

# Eight New Species of the Genus *Eopelecinus* (Hymenoptera: Proctotrupoidea: Pelecinidae) from the Laiyang Formation, Shandong Province, China

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Received February 4, 2004

**Abstract**—New species of fossil hymenopterans *Eopelecinus mecometasomatus*, *E. giganteus*, *E. leptaleus*, *E. hodoiporus*, *E. eucallus*, *E. mesomicrus*, *E. pusillus*, and *E. laiyangicus* are described from the Laiyang Formation, Shandong, China. The age of the insect-bearing deposits of the Laiyang Formation is briefly discussed; it is accepted as being close to the age of the Yixian Formation, which corresponds to the Late Jurassic (Late Tithonian) or Early Cretaceous (Berriasian).

**Key words:** paleoentomology, Hymenoptera, Pelecinidae, *Eopelecinus*, new species, Laiyang Formation, China.

## INTRODUCTION

The extinct genus *Eopelecinus* Zhang, Rasnitsyn et Zhang, 2002 belonging to the extinct subfamily Iscopinae of the extant family Pelecinidae (Proctotrupoidea) was described from the terminal Jurassic (Upper Tithonian) or lowermost Cretaceous (Berriasian) of the Yixian Formation near Beipiao, Liaoning Province, China (Zhang *et al.*, 2002). Until recently, it included three species, *E. vicinus*, *E. shangyuanensis*, and *E. similis*, although new representatives are known from the Zaza Formation of Baissa (Transbaikalia, Russia) and the Tsagaan-Tsav Formation of Hutel-Hara (Mongolia) (Zhang and Rasnitsyn, 2004).

Recently, thousands of fossil insect remains have been discovered in sediments of the Laiyang Formation in the vicinity of the villages of Nanligezhuang and Tuanwang (Laiyang, Shandong Province) (Zhang, 1992). They represent more than 800 species of the orders Odonata, Plecoptera, Blattaria, Dermaptera, Orthoptera, Thysanoptera, Hemiptera, Coleoptera, Neuroptera, Raphidioptera, Trichoptera, Mecoptera, Diptera, and Hymenoptera. Beetles, dipterans, and hymenopterans are most diverse among them; each order is represented by at least a hundred species. Like the Yixian Formation near Beipiao (Liaoning Province), the Laiyang Formation yields a good number of pelecinids, including new species and genera besides new species of the genus *Eopelecinus*, which are described in the present paper.

The age of the Laiyang Formation is debatable. We believe it to be Late Jurassic (Late Tithonian) or Early Cretaceous (Berriasian), like the age of the Yixian Formation in the Liaoning Province.

The age of the Laiyang Formation remains a focus of discussion among paleoentomologists. It had been accepted as Early Cretaceous by earlier workers (Grabau, 1923; Ping, 1928). Later, it was considered to be latest Jurassic (Zhang, 1992). Recently, however, some specialists have started to regard it as Late Jurassic (Ren and Hong, 1998), Early Cretaceous (Lin, 1995), or Hauterivian–Barremian (Hong, 1998).

The Yixian and Laiyang formations share many insect species in common. Among them, there are such widely geographically distributed as *Aeschnidium heishankowense* (Hong, 1965) (Odonata, Aeschnidiidae), *Mesolygaeus laiyangensis* Ping, 1928 (Hemiptera, Heteroptera, Mesolygaeidae), *Coptoclava longipoda* Ping, 1928 (Coleoptera, Coptoclavidae) and *Chironomaptera gregaria* (Grabau, 1923) (Diptera, Chaboridae) (Zhang, 1990, 1991, 1992, 1999). Additionally, a primitive bird *Confucisaurinis sanctus* Hou, Zhou, Gu, et Zhang, 1995 has recently been found in deposits of both formations (Hou, 1997). Consequently, these formations are deemed to be contemporaneous or nearly so. Regrettably, the age of the Yixian Formation is also controversial. We accept it as the latest Jurassic or the earliest Cretaceous, within the interval of the late Tithonian to Berriasian (Zhang and Zhang, 2001; Zhang, 2002); in this case, the Laiyang Formation should also fall into this interval, but its age can be Hauterivian–Aptian (Smith *et al.*, 1995) or Barremian (Swisher *et al.*, 1999) on the basis of isotope dating. On the other hand, this formation probably correlates with the Zaza Formation in Transbaikalia, which shares many genera and species with the Laiyang and Yixian formations. Russian paleoentomologists believe that the Siberian locality of Baissa is Lower Creta-

ceous, although its age is still debatable (Zherikhin *et al.*, 1999). We tend to agree with it, but it cannot be excluded that the above non-marine sediments are either the latest Jurassic (late Tithonian) or the earliest Cretaceous (Berriasian). It is supported by primitive bird faunas of the locality of Solnhofen in Germany (early Tithonian) and the Yixian Formation in China. The chances are low that the primitive avifauna and the fossil theropod family Compsognathidae (Coelurosauria, Dinosauria) demonstrated similarly low evolutionary rates and were distributed over at least 10–20 million years. The problem of stratigraphic correlation of non-marine sediments and identification of their geological age is complex and extensive, and further research based on biostratigraphy of various animal and plant groups, on analysis and discussion of such data is much required.

## MATERIAL

The material studied is kept in the Nanjing Institute of Geology and Paleontology of Chinese Academy of Sciences (NIGPAS).

## SYSTEMATIC PALEONTOLOGY

### Family Pelecinidae Haliday, 1840

#### Subfamily Iscopininae Rasnitsyn, 1980

The subfamily Iscopininae is known only from deposits of the terminal Jurassic and Lower Cretaceous. It comprises nine species in four genera (Kozlov, 1974; Rasnitsyn, 1980; Zhang *et al.*, 2002). Based on the new material from the Laiyang Formation, eight new species of the genus *Eopelecinus* are described, and an extended subfamilial diagnosis is provided. The forewing venation is comparatively complete or reduced in an ordinary way. The hindwing has only a costa. The antenna consists of thirteen to eighteen (?) segments. Unlike the recent subfamily Pelecininae, the basitarsus is always elongated and much longer than the following tarsomeres. The female metasoma has at least one wide basal segment. The male metasoma is stick-like.

#### Genus *Eopelecinus* Zhang, Rasnitsyn et Zhang, 2002

Type species. *E. vicinus* Zhang, Rasnitsyn, et Zhang, 2002.

**Diagnosis.** Female (male unknown). Antenna 13–15-segmented. Forewing with only C and R present; pterostigma short, variable in shape and size (lanceolate or transversely rectangular). Pronotum shortened medially. Mesonotum with areolate notauli. Propodeum reticulated. Metasoma with one wide basal segment, other segments usually tubular, but sometimes second metasomal segment club-shaped.

