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EARLY CRETACEOUS INSECTS FROM THE DALAZI FORMATION OF THE ZHIXIN BASIN, JILIN PROVINCE, CHINA

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Abstract: Twenty species of fossil insects are described from the Dalazi Formation in the Zhixin Basin, Jilin Province, China. They are referred to 15 families and 18 genera, among which 16 species and 5 genera are recognized as new, including *Rhipidoblattina magna* sp. nov., *Basiblattina conformis* gen. et sp. nov., *Geosoma prodromum* gen. et sp. nov., *Yanbianella simplex* gen. et sp. nov., *Cristocorixa dalaziensis* sp. nov., *Ensicupes obstusus* sp. nov., *Catinius ovatus* sp. nov., *Catinius artus* sp. nov., *Eodromeus viriosus* sp. nov., *Protorabus minisculus* sp. nov., *Conjunctia longa* sp. nov., *Geotrupoides saxosus* sp. nov., *Proteroscarabaeus robustus* sp. nov., *Umenocoleus nervosus* sp. nov., *Longidorsum generale* gen. et sp. nov. and *Ovigaster cephalotus* gen. et sp. nov.

The Dalazi Entomofauna can be divided into 3 ecological groups: the terrestrial, the aquatic and the semi-aquatic groups. The insect assemblage indicates a palaeo-environment with a stagnant but not deep freshwater lake surrounded by forest. The age of the entomofauna is tentatively considered as Barremian-Aptian. By comparison, the Dalazi Entomofauna is similar to the Early Cretaceous Fossil Entomofaunas of West Mongolia and Transbaikalia, indicating that these three fossil entomofaunas could be closely related.

Keywords: Fossil Entomofauna, Dalazi Formation, Zhixin Basin, Barremian-Aptian, Palaeo-environment

INTRODUCTION

The Dalazi Basin, located in the southeast of Longjing City (originally Yanji County), Yanbian Korean Autonomous District, Jilin Province (Text-fig.1), was a rift basin controlled by NNE rift structure based on the Hercynian Zone of Fold (Tao and Zhang C.,1990). A set of strata deposited in the basin is called Dalazi Formation, which consists of light-yellowed, yellowish brown sandstone, conglomerate and shale.

The Dalazi Formation, generally considered as the typical Early Cretaceous strata, is famous for the fauna represented by *Manchurichthys* (fish) —*Yanjiestheria* (conchostran) —TPN (bivalve faunule).

Studies of the Dalazi Formation began in 1937. Japanese Ueteko (see Yang,1959) called the set of strata the Dalazi System. Nisida (see Yang, 1959) in 1940-1941 called it the Dalazi Series, considered it as the Early Cretaceous and divided it in ascending order into three members, which consist of light-yellow conglomerate, fossil-bearing shale and brownish yellow sandstone respectively. From 1958 to 1959, the 203rd Team of Jilin Coalfield and the Institute of Jilin Coalfield studied this set of strata and agreed basically to Nisida's opinion. Yang Xuelin (1959) named it the Dalazi Formation. Chang Miman and Liu Chichang (1977) studied *Manchurichthys uwatokoi* from this formation and considered it as the middle-late Early Cretaceous. Zhou Zhiyan *et al.* (1980) studied this formation in detail and thought it very possible to be Aptian-Albian. Yu Jingxian and Miao Shujuan (1983) studied the sporopollen assemblage and referred it to the Albian. In the same year, Gou Yunsian (1983) studied the ostracod assemblage and ascribed it to the late Early Cretaceous. Zhang Chuanbo (1986) studied the plant assemblage and considered it as Albian. Tao Junrong and

Zhang Chuanbo (1990) studied the angiosperms and assigned this formation to the Aptian and speculated upon the palaeo-environment based on the plant assemblage and the deposition.

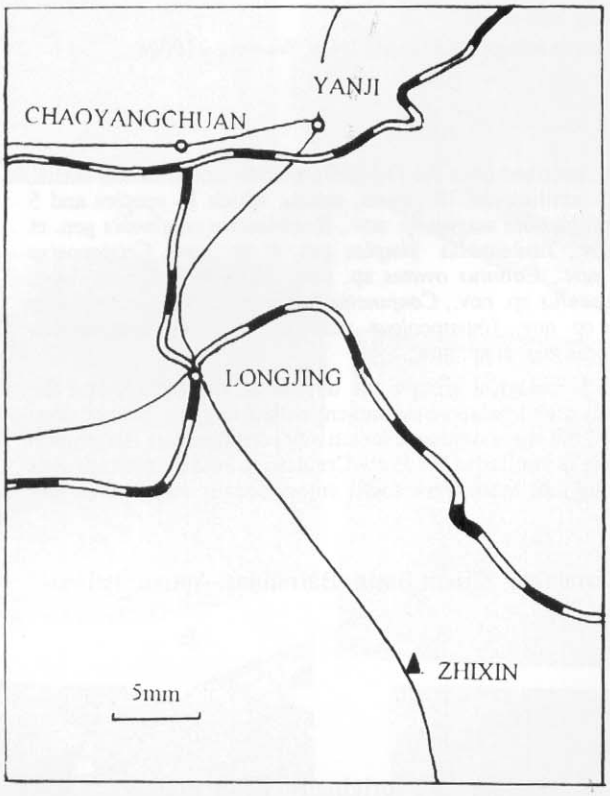

Fig.1 Map showing the location of Zhixin

Only a few of fossil insects from the Dalazi Formation have been reported. Masuzo Ueno (1935) described a fossil specimen and identified it as *Ephemeropsis* sp. But from its characteristics on the photograph, it should be the larva of *Coptoclava longipoda*. Zhou Zhiyan *et al.* (1980) reported a few fossil insects, which were not identified in detail except *Coptoclava longipoda*. Lin Qibin (1992) described some species, including *Rhipidoblattina decoris, Orthnospercheus longjingensis, Coptoclava longipoda* and *Chirono-maptera gregaria.*

The fossil insects described in this paper were collected mainly from the sections to the north of the Zhixin Forest Farm and to the east of the Dalazi River, and partly from the section on the northern side of the path from Dalazi to Jingu and the section on the southern side of the gulch near the path mentioned above. All these fossils were collected from the same horizon.

Now the synthetic section of the Dalazi Formation (Zhou *et al.*, 1980) is briefed as follows:

Quaternary System

~~~~~~~~~~unconformity~~~~~~~~~~

Dalazi Formation

Bed 9 Variegated sandstone, sandy mudstone and muddy shale; yielding Bivalvia, Ostracoda, Conchostraca, Gastropoda and plant remains. (250 m)

Bed 8 Black paper shale, oil shale; upper part consisting of grey mudstone and sandy mudstone. Paper shale yielding Conchostraca, the upper part yielding Bivalvia, Gastropoda and Ostracoda. (30 m)

Bed 7 Variegated sandstone, sandy mudstone, mudstone intercalated with dark grey paper shale and oil shale, yielding abundant animal and plant fossils. The fossils consisting of Bivalvia, Conchostraca, Ostracoda, Gastropoda, fish, insects, sporo-pollen and plants. (200 m)
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Bed 6 Grey calcareous or sandy mudstone containing lots of lumps; calcareous mudstone yielding rich animal fossils such as Bivalvia, Ostracoda and Conchostraca. (50 m)

Bed 5 Black calcareous and silty shale, yielding Conchostraca and plants. (40 m)

Bed 4 Greyish white sandstone intercalated with black grey sandy shale, sandstone in lower part containing gravels; yielding Ostracoda, small bivalves and Gastropoda. (70-150 m)

Bed 3 Thickly stratified yellow, greyish white conglomerate. (60-250 m)

~~~~~~~~~~unconformity~~~~~~~~~~

Palaeozoic metamorphic rocks

ECOLOGICAL ANALYSIS

In this paper twenty species are described. Together with several species published, there are 21 species referred to 16 families and 19 genera, including 16 new species and 5 new genera (Table I). This assemblage is called the Dalazi Fossil Entomofauna by the author.

Interpretations pertaining to the fossil insects are based on known ecological settings of related living species. On this basis the entomofauna has three ecological groups: the terrestrial, the semi-aquatic and the aquatic groups.

The terrestrial group

Rhipidoblattina, Basiblattina usually lived near the ground similar to their modern relatives, hiding under bark, logs or stones and running about quickly. They were omnivorous. *Geosoma*, similar to some modern dermapteran insects, frequented crevices under the bark of trees and in fallen logs, and crawled beneath debris on the ground. It was also omnivorous, living on living and dead plant and animal matter. *Yanbianella* was phytophagous, sucking liquid from succulent parts of plants. *Ensicupes* and *Catinius* fed in rotten wood. *Eodromeus*, *Protorabus* and *Conjunctia* were carnivorous, living under bark, logs or bryophyte and preying on other insects and small animals. *Geotropoides* and *Proteroscarabaeus* were very possibly saprophagous. *Longidorsum* fed on leaves and tender stems of plants. The adult female bored a hole in a seed or fruit of plants with her rostrum and laid an egg in it. Like some modern relatives of ichneumonoid wasps, *Ovigaster* was parasitic, parasitizing other insects.

On the basis of the above-mentioned analysis, the terrestrial insects can be divided into four ecological groups: the phytophagous, the carnivorous, the omnivorous and the saprophagous groups. The parasitic insect, *Ovigaster cephalotus*, eventually consumed its host, and hence was a special type of carnivore. Most of these terrestrial insects were foresters, from which we can deduce the fact that plants were varied and grew lushly around the basin during that period. Plenty of plants (Zhang, 1986; Tao & Zhang, 1990) and spore-pollen (Yu & Miao, 1983) preserved with fossil insects give evidence in support of this deduction. After studying the plants from the Dalazi Formation, Tao and Zhang (1990) came to the conclusion that the palaeo-environment was a lake surrounded by moisture-loving filices, herbaceous or low shrub-like angiosperms on the shore, conifers on the highest layer, and cycads and high angiosperms on the lower layer, which formed a dense forest.

