brown, including epiproct, paraprocts, genital plate, and cerci, but with lightish styli of genital plate and apices of cerci; structure of abdominal apex as in Figs 26-29.

Variation.— Size of spots and number of spines and denticles of hind legs slightly varied (paratype damaged). Lengths (mm). Body 23; body with wings 28-30; pronotum 6.5-7; tegmina 22-23; fore femora 9.5-10; middle femora 10.5-11; hind femora 18-19; hind tibiae 19.5-20.5.

Female unknown.

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