**Species composition.** Eleven species from the Yixian and Laiyang formations in the Liaoning and Shandong provinces, China.

#### Identification key to species of the genus *Eopelecinus*

1. Second metasomal segment half as long as first one; antenna 13-segmented; forewing 1.8 mm long.....2
  - Second metasomal segment 0.6–1.1 times as long as first one; antenna often 14–15-segmented; size variable.....3
2. Body robust, third metasomal segment longer than second one; fifth segment longer than fourth one; antenna distinctly widened toward apex, with lanceolate apical segment.....
  - .....*E. mesomicrus* sp. nov.
  - Body slender, metasomal segments very gradually shortening from second to sixth; antenna barely widened toward apex, apical antennomere sub-oval.....*E. laiyangicus* sp. nov.
3. Second metasomal segment 0.6–0.8 times as long as first one...4
  - Second metasomal segment 0.9–1.1 times as long as first one...8
4. Large slender species with body about 14 mm and forewing 4.0–5.2 mm long.....5
  - Smaller and more robust species with body under 10 mm and forewing 1.7–2.4 mm long.....6
5. Antenna somewhat widening toward apex, probably with 15 (or more) elongated segments, apical antennomere not distinctive; metasomal segments gradually shortening from second to sixth; forewing 5.2 mm long.....*E. leptaleus* sp. nov.
  - Antenna thin, not widening toward apex; metasoma as above except segments 5 and 6 equally long; forewing 4 mm long.....
    - .....*E. vicinus* Zhang, Rasnitsyn et Zhang
6. Small and robust species with body 5 mm and forewing 1.7 mm long; antenna 13-segmented, with flagellomeres moderately elongated, apical flagellomere distinctly incrassate; fourth metasomal segment distinctly shortest.....*E. pusillus* sp. nov.
  - Larger and slender species, with body about 8 mm and forewing where known 2.4 mm long.....7
7. Flagellomeres roughly subquadrate; metasomal segments 2–5 of similar length, segment 6 distinctly shorter.....*E. eucallus* sp. nov.
  - Flagellomeres longer; metasomal segments gradually shortening from 2 to 5; segment 6 longer than segment 5.....
    - .....*E. similis* Zhang, Rasnitsyn et Zhang
8. Body about 20 mm long (head and mesosoma combined 4.7 mm); forewing 6.4 mm long; metasomal segments 1–5 of similar length, fifth segment 3 times as long as segment 6; antenna thin, consisting of probably 14–15 segments.....*E. giganteus* sp. nov.
  - Much smaller, body ca. 10–13 mm long; segment 5 less than twice as long as segment 6.....9
9. Antenna 15-segmented, gradually widening toward apex; metasomal segments 1–5 of similar length; head and mesosoma combined 1.8 mm long, forewing about 2.8 mm long.....
  - .....*E. mecometasomatus* sp. nov.
  - Antenna 14-segmented.....10
10. Antenna barely widened toward apex; metasomal segments gradually shortening from 2 to 6; head and mesosoma combined 3.1 mm long.....*E. hodoiporus* sp. nov.
  - Antenna distinctly widening toward apex; head and mesosoma combined 2 mm long, forewing 2.8 mm long.....
    - .....*E. shangyuanensis* Zhang, Rasnitsyn et Zhang

#### *Eopelecinus mecometasomatus* Zhang, sp. nov.

Plate 6, fig. 2

**Etymology.** From the Greek *meco* (long) and *metasoma*.

**Holotype.** NIGPAS, no. L91438-1 (L91438-2), part and counterpart of female in dorsoventral position, with legs partially preserved and hindwings missing; locality of Laiyang; Upper Jurassic–Lower Cretaceous.

**Description** (Fig. 1). Female (male unknown). The body is dark brown. The head is large, broad and

trapezoid, with the anterior margin being much shorter than the posterior one; the eyes are large, suboval, reaching the posterior margin of the head. The antenna is thick, widening apically, 15-segmented, and distinctly longer than the head and mesosoma combined; the scape is relatively large, thin basally and widened apically, 2.5 times as long as wide; the pedicel is relatively small, slightly longer than wide, and barely shorter, but obviously thicker than the first flagellomere. The flagellomeres are gradually widening towards the apex, with the first flagellomere being thin, nearly three times as long as wide, and subequal to the second one in its length and width, the third flagellomere is barely shorter, but slightly thicker than the second one, each of the following segments is longer than wide, with the terminal segment being lanceolate apically. The mesosoma is suboval; the pronotum is short; the notauli are short and oblique; the scutellum has a slightly arched anterior margin; the propodeum and metanotum are coarsely reticulated. The hind femur is slightly club-shaped and thicker and shorter than the tibia; the tarsus is thin and long, distinctly longer than the tibia, the basitarsus is quite long, but shorter than the other tarsomeres combined. The forewing has R bent posteriad near pterostigma, the costal area is moderately broad, the pterostigma is small and entirely sclerotized. The metasoma is rather long, more than 4 times as long as the head and mesosoma combined, the first metasomal segment is robust, elongated oval, distinctly wider basally than apically, broadest basal to its midlength and shorter than the second segment, but slightly longer than the mesosoma; segments 2–6 are thin and long, tubular, each one is as wide basally as apically, the last one is truncated apically. The length ratio of the metasomal segments is 1 : 1.1 : 1.1 : 1 : 0.9 : 0.6.

**M e a s u r e m e n t s**, mm. Head length, 0.5; mesosoma length, 1.3; metasoma length, 8.1; antenna length, 2.4; forewing length, 2.7; width of its preserved fragment, 1.1.