Phytophagous insects feed on plants and obtain substance and energy. Meanwhile, they are also preyed on by predacious insects and other animals. This gives rise to the flow of substance and energy. According to the Principal of Energy Pyramid, the kinds and number of phytophagous insects must be far more than those of predacious insects, only by which can ecological equilibrium
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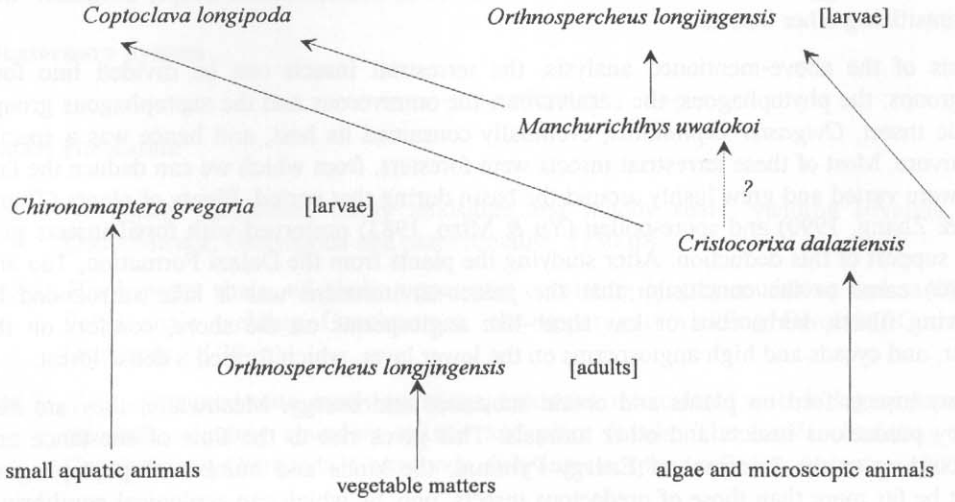
be kept in the ecosystem. But in this entomofauna the species of phytophagous insects are distinctly fewer. It can be concluded that many species of above insects must not be preserved as fossils and more specimens need to be collected. Under such conditions, therefore, it is very difficult to give deep ecological analysis of the terrestrial group.

The semi-aquatic and the aquatic groups

Adults of *Chironomaptera gregaria* lived in the vegetation around water. The female laid eggs in shallow and smooth fresh water and the eggs hatched as larvae (wrigglers), which were predators (particularly of mosquito larvae) and pupated in water. *Cristocorixa dalaziensis*, similar to some living water boatmen, lived in stagnant but not deep fresh water during the whole of its life history. It swam freely and fed on algae and microscopic animals in water. *Coptoclava longipoda* lived in water during the whole of its life history similar to some modern predacious aquatic beetles. The larva, with long body, robust mandibles and swimming legs, could quickly swim and preyed on *Cr. dalaziensis* and immature fishes such as *Manchurichthys uwatokoi*. The adult had hairs on the ventral surface of the abdomen near spiracles. The hairs were very possible water-repellent ones which retained a film of air when the beetle was submerged. The film of air functioned as a gill, taking up oxygen and losing carbon dioxide to the water. But the bettle must swim to water surface to get enough fresh air whenever the film of air could not retain enough dissolved oxygen from the surrounding water. It else had sharp mandibles, developed eyes, and flattened and oar-like hind legs, with which the adult could swim quickly and preyed on other small animals like the larva. *Orthnospercheus longjingensis,* the aquatic hydrophilid beetle, had different feeding behaviors in different life stages. The larva was carnivorous, preying on small aquatic animals such as small fishes, immature *Cr. dalaziensis.* The adult was phytophagous, feeding on vegetable matters. The discovery of these aquatic and semi-aquatic insects indicates that there had been a lake at Dalazi during that period. *Cr. dalaziensis, Or. longjingensis*, and larvae and pupae of *Ch. gregaria* lived in stagnant but not deep fresh water. *C. longipoda* preyed on *Cr. dalaziensis*, which indicates that *C. longipoda* also lived in stagnant but not deep water. Judging from the ecological habits of these insects, the author speculates that the Dalazi Lake was stagnant but not deep. This conclusion was supported by sedimentary petrology. The bed bearing fossil insects, consisting of yellow siltstone, mudstone intercalated with thinly stratified dark-grey shale, indicates that the lake was stagnant but not deep so light-coloured siltstone and mudstone were deposited, although sometimes the water became deeper as indicated by dark-grey shale.



In the ecosystem of the Dalazi Lake, aquatic and semi-aquatic insects formed a complicated food web with other aquatic animals and plants because of feeding relationship. Based on the materials having been collected so far, it is very difficult to analyse concretely the food web. But in the light of the feeding relationship of these insects, there at least exist the relations shown on the preceding page.

On the basis of analyses above, the author speculates that the palaeo-environment was a stagnant but not deep freshwater lake surrounded by exuberant plants which very possibly formed a forest.

THE AGE OF THE DALAZI FOSSIL ENTOMOFAUNA AND COMPARISON WITH OTHER EARLY CRETACEOUS ENTOMOFAUNAS.

The Dalazi Entomofauna includes 5 known species: *Rhipidoblattina decoris*, *Coptoclava longipoda*, *Orthnosperchus longjingensis*, *Jingxidiscus lushangfenensis* and *Chironomaptera gregaria*. *Rh. decoris* is present in the Late Jurassic Yixian Formation in western Liaoning Province (Lin, 1978) and the Dalazi Formation (Lin, 1992). *C. longipo*da is distributed throughout the Late Jurassic-Early Cretaceous non-marine strata in East Asia (Hong, 1990). *Or. longjingensis* was found in the Dalazi Formation (Lin, 1992). *J. lushangfenensis* was discovered in the Early Cretaceous Lushangfen Formation at Lushangfen village of Fangshan, Beijing (Hong, 1981) and the Early Cretaceous Laiyang Formation in Shandong (Hong, 1990). *Ch. gregaria* is present in northern China and southern Mongolia from the Late Jurassic to the Early Cretaceous in age and thrived in the Early Cretaceous (Hong, 1990). From the distributions of the 5 species in age, the entomofauna could be from the Late Jurassic to the Early Cretaceous age and it is difficult to determine its definite age.

Now to analyse the known genera of the entomofauna. *Umenocoleus* includes only one known species *U. sinuatus*, present in the Lower Cretaceous in Yumen of Gansu, China (Chen and T'an, 1973). *Cristocorixa* consists of 3 known species. *C. gurvanica* and *C. diaprepocoroides* are present in the Early Cretaceous Gurvaneren Formation in West Mongolia (Popov in JS-MPE, 1986) and *C. similis* in the Early Cretaceous Anda-khuduk Formation in Mongolia (Popov, 1988). *Ensicupes* contains a known species *E. guyangensis*, present in the Early Cretaceous Guyang Formation in Inner Mongolia (Hong and Wang, 1976). *Eodromeus* consists of 6 known species. *E. antiquus* exits in the Upper Jurassic in South Kazakhstan (Ponomarenko in Arnoldi *et al.*, 1977), *E. sternalis* in the Early Cretaceous Tignin Formation in Transbaikalia (Ponomarenko in Arnoldi *et al.*, 1977), *E. dissectus* and *E. major* in the early Cretaceous Zazin Formation in Transbaikalia (Ponomarenko in Arnoldi *et al.*, 1977), *E. mongolicus* in the Lower Cretaceous of Bon-Tsagan, Mongolia (Ponomarenko, 1989), and *E. sulcatus* in the Early Cretaceous Sinkhuduk Formation in Mongolia (Ponomarenko, 1989). *Protorabus* comprises 7 known species, among which *P. planus, P. nigrimoriticola* and *P. magnus* are distributed in the Upper Jurassic in South Kazakhstan (Ponomarenko in Arnoldi *et al.*, 1977), *P. kobdoensis* and *P. elongatus* in the Gurvaneren Formation in West Mongolia (Ponomarenko in Arnoldi *et al.*, 1977), *P. crassus* in the Early Cretaceous Dain Formation in Mongolia (Ponomarenko, 1989), and *P. tsaganensis* in the Lower Cretaceous in Mongolia (Ponomarenko, 1989). *Conjunctia* has only one known species, *C. prodroma*, present in the Zazin Formation in Transbaikalia (Ponomarenko in Arnoldi *et al.*, 1977). *Geotrupoides* comprises 4 known species. *G.sulcatus. G. leptoscelis* and *G. vitimensis* are present in the Zazin Formation in Transbaikalia (Nikritin in Arnoldi *et al.*, 1977), and *G. longipes* in the Gurvaneren Formation in West Mongolia (Ponomarenko in JS-MPE, 1986). *Proteroscarabaeus* is composed of 6 known species. *P. yeni* occurs in the Zazin Formation in Transbaikalia (Nikritin in Arnoldi *et al.*, 1977) and Laiyang Formation in Shandong, China (Grabau, 1923), *P. baissensis* in the Zazin Formation (Nikritin in Arnoldi *et al.*, 1977), *P. punctatus* in the lower Cretaceous in West Mongolia (Ponomarenko in JS-MPE, 1986), and *P. crassus, P. oblongus* and *P. sibircus* are present in the lower Cretaceous in East Transbaikalia (Ponomarenko in Rasnitsyn *et al.*, 1990). *Catinius* includes only one known species, *C. pelta*, in the Upper Jurassic in Kazakhstan (Ponomarenko, 1968).

Table 1 Table showing the Dalazi Entomofauna compared with the WM and the TB Entomofaunas

The Dalazi Entomofauna	The WM Entomofauna	The TB Entomofauna
Blattaria	O	O
Mesoblattinidae	F	F
Rhipidoblattina decoris	G	G
Rhipidoblattina magna		
Basiblattina conformis		
Dernaptera	O	O
Pygidicranidae		
Geosoma prodromum		
Homoptera	O	O
Cicadellidae	F	F
Yanbianella simplex		
Heteroptera	O	O
Corixidae	F	F
Cristocorixa dalaziensis	G	
Coleoptera	O	O
Taldycupidae		
Ensicupes obtusus		
Catiniidae		
Catinius ovatus		
Catinius artus		
Coptoclavidae	F	F
Coptocava longipoda		GS
Trachypachidae	F	F
Eodromeus viriosus		G
Carabidae	F	F
Protorabus minisculus	G	
Conjunctia longa		G
Hydrophilidae	F	F
Orthnospercheus longjingensis		
Scarabaeidae	F	F
Geotrupoides saxosus	G	G
Proteroscarabaeus robustus	G	G
Familia incertae sedis		
Jingxidiscus cf. *lushangfenensis*		
Umenocoleidae		
Umenocoleus nervosus		
Eobelidae	F	
Longidorsum generale		
Diptera	O	O
Chaoboridae	F	F
Chironomaptera gregaria	G	G
Hymenoptera	O	O
Ichneumonomimidae		F
Ovigaster cephalotus		

Notes: the WM Entomofauna — the Cretaceous Entomofauna of West Mongolia; the TB Entomofauna — the Cretaceous Entomofauna of Transbaikalia; O—a common order between the Dalazi Entomofauna and another one; F—a common family; G—a common genus; S—a common species

Most of these known genera and species are distributed in the Early Cretaceous strata in Transbaikalia and Mongolia. But the matter in dispute is the definite age of these strata. Palaeoentomologists ascribed these strata to Neocomian but palaeobotanists regarded them as Barremian-Aptian (Vakhrameev and Kotova, 1977; Vakhrameev, 1991). The author trends to support the palaeobotanists' opinion. Most of the known genera of the Dalazi Entomofauna are present in these strata in Transbaikalia and West Mongolia, which suggests that the Dalazi Formation is nearly equal to the strata in age. So the age of the Dalazi Entomofauna is tentatively ascribed to Barremian-Aptian.

So far, many entomofaunas of Early Cretaceous have been discovered throughout the world. However, those that have been studied in detail and known comparable in age with the Dalazi Entomofauna are only a few. They include the Early Cretaceous Koonwarra Entomofauna (Jell & Duncan, 1986), the Early Cretaceous Santana Entomofauna (Grimaldi, 1991), the Early Cretaceous Entomofauna of West Mongolia (JS-MPE, 1986) and the Early Cretaceous Entomofauna of Transbaikalia, but the former two faunas are distinctly different from the Dalazi Entomofauna by features.

The Entomofauna of West Mongolia includes 163 species referred to 65 families and 112 genera. These insects represent 15 orders, dominated by Coleoptera (44 genera 16 families), Diptera (39 genera 15 families) and Hymenoptera (21 genera 9 families) in terms of diversity (JS-MPE, 1986). Comparison between the Entomofauna of West Mongolia and the Dalazi Entomofauna indicates that there are 6 common genera, 9 common families and 7 common orders but no common species (see Table I).

The materials of the Early Cretaceous Entomofauna of Transbaikalia are scattered. From the materials collected (Popov, 1964; Rasnitsyn, 1975, 1977; Ponomarenko, 1976, 1989, 1990a; Arnoldi *et al.*, 1977; Rasnitsyn *et al.*, 1990), it is found that 7 genera, 8 families and 6 orders in the Dalazi Entomofauna have representives in the Transbaikalia Entomofauna and there is only one common species, *Coptoclava longipoda*, between the two faunas (see Table 1).

Based on the analyses above, these three faunas are similar and, perhaps, closely related to each other.

SYSTEMATIC PALAEONTOLOGY

Order Blattaria Latreille, 1810
Family Mesoblattinidae Handlirsch, 1906
Genus *Rhipidoblattina* Handlirsch, 1906

Rhipidoblattina decoris Lin, 1978
(Plate 1, fig.2; Fig.2)

1978 *Rhipidoblattina decoris* Lin, p. 330, pl. II, fig. 15
1992 *Rhipidoblattina decoris.* Lin, p.418, pl.164, fig.1

Material: DLZ050, a tegmen with apex not preserved.

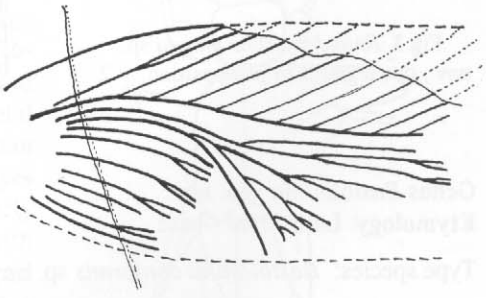


Fig.2 *Rhipidoblattina decoris* Lin, a tegmen with apex missing, × 3.4

Description: Tegmen length as preserved 17mm, width 8.8mm. Humeral area narrowed, as long as anal area. Vein Sc straight like a branch from vein R, branching into two near the middle of vein Sc.

Vein R slightly convex over anal area and then becoming straight with many comblike branches. Vein M convex as much as base of vein R near the stem of vein R, divided into two branches at the level of the end of anal area, the first one single and the second dichotomous branching. Vein CuA acuate, branching before the first branching of vein M, with 6 branches seen. Vein A with about 8 branches, most of them branching again.

Rhipidoblattina magna sp. nov.
(Plate 2, fig.3; Fig.3)

Etymology: From Latin "magnus"--large.

Material: Holotype DLZ024, DLX025, part and counterpart; the left and the right tegmina preserved in juxaposition, the left poorly preserved and the right better.

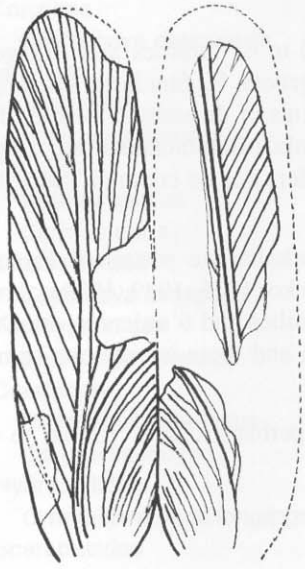


Fig.3 *Rhipidoblattina magna* sp. nov., two tegmina in juxaposition, × 2

Description: Tegmen 38 mm (maybe 40 mm) long, 10 mm wide. egmen elongate with costal and posterior margins nearly straight, apex rounded. Humeral area narrow and a little shorter than anal area. Vein Sc straight, branching into 2 at middle and ending in costal margin. Vein R slightly convex before the middle and then becoming straight, with 15 comblike branches; the first to sixth ones simple and the rest branching one or two times. Radial area about half the tegmen width. Vein M divided into 2 branches, the former branching 3 times and forming 4 branches with many secondary branches near apex; the later with 3 branches. Vein CuA poor-preserved, branching behind the first branching of vein M, anal area not high. Vein A with 10 branches, the first single and the rest branching one or two times. Tegmen without intercalary veins and crossveins.

Comparison: The new species resembles *Rh. hebeiensis* Hong, but there are some main differences as follows: The tegmen of the new species is distinctly long and about twice as long as that of the latter. The new species has a tegmen with the ratio of length to width being 4:1 but the latter 3:1.

Genus *Basiblattina* gen. nov.
Etymology Latin "bas"--base

Type species: *Basiblattina conformis* sp. nov.; Lower Cretaceous, Northeast China.

Diagnosis: Tegmen elongate with humeral area broadened. Vein Sc with 2 branches. Vein R strongly arcuate at the length of anal area near base and then becoming smooth towards apex, with many comblike branches; anal area high, nearly as long as humeral area. Vein A with 8 branches.

Comparison: The new genus is similar to *Rhipidoblattina* (Handlirsch, 1906), but differs in new genus with humeral area broadened and vein R strongly arcuate for basal half of tegmen length.

Basiblattina conformis sp. nov.
(Plate 1, fig.4; Fig.4)

Etymology: Latin "conformis"--similar.

Material: Holotype DLZ030, DLZ031, part and counterpart, two tegmina preserved in juxtaposition with apexes missing and anal areas partly overlapping.

Description: Tegmen length as preserved 19mm, width 8mm. Humeral area broadened, nearly as long as anal area. Vein Sc straight with 2 branches ending in costal margin. Vein R strongly arched at the length of anal area near base and straight for the rest, with many comblike branches; the preceding five simple, not forking, each of the rest forking and forming 2 branches. Radial area about half the tegmen width. Vein M divided into 2 branches with anterior branching late and forming 2 branches, posterior branching many times and forming many branches. Vein CuA with 8 branches, most of them forking near end.

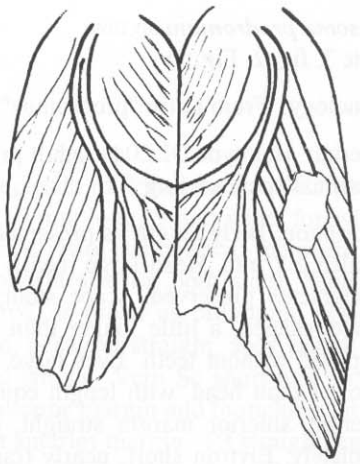


Fig. 4 *Basiblattina conformis* gen. et sp. nov, two tegmina in juxaposition with apexes missing, × 3

Order Dermaptera Leach, 1817
Suborder Forficulina Newman, 1834
Family Pygidicranidae Verhoeff, 1902
Genus *Geosoma* gen.nov.

Etymology: From Greek "geo"--earth, "soma"--body.

Type species: *Geosoma prodromum* sp. nov.; Lower Cretaceous, Northeast China.

Diagnosis: Size moderate, body slender. Head large, somewhat triangular. Antennae elongate, over 26-segmented, with scape massive, longer than wide and shorter than the third; the latter shorter than the total length of the fourth and fifth; the rest small and longer than wide; flagella gradually becoming thin towards apex. Eyes very large on both sides of head base. Pronotum nearly reversely trapezoidal and a little narrower than head with eyes included. Elytron short, nearly trapezoid-shaped. Hindwing short and narrow. Legs short; hind femur with a ridge. Abdomen becoming gradually narrow towards its apex.