**M a t e r i a l**. Holotype.

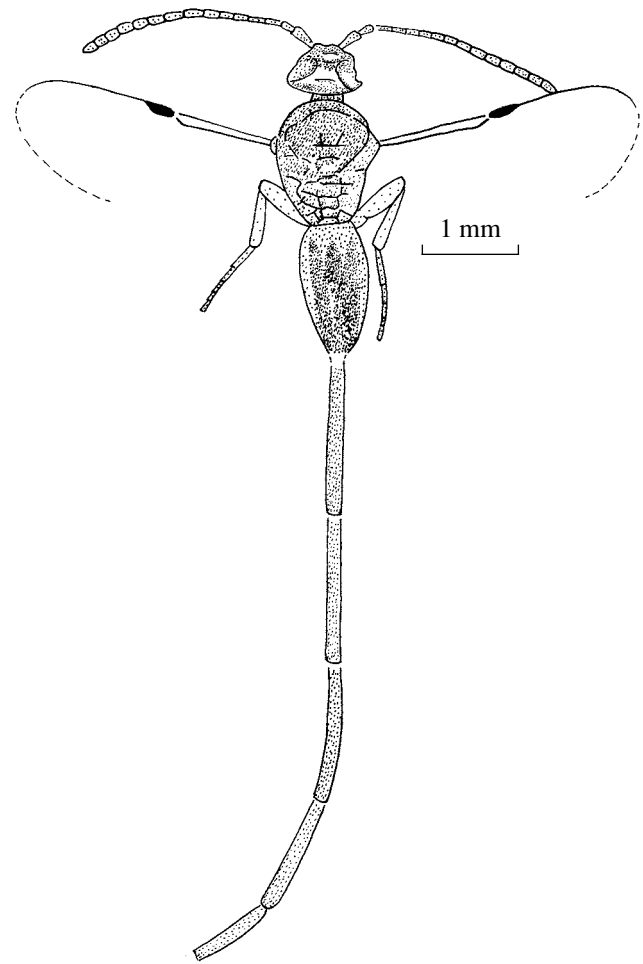
*Eopelecinus giganteus* Zhang, sp. nov.

Plate 6, fig. 3

**E t y m o l o g y**. From the Latin *giganteus* (giant).

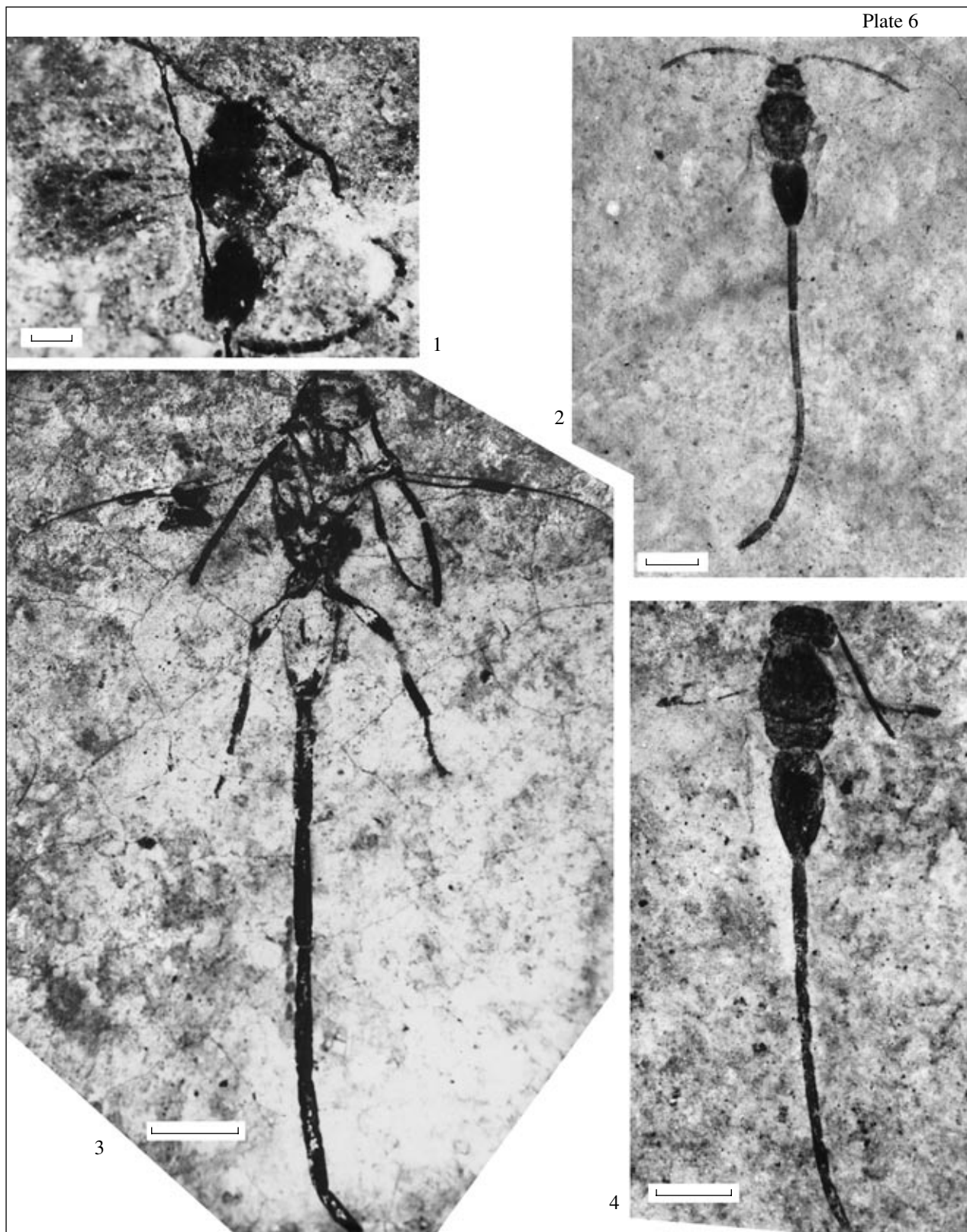
**H o l o t y p e**. NIGPAS, no. L91436, female in dorsal position, with poorly preserved eyes and scutellum, partially preserved antennae and legs, and with hindwings missing; locality of Laiyang; Upper Jurassic–Lower Cretaceous.

**D e s c r i p t i o n** (Fig. 2). Female (male unknown). The body is dark brown. The head is broadly transverse, nearly hexagonal, its anterior margin is nearly truncate and slightly wider than the posterior one; the eyes are apparently large and remote from the posterior margin of the head. The antenna is thin, filiform, probably 14 or 15-segmented (at least the scape and pedicel are invisible), nearly as long as the head and mesosoma combined; each flagellomere is oblong, about 3 times



**Fig. 1.** *Eopelecinus mecometasomatus* sp. nov., holotype NIGPAS, no. L91438-1.

as long as wide, the last flagellomere is rounded apically. The mesosoma is oval; the notauli are short and slightly oblique; the metanotum and propodeum are irregularly and coarsely reticulated. The fore femur is short and thin, club-shaped; the mid femur is slightly longer and thicker than that of the foreleg. The mid tibia is quite short and thin, barely widened apically, the tarsus is filiform, much longer but noticeably narrower than the tibia, the basitarsus is elongated, more than twice as long as the second tarsomere, the second through fourth tarsomeres are gradually shortening, the last (fifth) tarsomere is thickened apically, and at least twice as long as the fourth one. The hind coxae are tightly approximated to each other, sub-tubular, twice or nearly so as long as wide, the trochanter is relatively large, suboval, the femur is clearly longer and thicker than fore and mid femora and also club-shaped, the tibia is thin and long, distinctly longer and narrower than the femur, quite thin basally and gradually thickening towards the apex, with quite thin and short tarsal spurs, the tarsus is rather thin, noticeably shorter and narrower than the tibia, the basitarsus is shorter than the