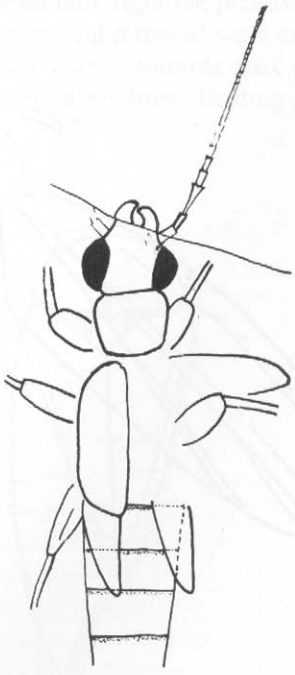


Fig.5 *Geosoma prodromum* gen. et sp. nov., × 5

Comparison: The new genus is alike to *Archaeosoma* Zhang by large, nearly triangular head, many-segmented antennae (*Archaeosoma* with 24 segments), thick and long scape, large eyes, narrower and reversely trapezoidal pronotum, hidden scutellum, well-developed elytra, narrow hindwings and short legs

with thick femora. But the new genus differs from the known in the latter having the following features: body is clothed with short hairs, scape of antenna longer than the third, ocelli are distinct, eyes are divided into fore and hind parts and pronotum is wider than its length.

Geosoma prodromum sp.nov.
(Plate 3, fig. 2; Fig. 5)

Etymology: From Latin "prodromus"--advanced.

Material: Holotype DLZ041, adult preserved in dorsal view with antennae and legs not complete and abdominal apex missing.

Description: Body length as preserved 13mm, width 3mm; elytron length 4mm; hindwing length as revealed 2.2 mm. Head large, nearly triangular with length equal to width. Antennae filiform,with 26 segments preserved; scape stout; the second distinctly thin and as long as scape; the third trumpet-shaped, a little longer than scape; each flagellum longer than wide. Mandibles stout and sharpened without teeth. Eyes large and protruding on both sides of head base. Pronotum slightly narrower than head, with length equal to width of anterior border, and anterior a little wider than posterior; anterior margin straight, posterior arched and lateral sides straight. Scutellum hidden completely. Elytron short, nearly trapezoidal. Hindwing narrow and one third as wide as the first abdominal segment, its apex beyond anterior border of the third abdominal segment. Legs with femora stout and tibiae slender; fore femora thick and short; middle slightly thinner and longer than fore and so hind than middle; hind femur with a longitudinal ridge. Abdomen gradually thinning towards apex,with 4 segments preserved and each other equal in length.

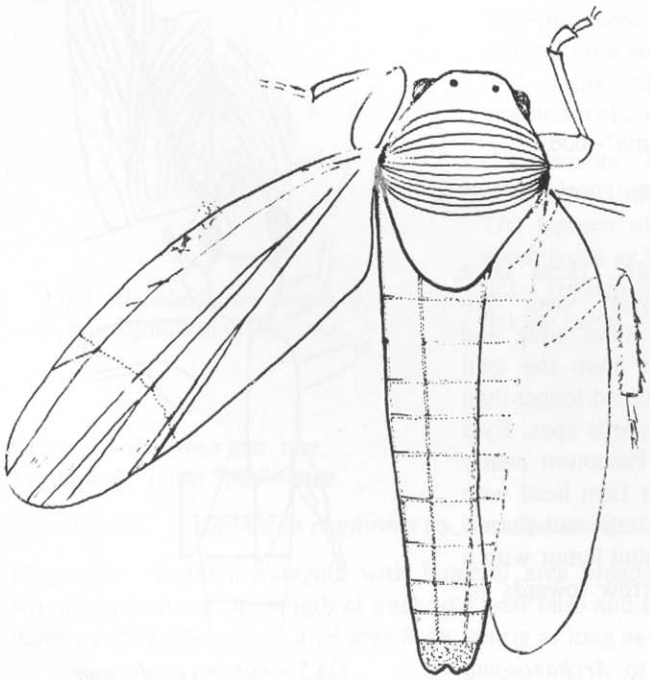


Fig.6 *Yanbianella simplex* gen. et sp. nov., × 8

Order Homoptera Leach, 1815
Family Cicadellidae Latreille, 1825
Genus *Yanbianella* gen. nov.

Etymology: From Yanbian Korean Autonomous District, Jilin province, P. R. China.

Type species: *Yanbianella simplex* sp.nov.; Lower Cretaceous, Northeast China.

Diagnosis : Head transversely broad; eyes lateral, protrusive. Pronotum elliptical. Fore wing with few veins, veins of basal two thirds of wing length weak and of distal one third distinct. Vein Rs diverging from vein R near two thirds of wing length from base.Vein M divided into MA, MP; vein MP branching into two.Vein CuA weak. Vein CuP straight and distinct. Veinlets many near wing apex. Legs with femora stout and tibiae slender. Abdomen nine-segmented,as wide as posterior border of thorax and then narrowed towards apex;

apex abdominis with a pair of genital lobes.

Comparison: This new genus is similar to *Myangadina* from Lower Cretaceous in West Mongolia, but the former can be distinguished from the latter by its elliptical pronotum, simple forewing veins and the wide first and second abdominal segments.

Yanbianella simplex sp. nov.
(Plate 1, fig.1; Fig.6)

Etymology: From Latin "simplex" — simple.

Material: Holotype DLZ005. DLZ006, part and counterpart; a cicada in dorsal view with antennae, hindwings not preserved and legs incomplete.escription: Body 10 mm long, 3 mm wide; forewing 8 mm long, 2.6 mm wide. Head broad; eyes lateral, protrusive; two ocelli small between eyes. Pronotum transverse. elliptical with many transverse,striae concentrated on both sides. Scutellum large, crescent-shaped with anterior margin moderately concave, as broad as pronotum; posterior strongly concave. Forewing with anterior margin slightly arched; posterior straight; apex round; anal angle obtuse; the broadest a little behind base. Veins few and simple. Vein Sc short and straight, ending in anterior margin. Vein R a little curved, parallel to anterior margin and branching into R1, Rs near two thirds of wing length from base.R1 short, ending in anterior margin. Rs straight, ending in apex. Vein M divided into MA, MP near one fourth of wing length from base; MA straight, simple; MP branching into two slightly behind two thirds of wing length from base.Vein CuA weak, straight; vein CuP distinct and straight, ending in posterior margin.Clavus large without veins.Veinlets dense near wing apex. Veins weak and indistinct of two thirds of wing from base, but distinct of distal one third. Forelegs with femora stout, tibiae slender and tarsi three-segmented; middle legs similar to forelegs with tarsi not preserved; hind legs with only right leg preserved, its femur long, tibia having a row of stout and long spines on outer margin and a row of weak ones on inner, tarsus three-segmented. Abdomen elongate, becoming gradually narrow towards apex with 9 segments in equal length; base equal to thorax in width; two longitudinal lines dividing dorsal surface into 3 equal parts.

Order Heteroptera Latreille, 1810
Family Corixidae Leach, 1815
Genus *Critocorixa* Yu. Popov, 1986

Cristocorixa dalaziensis sp. nov.
(Plate 1, fig.3; Fig.7)

Etymology: From the Dalazi Village for the collecting site.

Material: Holotype DLZ023, DLZ024, part and counterpart, preserved in dorsal view with head, legs and abdomen incompletely preserved.

Description: Body 6 mm (preserved) long, 3 mm (restored) wide; tegmen 4.8 mm (preserved) long, 1.5 mm wide. Head poorly preserved, distinctly narrower than prothorax. Pronotum broad, its width double length with a short longitudinal ridge near posterior margin; anterior margin slightly arched, distinctly narrower than posterior; posterior wave-shaped with the middle protruding; sides straight.

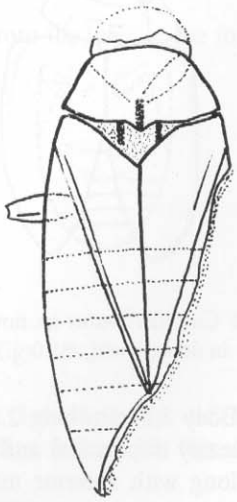


Fig.7 *Cristocorixa dalaziensis* sp.nov., incomplete in dorsal view. × 10

Scutellum transervely triangular, its width about double length with 2 weak longitudinal ridges. Tegmen with anterior margin distinctly acurate; base narrow and apex broad; corium without any veins; membrane nearly missing completely; clavus large, nearly triangular with a longitudinal vein nearly parallel to vein Cu. Foreleg with femur stout; hindlegs with only left femur left, stout. Abdomen as broad at base as metathorax, becoming gradually narrow towards apex, 6 segments seen.

Comparison: The new species is similar to *C. diaprepocoroides* Yu. Popov, but differs in new species having a shorter longitudinal ridge on pronotum and a long and large clavus.

Order Coleoptera Linnaeus, 1758
Suborder Archostemata Kolbe, 1908
Family Taldycupidae Rohdendorf, 1961
Genus *Ensicupes* Hong, 1976

Ensicupes obtusus sp.nov.
(Plate 3, fig.7)

Etymology: From Latin"obtusus"--blunt.

Material: Holotype DLZ034, DLZ035, part and counterpart, right elytron; black in colour.

Description: Elytron 7.5 mm long, 2.5mm wide. Elytron knife-shaped with disc a little convex; basal edge slightly acurate; humeral margin slightly rounded; lateral and sutural margins parallel for most part, then becoming strongly narrow towards apex; apex obtusely rounded; lateral border distinct, about 0.2 mm wide. Elytron with reticulate venation consisting of 9 thick longitudinal veins separated on each side by a row of nearly quadrilateral cells, with a few additional cells basally; the veins parallel at middle, close near base and some merged near apex.

Comparison: The new species is close to *E. guyangensis* Hong et Wang in the characters of elytron, but differs in the former having a distinctly small elytron with lateral border narrow and sutural margin strongly arched near base.

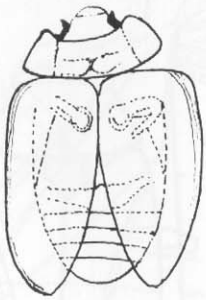


Fig.8 *Catinius ovatus* sp. nov., in dorsal view, × 10

Family Catiniidae Ponomarenko,1968
Genus *Catinius* Ponomarenko,1968

Catinius ovatus sp.nov.
(Plate 3, fig.4; Fig.8)

Etymology: From Latin"ovatus" — oval.

Material: Holotype DLZ017, a beetle dorsally preserved with antennae missing, legs incomplete; yellowish brown in colour.

Description: Body 3.8 mm long 2.5 mm wide; elytron 2.7 mm long. Head transversely triangular with clypeus nearly trapezoidal and eyes large on both sides of base. Pronotum transverse, 3 times broader than long with anterior margin far broader than head base and distinctly narrower than posterior; anterior concave strongly and posterior less; sides a little arcuate; anterior angles obtuse and posterior rounded. Scutellum small, triangular. Elytra with bases a little broader than base of pronotum; base straight; humeral angle rounded; lateral margin straight for one half of the elytron length from base and then arcuate towards acute apex; sutural arcuate. Surface of elytron smooth

with only several striae near and parallel to lateral margin. Forelegs with coxae small, elliptical and close to each other. Middle legs with coxae moderate in size, rounded and not far from each other; femora stout and short; tibiae slender. Hindlegs with coxae transverse and connected. Abdomen short, nearly semi-circular, 5-segmented, with the first to the fourth equal in length and the fifth a little longer.

Comparison: The new species is alike to *C. pelta* Ponomarenko, but different in its smaller size, broad and short pronotum.

Catinius artus sp. nov.
(Plate 3, fig. 5; Fig. 9)

Etymology: From Latin "artus"--narrow.

Material: Holotype DLZ018, DLZ019, part and counterpart; preserved in dorsal view with antennae not preserved, legs incomplete; brown in colour.

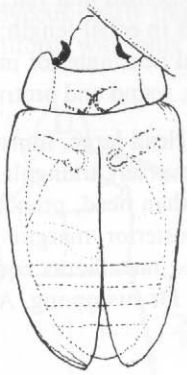


Fig.9 *Catinius artus* sp. nov., in dorsal view, × 12.5

Description: Body oval, 3.8 mm long, 1.8 mm wide; elytron 2.8 mm long. Head transverse; eyes large and lateral; clypeus nearly trapezoidal. Pronotum transverse, 3 times broader than long with anterior border distinctly narrower than posterior; anterior and posterior borders concave in same degrees; sides arched; anterior angles projecting, a little acute, posterior obstuse. Scutellum not distinguished. Meso-and meta-thorax united strongly. Elytra with bases straight, broader than pronotal base; humeral angles obtuse; lateral margin straight for two-thirds of elytral length from base and then arched strongly towards the acute apex and so with sutural margin but arched less. Surface of elytron having several longitudinal striae close and parallel to lateral margin. Fore coxae small, elliptical and close to each other; middle legs with coxae moderate in size and round, femora stout and short; hind coxae transverse and connected. Abdomen elongate, semi-elliptical, covered by elytra, five-segmented with the first to the fourth equal in length and the fifth a little longer.

Comparison: The new species is alike to *C. ovatus,* but differs from the later in the former having a distinctly narrower body and slightly dehiscent elytra.

Suborder Adephaga Emery, 1886
Family Coptoclavidae Ponomarenko, 1961
Genus *Coptoclava* Ping, 1928

Coptoclava longipoda Ping, 1928
(Plate 2, figs. 1, 2, 4)

1928 *Coptoclava longipoda* Ping, p. 40-41, pl. II, figs, 3, 4. text-figs. 19-20
1961 *Coptoclava longipoda*, Ponomarenko, p. 70-72, figs. 1-6
1975 *Coptoclava longipoda*, Ponomarenko, p. 132-139, pl. I, figs. 1-4 ;pl. II, figs. 1-5; tex-figs. 1-10
1982 *Coptoclava longipoda*, Hong, pl. 30, figs. 1-4; pl. 31, figs. 1-4; pl. 32, figs. 1-2; pl. 33, fig. 1; text-figs. 19, 79-84
1992 *Coptoclava longipoda*, Lin ,pl. 163, figs, 3, 4; pl. 164, figs, 2,3

Material: Audlts DLZ043, preserved in dorsal view; DLZ065, DLZ066, part and counterpart, preserved in ventral view; larvae DLZ011, DLZ012, DLZ022, DLZ105-110.

Description: *Adults* Head not large, broader than long; eyes large, round on lateral sides of head; antennae with only two basal segments preserved, rectangular; mandibles not large,acute without teeth. Pronotum small, nearly trapezoidal. Scutellum small, triangular. Meso-and meta-thorax united closely, nearly trapezoidal. Elytron with base straight; humeral angle obstue; lateral margin arcuate, sutural straight for about basal half of elytral length and then arcute slightly towards apex; broadest slightly behind the middle; surface without ornament. Fore coxae longitudial; middle coxae transverse, not large; hindlegs with coxae transverse, femora not preserved, part tibia and 3 tarsi preserved,broad and flat . Abdomen equal to head and thorax combined in length, consisting of 7 segments in equal length; the second to the sixth segments with hairs and a pair of spiracles on both sides and near anterior margin of each sternum; the last one small, dehiscent at apex with genitalia elongate, round and protruding (female).

Larvae Head large, transversely broad with both basal lateral parts convex and rounded, the middle nearly reversely triangular; mandibles stout with 3 pairs of teeth. Prothorax well-developed, a little broader than head; pronotum with anterior margin wave-shaped, anterior angles protruding but not acute; posterior margin straight, sides arched; mesothorax a little shorter and narrower than prothorax; metathorax equal to mesothorax in size. Fore legs slender, raptorial; middle and hind legs flattened for swimming. Abdomen 8-segmented with urogomphi elongate.

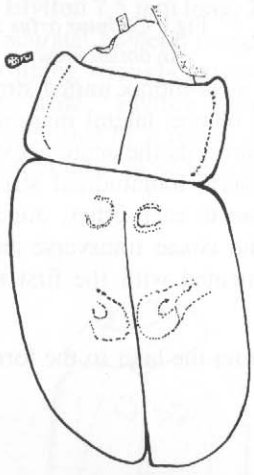


Fig.10 *Eodromeus viriosus* sp. nov., in dorsal view, × 8

Family Trachypachidae LeConte,1861
Genus *Eodromeus* Ponomarenko, 1977

Eodromeus viriosus sp. nov.
(Plate 3, fig.3; Fig.10)

Etymology: From Latin "viriosus"--robust.

Material: Holotype DLZ350, a beetle preserved in dorsal view, with head poor-preserved, antennae and legs incomplete.

Description: Body length 7.2mm, width 3.8mm; elytron length 5mm. Head large, triangular with left eye (right not preserved) large, lateral; left antenna not long with scape stout, rectangular; the last flagellum enlarging to be elliptical and the second from apex thin, longer than wide. Pronotum transversely broad, distinctly broader than head base with anterior border slightly concave and narrower than posterior; posterior straight; anterior angles projecting but not acute, posterior rounded; a longitudinal ridge in the middle reaching anterior and posterior borders. Scutellum ill-preserved. Etytra with bases a little broader than posterior border of pronotum; base straight, humeral angle rounded; lateral margin straight for basal two-thirds of elytral length and then arcuate towards slightly acute apex, sutural straight. Forelegs not preserved; middle legs with coxae moderate in size, round and close to each other; hind coxae large, nearly square. Abdomen covered by elytra.

Comparison: The new species resembles *E. dissectus* Ponomarenko, but differs in the former having a broadened and stout body.Family Carabidae Latreille,1802
Genus *Protorabus* Ponomarenko,1977

Protorabus minisculus sp. nov.
(Plate 3, fig.6; Fig.11)

Etymology: From Latin "minisculus"--smaller.

Material: Holotype DLZ108, DLZ109, part and counterpart; a beetle preserved in dorsal view with antennae and legs incomplete.

Description: Body 5.8 mm long, 2.5 mm wide; elytron 3.5 mm long; pronotum 1 mm long, 1.8 mm wide. Head large, transversely broad with mandibles stout and sharpened; clypeus nearly trapezoidal, not reaching base of antennae; eyes large, round and lateral; antennae filiform with only 9 basal segments preserved; scape large and rectangular, others nearly trapezoidal and longer than wide. Pronotum transversely broad with anterior border a little broader than head base and strongly concave; posterior nearly straight; sides arched; anterior angles projecting and acute, posterior slightly obtuse; broadest a little before the middle; a longitudinal ridge in the middle reaching anterior and posterior borders. Scutellum ill-preserved. Elytra with bases equal to posterior border of pronotum in width; base nearly straight; humeral angle slightly obtuse; lateral margin arcuate, sutural straight for one half of elytral length from base and then arcuate moderately towards acute apex; several weak longitudinal striae on surface. Fore and middle legs with femora stout, tibiae thin; hindlegs with coxae large, inclinate and nearly triangular, femora thicker than fore and middle, tibiae slender and having a longitudinal ridge. Abdomen covered by elytra, not distinguished.

Fig.11 *Protorabus minisculus* sp. nov., in dorsal view, × 10

Comparison: The new species is similar to *P. planus* Ponomarenko from the Upper Jurassic in Kazakhstan, but differs in new species having a smaller body, a larger head and longer elytra.

Genus *Conjunctia* Ponomarenko,1977

Conjunctia longa sp. nov.
(Plate 4, fig. 1; Fig.12)

Etymology: From Latin "longus"--long.

Material: Holotype DLZ053, DLZ054, part and counterpart; a beetle preserved in dorsal view with antennae not preserved and legs incomplete; blackish brown in colour.

Description: Body 8.5 mm long. 3.3 mm wide; elytra 5 mm long. Head large, elongate; mandibles moderate in size, narrow; clypeus nearly trapezoidal; eyes large, lateral. Pronotum transverse, 1.3 times broader than long; anterior margin straight, a little broader than head base; posterior straight, slightly

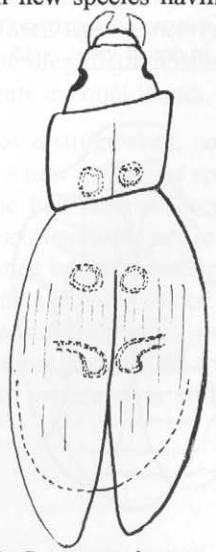


Fig.12 *Conjunctia longa* sp. nov., in dorsal view, × 8

narrower than anterior; sides slightly arcuate; anterior angles rounded and posterior blunt: a longitudinal ridge in the middle reaching anterior and posterior borders. Scutellum not preserved. Elytra with bases equal to posterior border of pronotum in width; lateral margin strongly arcuate, sutural straight for basal two-thirds of elytral length and then slightly arched towards slightly acute apex, 8 longitudinal striae on the surface of elytron. Fore coxae rounded, moderate in size; middle coxae rounded, a little larger than fore; hind transverse. Abdomen covered by elytra, short.