## Explanation of Plate 6

**Fig. 1.** *Eopelecinus pusillus* sp. nov., holotype NIGPAS, no. L91435. Scale bar 0.5 mm.

**Fig. 2.** *Eopelecinus mecometasomatus* sp. nov., holotype NIGPAS, no. L91438-1. Scale bar 1 mm.

**Fig. 3.** *Eopelecinus giganteus* sp. nov., holotype NIGPAS, no. L91436. Scale bar 2 mm.

**Fig. 4.** *Eopelecinus hodoiporus* sp. nov., holotype NIGPAS, no. L91439. Scale bar 2 mm.

rest of the tarsomeres combined. The apex of the forewing is somewhat acuminate, R is straight or slightly bent posteriad, the pterostigma is entirely sclerotized, thin, long, rectangular (truncate apically). The first metasomal segment is elongated oval, broadest near its base (twice as wide basally as apically), shorter than the mesosoma. The second segment is tubular, nearly as long as first one; the last segment is truncate apically; the second and the fourth through sixth segments have numerous transverse fossae. The length ratio of the metasomal segments is 1 : 1 : 0.9 : 1 : 0.9 : 0.3.

**Measurements**, mm. Head length, 1.3; mesosoma length, 3.4; hindleg length, 6.1; metasoma length, 15.9; length of preserved fragment of antenna, 4.9; forewing length, 6.4; forewing width, 2.3.

**Material.** Holotype.

*Eopelecinus leptaleus* Zhang, sp. nov.

Plate 7, fig. 1

**Etymology.** From the Greek *leptaleos* (slim).

**Holotype.** NIGPAS, no. L91442, female in dorsoventral position with incomplete eyes, antennae, and legs and with hindwings missing; locality of Laiyang; Upper Jurassic–Lower Cretaceous.

**Description** (Fig. 3). Female (male unknown). The body is dark brown. The head is fairly large, transverse, suboval; the eyes are apparently small, suboval, removed from the posterior margin of the head. The antenna is clearly longer than the head and mesosoma combined, somewhat widening toward the apex, probably with 15 (or more) elongated segments, the apical antennomere is indistinctly thinner, each flagellomere is oblong, about twice as long as wide. The mesosoma is relatively slender, sub-pentagonal. The hind femur is club-shaped, the tibia is apparently tubular. The forewing has R being distinctly bent posteriad near the entirely sclerotized, thin, long, rectangular, slightly thickened apically pterostigma. The first metasomal segment is elongated oval, broadest before its midlength, twice as wide basally as apically, longer than the mesosoma; the second segment is tubular, obviously shorter than the first one; the last segment is tapering. The length ratio of the metasomal segments is 1 : 0.8 : 0.7 : 0.6 : 0.4 : 0.3.

**Measurements**, mm. Head length, 1; mesosoma length, 2.5; metasoma length, 10.7; length of preserved fragment of antenna, 4.6; forewing length, 5.2; forewing width, 2.

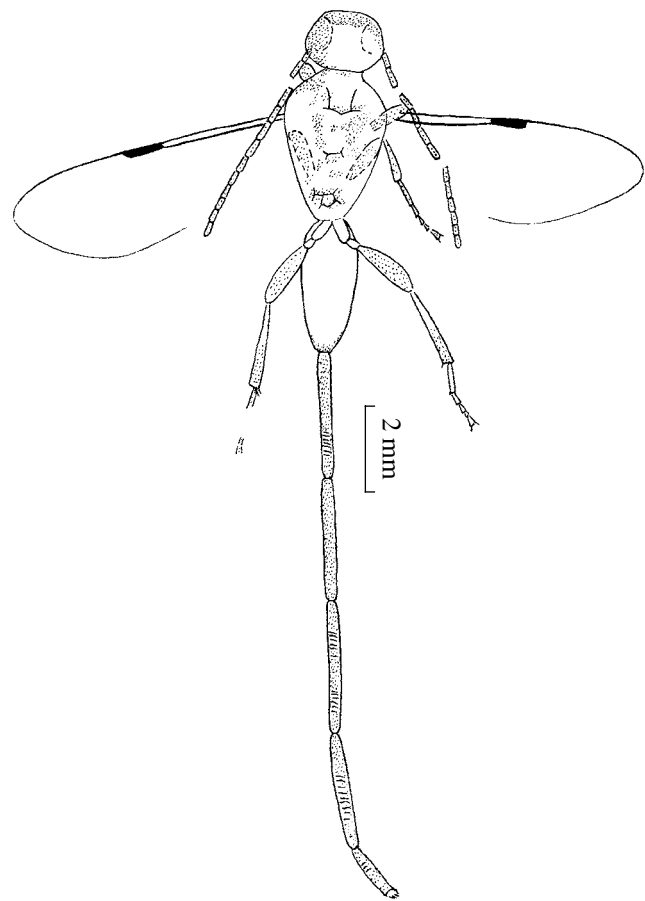
**Material.** Holotype.

*Eopelecinus hodoiporus* Zhang, sp. nov.