Comparison The new species is alike to *C. prodroma* Ponomarenko from the Early Cretaceous Zazin Formation in Transbaikalia, but differs in the former having a longer body and a narrower pronotum.

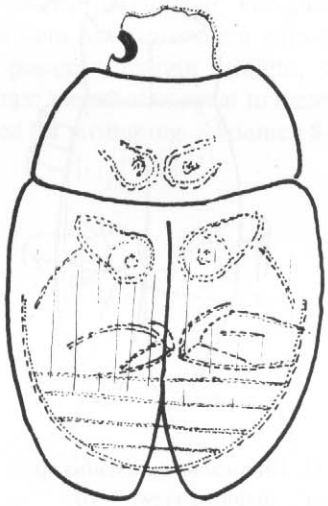


Fig.13 *Geotrupoides saxosus* sp. nov., in dorsal view, × 15

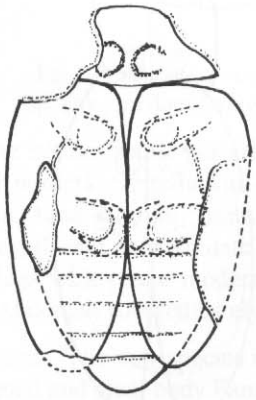


Fig.14 *Proteroscarabaeus robustus* sp. nov., in dorsal view, × 8

Suborder Polyphaga Emery,1886
Family Scarabaeidae Latreille, 1802
Genus *Geotrupoides* Handlirsch,1908

Geotrupoides saxosus sp. nov.
(Plate 4, fig.5; Fig. 13)

Etymology: From Latin "saxosus"--rocky.

Material: Holotype DLZ077, a beetle dorsally preserved with head and legs incomplete; blackish brown in colour.

Description: Body length as preserved 4.5mm, width 2.7mm; elytral length 2.7mm. Head large with left eye large and round. Pronotum broad with anterior and posterior borders slightly concave; sides a little curved; anterior border about two-thirds of the width of posterior; anterior angles slightly projecting and rounded, posterior nearly right. Scutellum small, poor-preserved. Elytra with bases as broad as posterior border of pronotum; base straight,ateral margin strongly arched, sutural straight for basal three-fourths of elytral length and then arched towards rounded apex. Surface of elytron with several weak longitudinal striae. Forelegs with coxae moderate in size, transverse; middle legs with coxae large, transverse; hindlegs with coxae large, trochanters small and nearly triangular, femora stout. Abdomen short, semi-circular, covered by elytra with 5 segments in equal length.

Comparison: The new species is similar to *G. sulcatus* Nikritin from the Lower Cretaceous in Transbaikalia, but differs in that the former has a longer pronotum, less dehiscent elytra and a narrower posterior margin of pronotum.

Genus *Proteroscarabaeus* Grabau, 1923

Proteroscarabaeus robustus sp. nov.
(Plate 4, fig.2; Fig.14)

Etymology: From Latin "robustus"--strong.

Material: Holotype DLZ169, a beetle dorsally preserved with head not preserved; pronotum, elytra and legs incomplete. Black in colour.

Description: Elytron 4.6 mm long, 2 mm wide. Pronotum with posterior border a little concave. Scutellum not preserved. Meso- and meta-thorax united lightly. Elytron with base slightly rounded, humeral angle rounded; lateral and sutural margins arched slightly for basal two-thirds of elytral length and then strongly towards round apex; surface without ornament. Forelegs with coxae moderate in size, a little rounded, close to each other; middle legs with coxae large, transverse; hindlegs with coxae large, trochanters small, nearly triangular; femora stout, thickened. Abdomen 6-segmented with the sixth semi-circular beyond elytra, others equal in length.

Comparison: The new species resembles *P.yeni* Grabau, but differs in the former having a thinner and smaller body and a shorter abdomen.

Incertae Familiae
Genus *Jingxidiscus* Hong, 1990

Jingxidiscus cf. ***lushangfenensis*** Hong, 1990
(Plate 4, fig. 4; Fig. 15)

cf. 1981 *Discus lushangfenensis*, Hong, p.90-91, pl. I, fig. 3, fig.4
cf. 1990 *Jingxidiscus lushangfenensis*, Hong, p.118-119, pl. 27, fig. 2.

Material: DLZ090, DLZ091, part and counterpart; a beetle preserved in dorsal view; black in color.

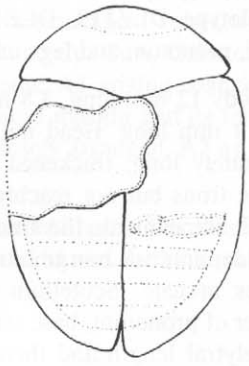


Fig.15 *Jingxidiscus* cf. *ushangfenensis* Hong, in dorsal view, × 12.5

Description: Body length 3.8 mm, width 2.6 mm; elytra length 2.8 mm. Body small, disc-shaped. Head broad, covered by pronotum. Pronotum transversely broad, arch-shaped with anterior border convex and distinctly narrower than posterior, posterior slightly undulated, sides arcuate. Meso- and meta-thorax fused tightly, nearly rectangular. Elytra broad without ornament. Legs ill-preserved with only right hindleg distinguished; coxa oval, femur short and thick. Abdomen short, semi-circular with five segments in equal length.

Discussion: Some ventral features from the two specimens are not distinguished, so this author identifies this beetle as *J.* cf. *lushangfenensis.* In 1981, Hong set up a new genus and species *Discus lushangfenensis* and referred it to Byrrhidae. But the generic name had been preoccupied, so he replaced it with *Jingxidiscus* in 1991. However, many features of *Jingxidiscus* are not in accord with Byrrhidae as follows: Byrrhid beetles have eleven-segmented antennae beneath anterior margin of frons and between eyes; their hind coxae are transverse; legs are capable of being folded into cavities on the ventral surface. *Jingxidiscus* has thirteen-segmented antennae in front of eyes, its hind coxae elliptical; it hasn't above-mentioned cavities.It very possible that Hong regarded hind trochanters as coxae. So it is questionable to refer *Jingxidiscus* to Byrrhidae. At present it is still difficult to determine which family this genus is assigned to.

Family Eobelidae L. Arnoldi, 1977
Genus *Longidorsum* gen. nov.

Etymology: From Latin "longus"—long, "dorsum"—back.

Type species: *Longidorsum generale* sp. nov.; Lower Cretaceous, Northeast China.

Diagnosis: Head rounded; frons convex; rostrum moderate in length, slightly shorter than pronotum; antennae attached near middle of rostrum; pronotum a little longer than broad; legs with femora thickened, tibiae straight.

Comparison: The new genus is alike to *Oxycorynoides* L. Arnoldi in rostrum moderately long, antennae attached near middle of rostrum and tibiae straight. But there are some differences between these two genera. The former has a rostrum shorter than pronotum and the pronotum is slightly longer than its width. The latter, however, has a rostrum longer than pronotum and a transverse pronotum.

Longidorsum generale sp. nov.
(Plate 4, fig.3; Fig. 16)

Etymology: Latin "generalis"—general.

Material: Holotype DLZ119, DLZ120, part and counterpart; a weevil dorsally preserved with antennae, head, pronotum and legs incomplete; black in colour.

Description: Body 12 mm long, 3.8 mm wide; rostrum 2 mm long; pronotum 2.5 mm long, 2.3 mm wide; elytra 6.4 mm long. Head not large, nearly semi-circular; frons convex; eyes not preserved; rostrum moderately long, thickened at base and end, narrowed at middle, with two longitudinal ridges reaching frons but not reaching end of rostrum; antennae with only 2 right basal segments preserved, each trapezoidal; the first a little longer than the second. Pronotum elongate, a little longer than wide; anterior margin straight, as broad as head base, posterior nearly equal to anterior in width, sides arcuate. Scutellum small, triangular. Elytra with bases distinctly broader than posterior border of pronotum; base straight, humeral angle rounded; lateral margin straight for basal two-thirds of elytral length and then arcuate towards apex, sutural straight for basal four-fifths of length and then slightly arcuate; apex not acute. Fore legs with right femur thickened, tibia thin and straight; middle legs with left femur short and thickened, tibia thin and straight; hindlegs with right femur thickened. Abdomen short, nearly semi-circular, covered by elytra.

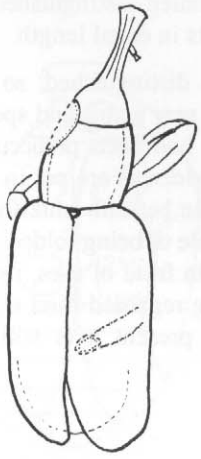


Fig.16 *Longidorsum generale* gen. et sp. nov., in dorsal view, × 5

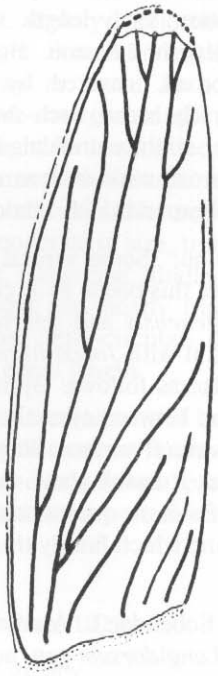


Fig.17 *Umenocoleus nervosus* sp. nov., a right elytron, × 8

Suborder Incertae Sedis
Family Umenocoleidae Chen et T'an, 1973
Genus *Umenocoleus* Chen et T'an, 1973

Umenocoleus nervosus sp. nov.
(Plate 3, fig.1; Fig.17)

Etymology: From Latin "nervosus" — of many veins.

Material: Holotype DLZ063, right elytron with base and apex a little missing.