Plate 6, fig. 4

**Etymology.** From the Greek *hodoiporos* (pilgrim).

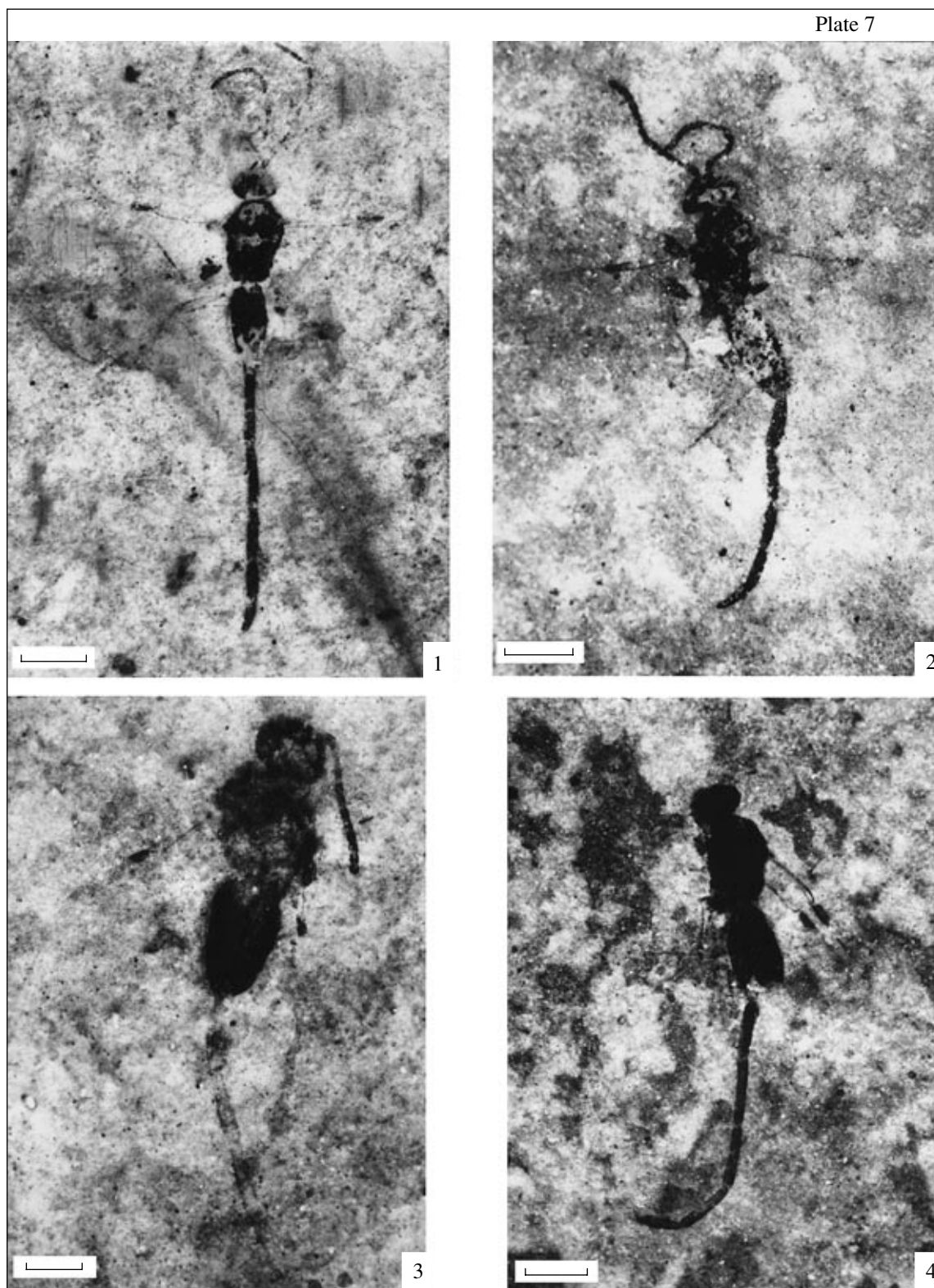
**Holotype.** NIGPAS, no. L91439, female in dorsoventral position with left antenna, legs and hindwings



**Fig. 2.** *Eopelecinus giganteus* sp. nov., holotype NIGPAS, no. L91436. Scale bar 2 mm.

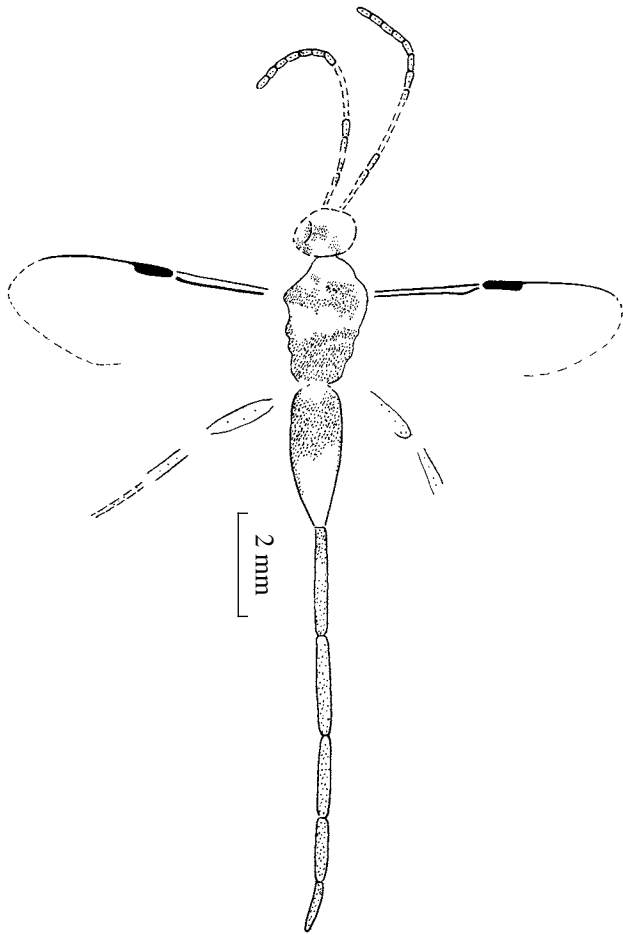
missing, forewings partially preserved; locality of Laiyang; Upper Jurassic–Lower Cretaceous.

**Description** (Fig. 4). Female (male unknown). The body is dark brown. The head is large, transverse, suboval; the eyes are apparently large, suboval, not reaching the posterior margin of the head. The antenna is thin, filiform, 14-segmented, slightly shorter than the head and mesosoma combined; both the scape and pedicel are similar in shape and size, elongated oval, thin basally and widened apically, less than twice as long as wide, thicker than flagellomeres; flagellomeres are oblong, gradually getting shorter towards the apex, the terminal flagellomere is lanceolate. The mesosoma is relatively massive, suboval; the scutellum is apparently large, subtriangular; the propodeum and metanotum are irregularly and coarsely reticulated. The forewing has R distinctly bent posteriad; the costal area is broad; the pterostigma is fairly large, lanceolate, entirely sclerotized. The first metasomal segment is elongated oval, 3 times as wide basally as apically, broadest near its midlength, slightly longer than the mesosoma; the second segment is tubular, obviously shorter than the first one; the last segment is tapering. The length ratio of the metasomal segments is 1 : 0.9 : 0.8 : 0.7 : 0.6 : 0.5.



Explanation of Plate 7

- Fig. 1.** *Eopelecinus leptaleus* sp. nov., holotype NIGPAS, no. L91442. Scale bar 2 mm.  
**Fig. 2.** *Eopelecinus laiyangicus* sp. nov., holotype NIGPAS, no. L91440. Scale bar 1 mm.  
**Fig. 3.** *Eopelecinus mesomicrus* sp. nov., holotype NIGPAS, no. L91443. Scale bar 0.5 mm.  
**Fig. 4.** *Eopelecinus eucallus* sp. nov., holotype NIGPAS, no. L91437. Scale bar 1 mm.



**Fig. 3.** *Eopelecinus leptaleus* sp. nov., holotype NIGPAS, no. L91442.

**Measurements, mm.** Head length, 1; mesosoma length, 2.1; metasoma length, 10.2; antenna length, 3.

**Material.** Holotype.

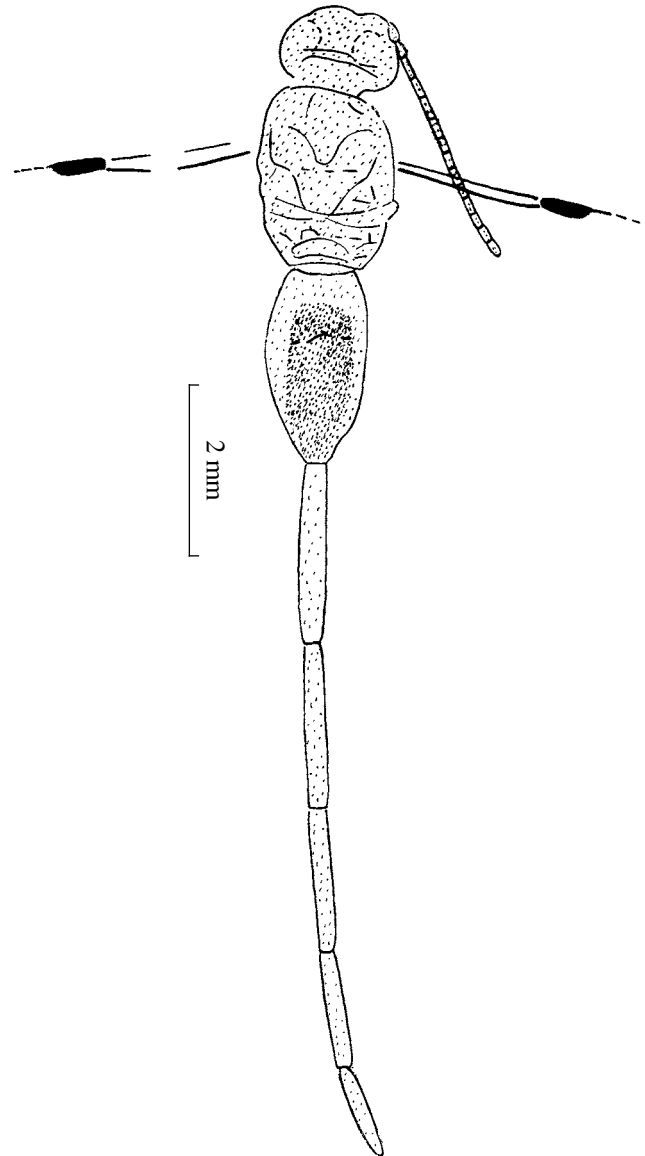
*Eopelecinus eucallus* Zhang, sp. nov.

Plate 7, fig. 4

**Etymology.** From the Greek *eu* (emphasizing particle) and *callos* (beautiful).

**Holotype.** NIGPAS, no. L91437, female in lateral aspect with antennae, legs and forewings partially preserved and hindwings missing; locality of Laiyang; Upper Jurassic–Lower Cretaceous.

**Description** (Fig. 5). Female (male unknown). The body is dark brown. The head is large, suboval; the eyes are fairly large, oval, not reaching the posterior margin of the head. The antenna is apparently short and thick; the scape is slightly thicker than other segments, slightly thinned basally and thickened apically; flagellomeres are quite short and transverse. The mesosoma is relatively slender, suboval. The basitarsus of

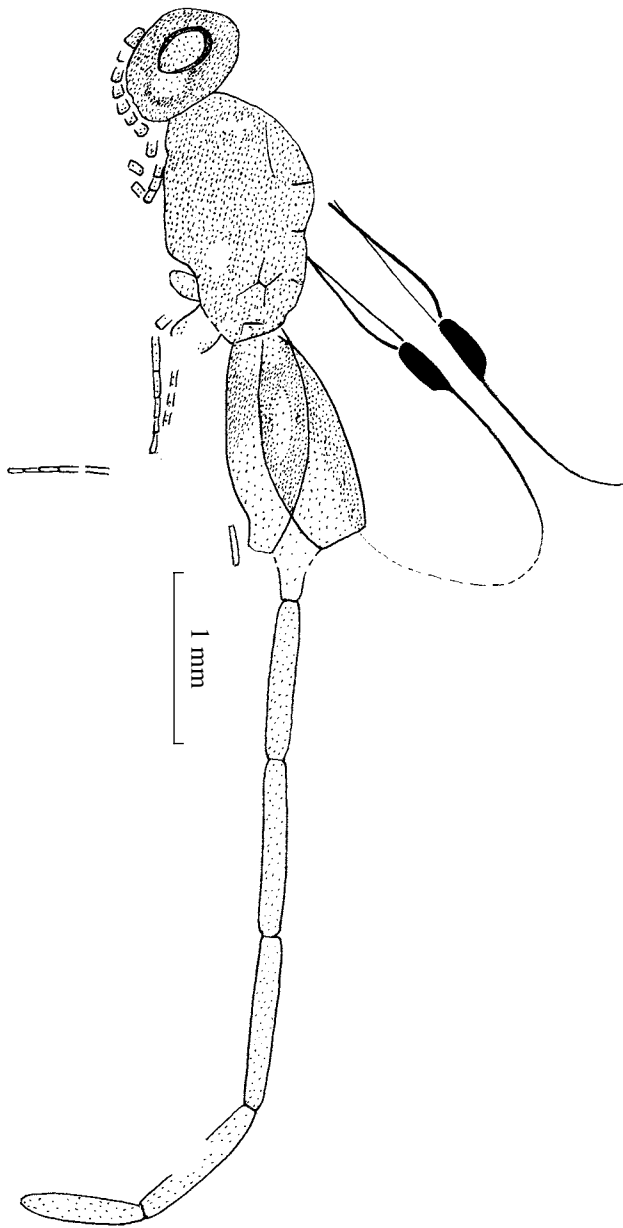


**Fig. 4.** *Eopelecinus hodoiporus* sp. nov., holotype NIGPAS, no. L91439.

the hind (?) leg is quite thin, other tarsomeres are getting shorter, but the fourth segment is almost equal to the fifth one. The forewing has R distinctly bent posteriorly; the pterostigma is large, rectangular, lanceolate, entirely sclerotized. The first metasomal segment is elongated oval, 3 times as wide basally as apically, broadest near its midlength, longer than the mesosoma; the second segment is tubular, obviously shorter than the first one; the last segment is more or less thickened medially, lanceolate. The length ratio of the metasomal segments is 1 : 0.6 : 0.7 : 0.7 : 0.6 : 0.5.