Description: Elytron 11 mm long, 3.2 mm wide; black in colour, and slightly convex, elongate; broadest slightly behind the shoulder and gradually narrowed towards apex. Longitudinal veins well-developed. Vein Sc very close to and parallel to lateral margin. Vein R nearly parallel to vein Sc. Vein Rs arising about one-fourth of elytron length from base, branching into two near the middle of elytron with the former parallel to vein R, the latter also nearly parallel to vein R and branching twice near apex into three. Stems of veins M and Cu coalesced; vein M diverging from common stem just before level of origin of Rs, parallel to Rs and forking twice near apex; vein Cu branching into CuA and CuP just after Cu diverging from common stem of M and Cu. CuA, CuP arching backward and CuA longer than CuP. Vein A consisting of 4 short anal veins, A1 arising near common stem of M and Cu from base, extending backward but not reaching sutural margin and its length about one-third of elytron length; A2, A3 and A4 parallel to each other, closely arranged, A2 as long as A1 and A4 the shortest. Surface of elytron finely granulate.

Comparison: The new species is similar to the *U. sinuatus* Chen et T'an in the characters of elytron, but it is distinguished from the latter by the branched veins Rs and M and the unbranched vein Cu.

Diptera Linnaeus, 1758
Suborder Nematocera Brauer, 1880
Superfamily Culicoidea Billbergh, 1820
Family Chaoboridea Hendel, 1936
Genus *Chironomaptera* Ping, 1928

Chironomaptera gregaria(Grabou 1923) Ping, 1928
(Plate 4, figs. 7-9)

1923 *Samarura gregaria*,Grabau, p. 178-180, pl. I, fig. b-d
1928 *Chironomaptera gregaria*, Ping, p. 33-35. pl.III, fig. 2
1976 *Chironomaptera gregaria*, Lin, p.107, plII ,fig. 3
1982 *Chironomaptera gregaria*,Lin,p.82,pl.32,fig.5
1989 *Chironomaptera gregaria*, Zhang J., p. 348-353. pl. I, figs. 1-3; pl .II, figs. 1-5; pl. III, figs. 1-4; text-figs. 2-4
1990 *Chironomaptera gregaria*, Zhang J., p. 241-243, pl. I, figs, 1-7

Material: DLZ099, an adult male in dorsal view, with antennae not preserved; legs incomplete. Blackish brown in colour. DLZ111, DLZ121, male pupae; brown in color.

Description: *Adult male* Body length 6.5 mm, width 1.6 mm.Head transversely broad; antennal fossae rounded; eyes large, kidney-shaped, lateral. Thorax oval, broader than Head. Legs with only left middle femur, slender and straight. Abdomen cylindrical, nine-segmented, a little narrower and shorter than thorax; the first to the seventh segments nearly equal in width, the eighth narrower and shorter than the seventh and the ninth much smaller, armed with a pair of circular genital appendages.

Male pupa Body length 5.5 mm and width 1.5mm. Cephalothorax oval, a little wider than abdomen. Abdomen consisting of seven segments in equal width; each clothed with hairs. Apex abdominis bivalve, with caudal angulus sickle-shaped.

Order Hymenoptera Linnaeus, 1758
Suborde Apocrita Handlirsch, 1906
Superfamily Ichneumonoidea Latreille, 1802
Family Ichneumonomimidae Rasnitsyn, 1975
Genus *Ovigaster* gen. nov.

Etymology: From Latin "Ovi" — egg, "gaster" — abdomen.

Type species: *Ovigaster cephalotus* sp. nov.; Lower Cretaceous, Northeast China.

Diagnosis: Adult female. Head lage, transversely rectangular; eyes large, lateral; antennae not elongate, about as long as cephalothorax. Pronotum well-developed, arch-shaped; mesoscutum large, nearly pentagonal with two longitudinal notaulices; propodeum transverse with two oval projections. Forewing with pterostigma moderately long; costal space broad; crossveins 2r-m and 3r-m present; cells 1+2r, 3r long; cell 1mcu large, longer than high; cell 2rm nearly trapezoidal, longer than 3rm; cell 3rm short and high. Ovipositor short.

Discussion: This new genus is referred to Ichneumonomimidae in its forewing with costal space broad, crossveins 2r-m and 3rm present, cell 2rm longer than 3rm, cell 3rm short and high. It differs from *Ichneumonomima* Rasnitsyn mainly in that *Ovigaster* has larger cells 2rm, 1mcu and longer cell 1+2r in forewing.

Ovigaster cephalotus sp. nov.
(Plate 4, fig.6; Fig. 18)

Etymology: From Latin "cephalotus"--with a large head.

Material: Holotype DLZ075, DLZ076, part and counterpart; an adult female in dorsal view with legs not preserved, hind wings not distinguished; yellowish brown in colour.

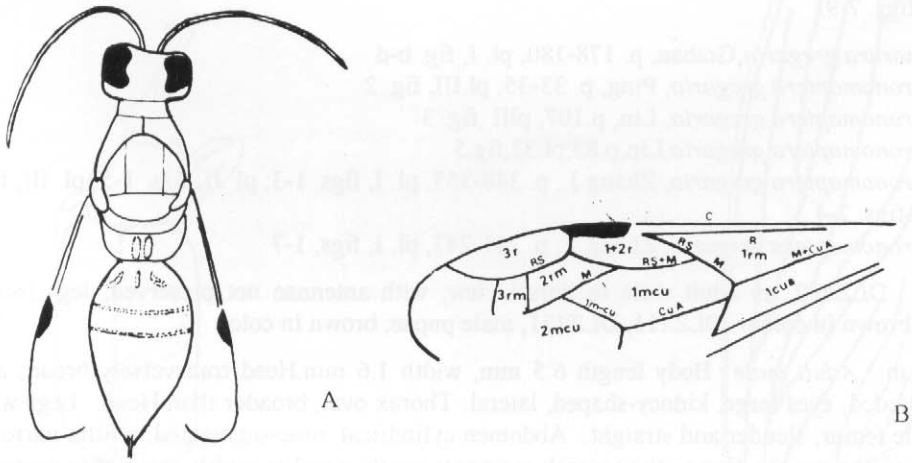


Fig. 18 *Ovigaster cephalotus* gen. et sp. nov.,
A. adult female in dorsal view, × 5. B. left forewing, × 12

Description: Body length 9.5 mm, width 3.3 mm; forewing length 6.5 mm. Head transversely rectangular; eyes large, nearly kidney-shaped, lateral; antennae about as long as head and thorax combined. Thorax a little broader than head; pronotum consisting of two parts, anterior small, nearly rectangular and posterior larger, nearly arch-shaped with a longitudinal ridge reaching anterior and posterior margins; mesoscutum large, nearly pentagonal with two notaulices; scutellum transverse, bowl-shaped; metanotum inversely arch-shaped; propodeum short, transversely broad with two longitudinally oval projections close to each other; wing scales kidney-shaped. Forewing with pterostigma moderately long, costal space broad; cell 1+2r long; cell 3r a little higher than 1+2r; cell 1mcu large, distinctly longer and higher than 1+2r; cell 2rm a little shorter than 1+2r but longer than 3rm; cell 3rm short and high. Abdomen nearly as broad as thorax, oval with apex acute; the first segment semi-circular, the second short, others not distinguished; apex abdominis with a pair of stylets, short.

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EXPLANATION OF PLATES

All specimens illustrated by photographs were collected from the Early Cretaceous Dalazi Formation (Bed 7) of the Zhixin Basin, Jilin Province. The specimens are deposited in Nanjing Institute of Geology and Palaeontology, Academia Sinica (NIGP). All these photographs were taken by Mr. Deng Dongxing of Photographic Unit, NIGP.

Plate 1

1. *Yanbianella simplex* gen. et sp. nov.
   1a, 1b, Part and counterpart, × 8, dorsal view.
   Holotype, NIGP124642,124643.
2. *Rhipidoblattina decoris* Lin
   Forewing, × 3. NIGP124644.
3. *Cristocorixa dalaziensis* sp. nov.
   Adult, × 10, dorsal view. Holotype, NIGP124645.
4. *Basoblattina conformis* gen. et sp. nov.
   Two forewings, × 3. Holotype, NIGP124646.

Plate 2

1, 2, 4. *Coptoclava longipoda* Ping
   1. Adult, × 2, dorsal view. NIGP124647.
   2a,2b. Part and counterpart. Adult, × 2, ventral view. NIGP124648, 124649.
   4a,4b. Part and counterpart. Larva, × 3, dorsal view. NIGP124650, 124651.
3. *Rhipidoblattina magna* sp. nov.
   Two forewings, × 2. Holotype, NIGP124652.

Plate 3

1. *Umenocoleus nervosus* sp. nov.
   Right elytron, × 8. Holotype, NIGP124653.
2. *Geosoma prodromum* gen. et sp. nov.
   Adult, × 5, Dorsal view. Holotype, NIGP124654.
3. *Eodromeus viriosus* sp. nov.
   Adult, × 8, dorsal view. Holotype, NIGP124655.
4. *Catinius ovatus* sp. nov.
   Adult, × 10, dorsal view. Holotype, NIGP124656.
5. *Catinius artus* sp. nov.
   Adult, × 12.5, dorsal view. Holotype, NIGP124657.
6. *Protorabus minisculus* sp. nov.
   Adult, × 10, dorsal view. Holotype, NIGP124658.
7. *Ensicupes obtusus* sp. nov.
   Right elytron. 7a,7b, part and counterpart, × 8. Holotype, NIGP124659, 124660.

Plate 4

1. *Conjunctia longa* sp. nov.
   Adult, × 8, dorsal view. Holotype, NIGP124661.

2. *Proteroscarabaeus robustus* sp. nov.
   Adult, × 8, dorsal view. Holotype, NIGP124662.
3. *Longidorsum generale* gen. et sp. nov.
   Adult, × 5, dorsal view. Holotype, NIGP124663.
4. *Jingxidiscus* cf. *lushangfenensis* Hong
   Adult, × 12.5, dorsal view. NIGP124664.
5. *Geotrupoides saxosus* sp. nov.
   Adult, × 10, dorsal view. Holotype, NIGP124665.
6. *Ovigaster cephalotus* gen. et sp. nov.
   Adult, × 5, dorsal view. Holotype, NIGP124666.
7-9. *Chironomaptera gregaria* Ping
   7. Adult, × 10, dorsal view. NIGP124667.
   8. Pupa, × 10, dorsal view. NIGP124668.
   9. Pupal cephalothorax, × 12.5, dorsal view. NIGP124669.