**Measurements, mm.** Head length, 0.5; mesosoma length, 1.5; metasoma length, 6.5; forewing length, 2.4; forewing width, 1.

**Material.** Holotype.



**Fig. 5.** *Eopelecinus eucallus* sp. nov., holotype NIGPAS, no. L91437.

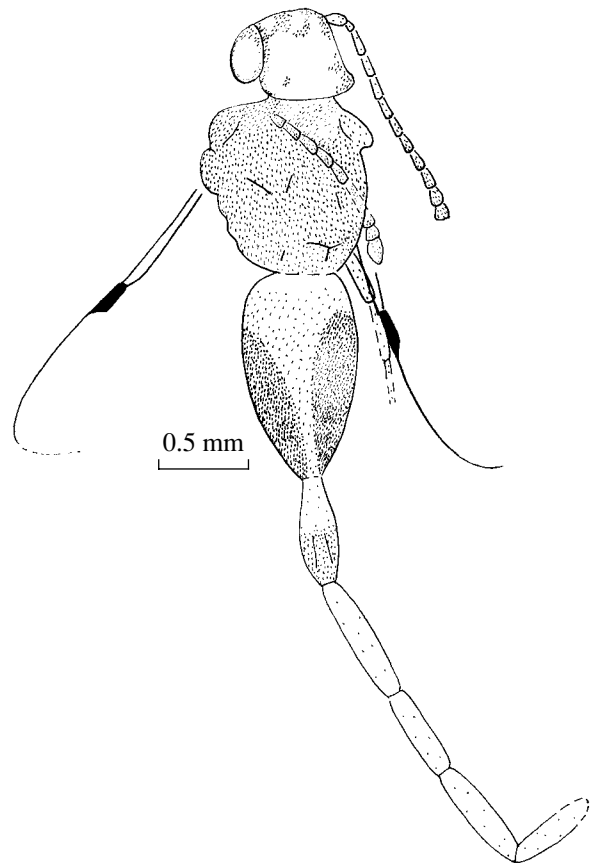
*Eopelecinus mesomicrus* Zhang, sp. nov.

Plate 7, fig. 3

**Etymology.** From Mesozoic and the Greek *micros* (small).

**Holotype.** NIGPAS, no. L91443, female in dorsoventral position, antennae and forewings partially preserved, legs and hindwings missing; locality of Laiyang; Upper Jurassic–Lower Cretaceous.

**Description** (Fig. 6). Female (male unknown). The body is dark brown. The head is large, subquadrate, its anterior margin is nearly as wide as the posterior one; the eyes are relatively large, suboval, distinctly



**Fig. 6.** *Eopelecinus mesomicrus* sp. nov., holotype NIGPAS, no. L91443.

protruding laterally and remote from the posterior margin of the head. The antenna is thick, widened apically, 13(?) -segmented, and barely shorter than the head and mesosoma combined; the scape is relatively large, elongated oval, thin basally and thick apically, about twice as long as wide, shorter than the first flagellomere; the pedicel is quite small, nearly tubular and slightly thinner, but noticeably shorter than the first flagellomere; flagellomeres are gradually widening apically, the first flagellomere is nearly 3 times as long as wide and slightly longer than the second one, the twelfth flagellomere is transverse, thirteenth (?) flagellomere is more or less lanceolate. The mesosoma is massive, dilated oval. The forewing has R slightly bent posteriad near the pterostigma; the costal area is relatively narrow; the pterostigma is large, rectangular, narrowing apically and completely sclerotized. The metasoma is relatively short and thick, less than 3 times as long as the head and mesosoma combined, the first metasomal segment is massive, oval, 3 times as wide basally as apically, broadest before its midlength, clearly longer than the mesosoma; the second segment is club-shaped, broadest before its midlength, about one half of length of the first one; other segments are tubular. The length ratio of the metasomal segments is 1 : 0.5 : 0.6 : 0.4 : 0.5 : 0.4.

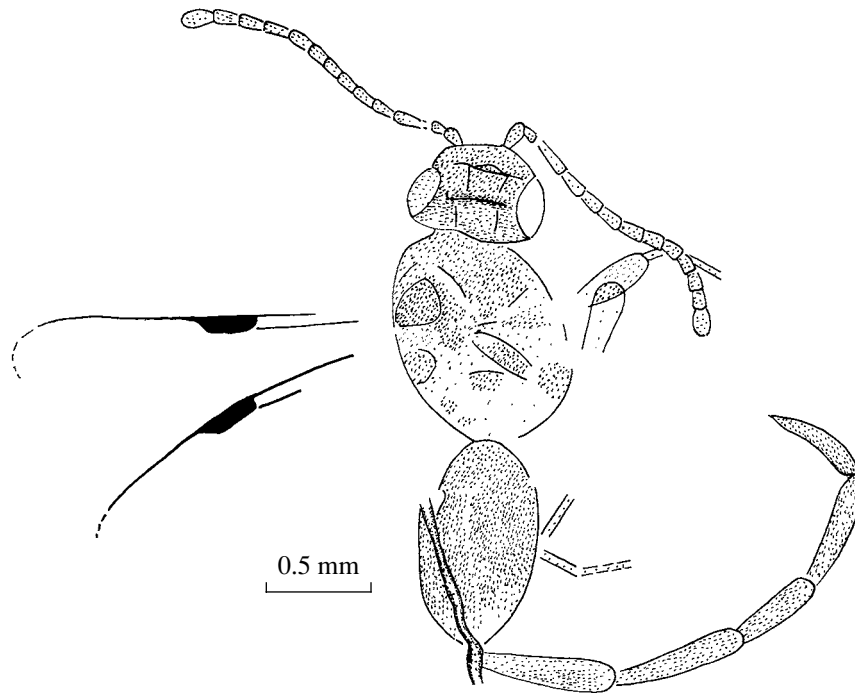


Fig. 7. *Eopelecinus pusillus* sp. nov., holotype NIGPAS, no. L91435. Scale bar 0.5 mm.

**Measurements**, mm. Head length, 0.5; mesosoma length, 1; metasoma length, 4.1; length of preserved fragment of antenna, 1.4; forewing length, 1.8.