Plate 1

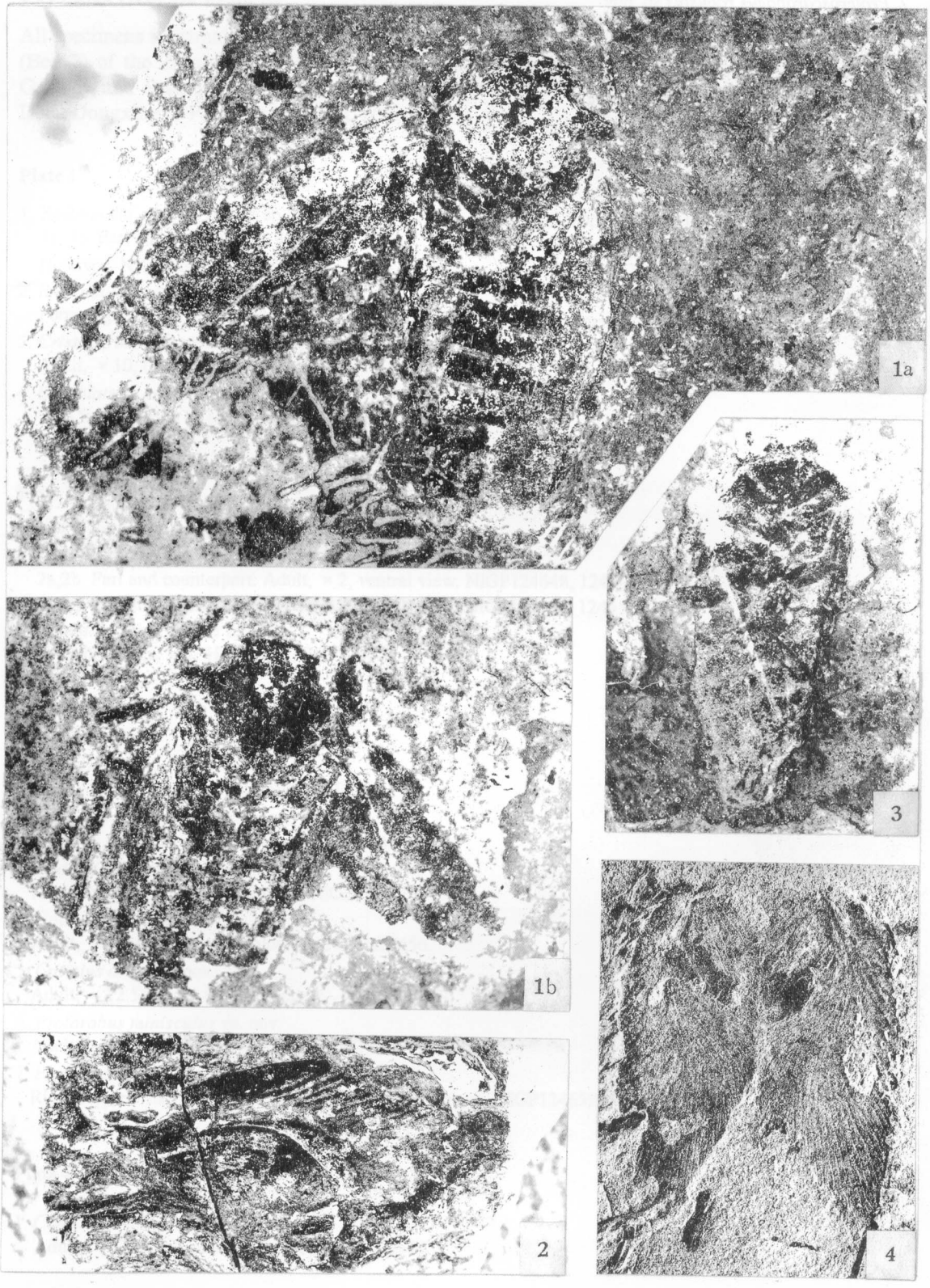
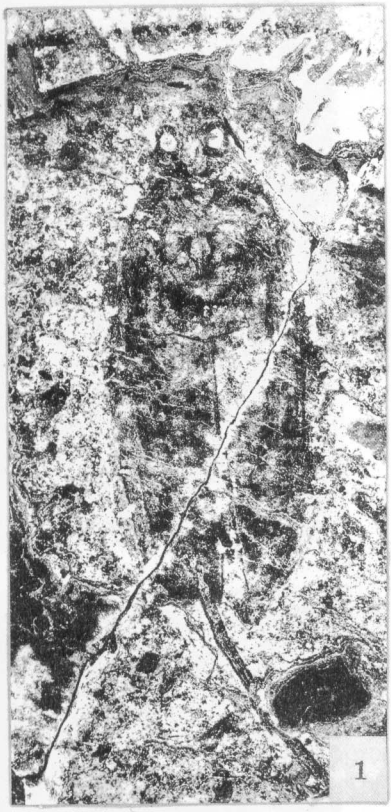


Plate 2


1


2a


2b


3


4a


4b

Plate 3

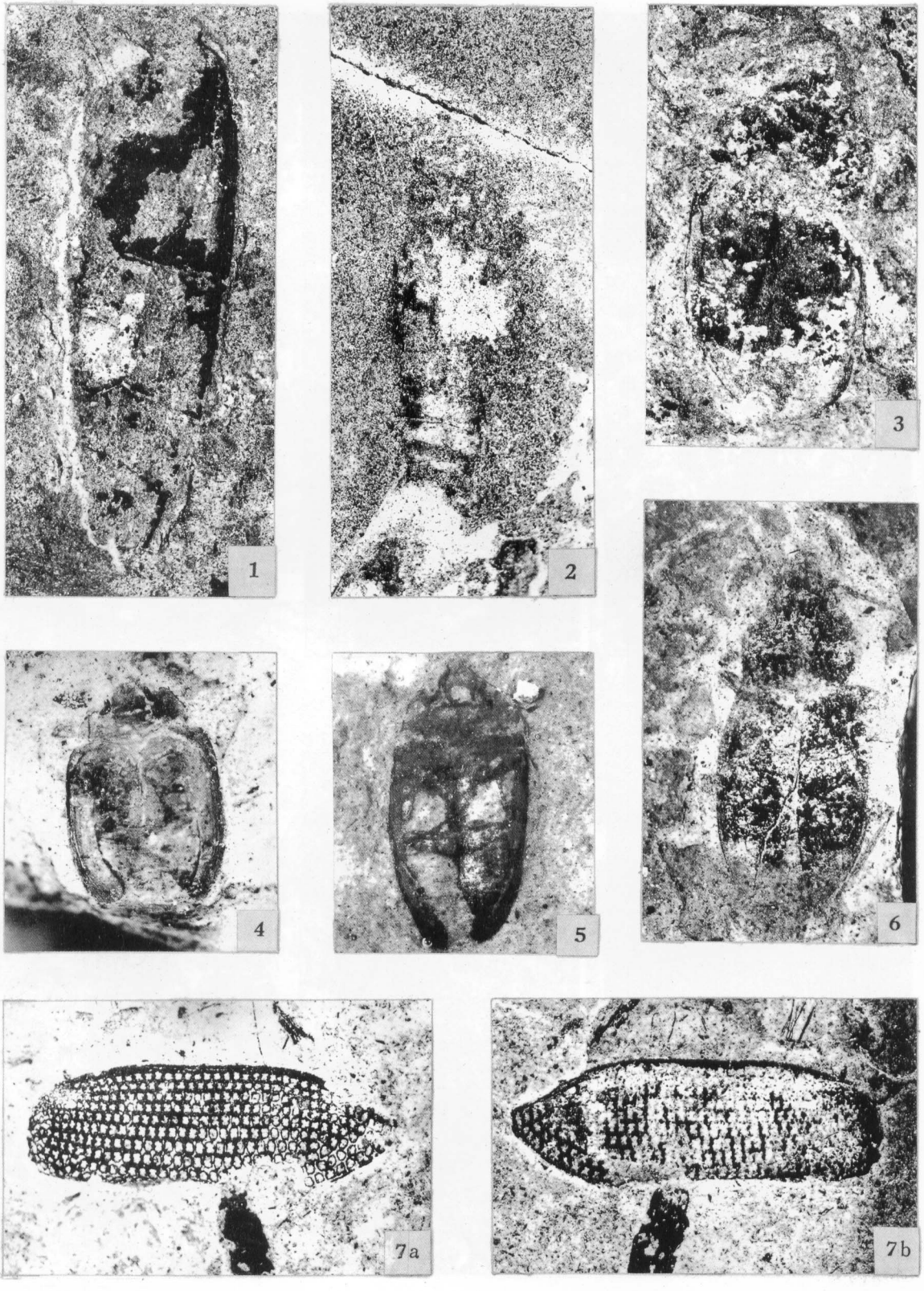


Plate 4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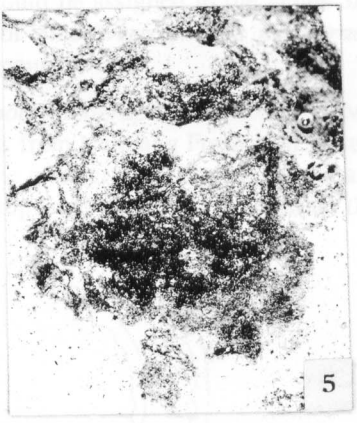
2


3


4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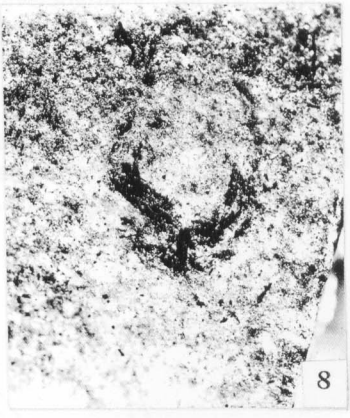
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6


7


9