**Material.** Holotype.

*Eopelecinus pusillus* Zhang, sp. nov.

Plate 6, fig. 1

**Etymology.** From the Latin *pusillus* (very small).

**Holotype.** NIGPAS, no. L91435, female in dorsoventral position, legs and forewings partially preserved, hindwings missing; locality of Laiyang; Upper Jurassic–Lower Cretaceous.

**Description** (Fig. 7). Female (male unknown). The body is dark brown. The head is large, transverse and semicircular, with the anterior margin being clearly wider than the posterior; the eyes are large, suboval, reaching the posterior margin of the head. The antenna is thick, widening apically, 13-segmented, slightly longer than the head and mesosoma combined; the scape is relatively large, elongated oval, thin basally and thick apically, almost twice as long as wide, distinctly shorter than the first flagellomere; the pedicel is small, similar to scape in its shape, noticeably shorter than the first flagellomere; the flagellomeres are gradually thickening (widening) apically, each one is longer than wide, the first flagellomere is nearly 3 times as long as wide and clearly longer than the second one, the thirteenth flagellomere is elongated oval and rounded apically. The mesosoma is massive and oval. The mid

(?) femur is thick and club-shaped, the hind (?) tibia and tarsus are thin and tubular. The forewing has R being not bent posteriorly near the pterostigma; the costal area is broad; the pterostigma is rather large, rectangular but sharpened terminally and entirely sclerotized. The metasoma is relatively short and thick, less than 3 times as long as the head and mesosoma combined, the first metasomal segment is massive, oval, nearly as wide basally as apically, broadest at its midlength, nearly as long as the mesosoma; the second segment is club-shaped, broadest near its end, 0.66 times as long as the first one; other segments are nearly tubular, but slightly thinned basally, except for the last (sixth) segment, which is lanceolate. The length ratio of the metasomal segments is 1 : 0.7 : 0.7 : 0.4 : 0.6 : 0.5.

**Measurements**, mm. Head length, 0.4; mesosoma length, 0.9; metasoma length, 3.6; antenna length, 1.5; forewing length, about 1.7.

**Material.** Holotype.

*Eopelecinus laiyangicus* Zhang, sp. nov.

Plate 7, fig. 2

**Etymology.** From the city of Laiyang, where the material was collected.

**Holotype.** NIGPAS, no. L91440, female in dorsoventral position, antennae, legs and forewing partially preserved, hindwings missing; locality of Laiyang; Upper Jurassic–Lower Cretaceous.

**Description** (Fig. 8). Female (male unknown). The body is dark brown. The head is large, semicircu-

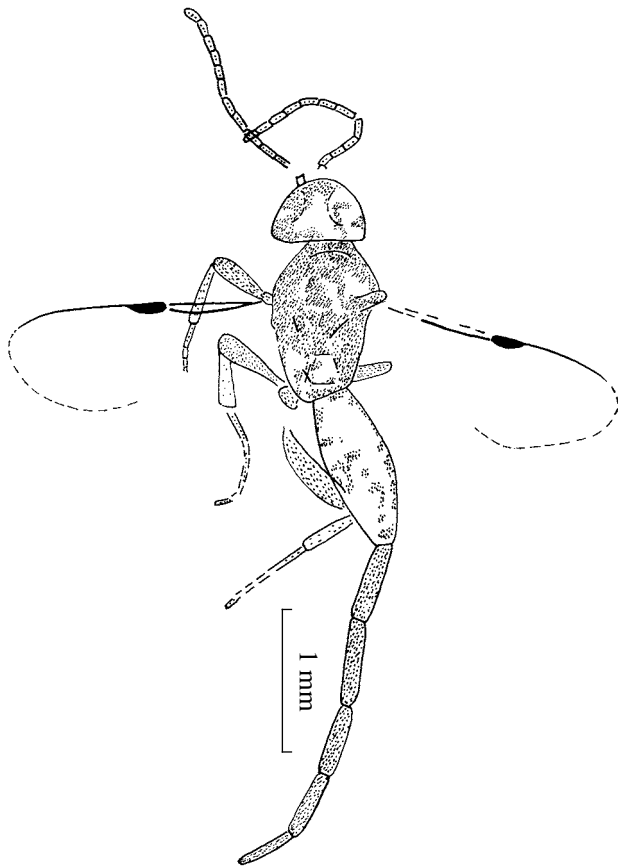


Fig. 8. *Eopelecinus laiyangicus* sp. nov., holotype NIGPAS, no. L91440. Scale bar 1 mm.

lar, with the anterior margin rounded and the posterior margin straight; the eyes are apparently large, suboval, approximated to the posterior margin of the head. The antenna is thin, filiform, 13(?) -segmented and nearly as long as the head and mesosoma combined; the scape is relatively small, nearly tubular, slightly longer than wide, distinctly shorter than the first flagellomere; each flagellomere is about twice as long as wide, the first flagellomere is nearly as long as the second one, the last flagellomere is sub-oblong, nearly as long as the subterminal segment. The mesosoma is relatively small and suboval. The fore femur is thick and club-shaped, the tibia is tubular, slightly longer but clearly thinner than the femur, the tarsus is quite thin, the basitarsus is more than twice as long as the second tarsomere. The midleg is thicker and longer than the foreleg, the tibia is thickened, nearly as thick as but distinctly shorter than the femur, the tarsus is clearly longer than the tibia. The hindleg is apparently thicker and longer than fore- and midlegs, similar to the foreleg in its shape. The forewing has R slightly bent posteriorly near the pterostigma; the costal area is relatively narrow; the pterostigma is small, lanceolate and entirely sclerotized. The metasoma is relatively short, about 2.5 times as long as the head and mesosoma combined, the first metasomal seg-

ment is thin, elongated oval, more than twice as wide basally as apically, broadest at its midlength, nearly as long as the mesosoma; other segments are tubular but more or less thickened, except for the sixth segment, which is clearly thinner than the others. The length ratio of the metasomal segments 1 : 0.5 : 0.5 : 0.4 : 0.4 : 0.3.

Measurements, mm. Head length, 0.4; mesosoma length, 1.1; metasoma length, 3.7; antenna length, 1.5; forewing length, about 1.8; forewing width, 0.7.

Material. Holotype.

#### ACKNOWLEDGMENTS

This work was supported by the Pilot Project of Knowledge Innovation Program of the Chinese Academy of Sciences, grant no. KZCX2-114, the National Natural Science Foundation of China (grant no. 40072004), the Major Basic Research Projects of Ministry of Science and Technology, China (grant no. G2000077700) and the National Geographic Society of the United States (grant no. 5514-95).

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