

Prof. Hubbard U.D.

Hong You-chong

ON EOCENE *PHILOLIMNIAS* GEN. NOV. (EPHEMEROPTERA, INSECTA) IN AMBER FROM FUSHUN COALFIELD, LIAONING PROVINCE

HONG YOU-CHONG (洪友崇)

(North China Institute of Geological Sciences)

Received March 14, 1978.

ABSTRACT

A new genus, Eocene *Philolimnias* (Ephemeroptera, Insecta), has been collected in amber on the main coal beds of the Guchengzi formation (E_2^1 g) from Fushun Coalfield, Liaoning Province. This is a complete specimen with the body and wings well preserved. The characteristics of this new genus are fairly close to the living form of *Ephemerella*, but the anterior cubitus (CuA_1) has five branches, with narrow costal area, intercalary vein well developed between the regions of MP_1 and MP_2 , and slender antennae. The structure of the genitalia is different from that of the modern form.

The present paper describes new results of the stratigraphic subdivisions of Fushun Coalfield.

I. STRATIGRAPHY OF THE FUSHUN COALFIELD

The Fushun Coalfield is situated in the eastern part of Liaoning Province where the following four stratigraphic units may be found: Presinian system; Longfengkan formation of Lower Cretaceous (K_1); Laohutai and Lizigou formations of Palaeocene (E_1); Guchengzi formation of Lower Eocene (E_2^1); Jijuntun, Xilutian and Gengjiajie formations of Middle-upper Eocene (E_2^{2-4}); and Quaternary (Q) (Figs. 1, 2; Table 1).

(1) Presinian System. This system consists of reddish granite-gneiss, micagneiss, amphibole-gneiss and pegmatite, predominantly of granite-gneiss. Thickness unknown.

(2) Longfengkan Formation of Lower Cretaceous (K_1 l). Overlying unconformably the Presinian system, this formation varies from 300 to 1,122.48 meters in thickness and may be subdivided in ascending order as follows:

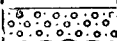
1) Dark purple sandy shale (K_1 l¹). This consists predominantly of dark purple sandstone, sandy shale and argillaceous limestone. 100—140 m thick.

2) Dark purple sandy shale intercalated with basalt (K_1 l²). It consists of purple sandy shale, intercalated with basalt, diabase, andesite and rhyolite. 183.45 m thick.

3) Green, purple and greyish-white tuff (K_1 l³). 130 m thick.

4) Conglomerate (K_1 l⁴). It consists mainly of conglomerate, sandstone, with a thickness of 150 to 279.03 m.

My addr. NO. 26, Jintang Highway, Tianjin (Tientsin), China.
Tianjin Institute of Geology and Mineral Resources State
Bureau of Geology, P.R.C.

Stratigraphic System						Columnar Section	Thick- ness (m)	Lithological Characters
Quaternary (Q)							3—35.5	sandstone, pebbles and clay
Cainozoic (C _z)	Lower Tertiary (E)	Fushun group (Ef)	Eocene (E ₂)	Middle—upper Eocene (E ₂ —')	Gengjiajie form.	brown shale	111.37—338.05	brown shale intercalated with thin-bedded sandstone, green mudstone
					Xilutian form.	green mudstone	137—600	main green mudstone intercalated with brown shale, green thin-bedded and green marl
			Lower Eocene (E ₁)	Jijuntan form.	brown oil shale	48—190	brown and dark brown compact and oil shale, yielding fossils	
				Guchengzi form.	main coal shale	0.6—195	main coal seam intercalated with carbonaceous shale, siltstone, richly insects in amber	
			Palaeocene (E ₁)	Lizigou form.	complex tuff	76.5—115	greyish-green, greyish-white tuff, tuffaceous sandstone and shale, with coal seam A	
				Laohutai form.	baslt intercalated with shale	8—193	dark-grey compact basalt with tuff, thin-bedded shale	

(Continued)

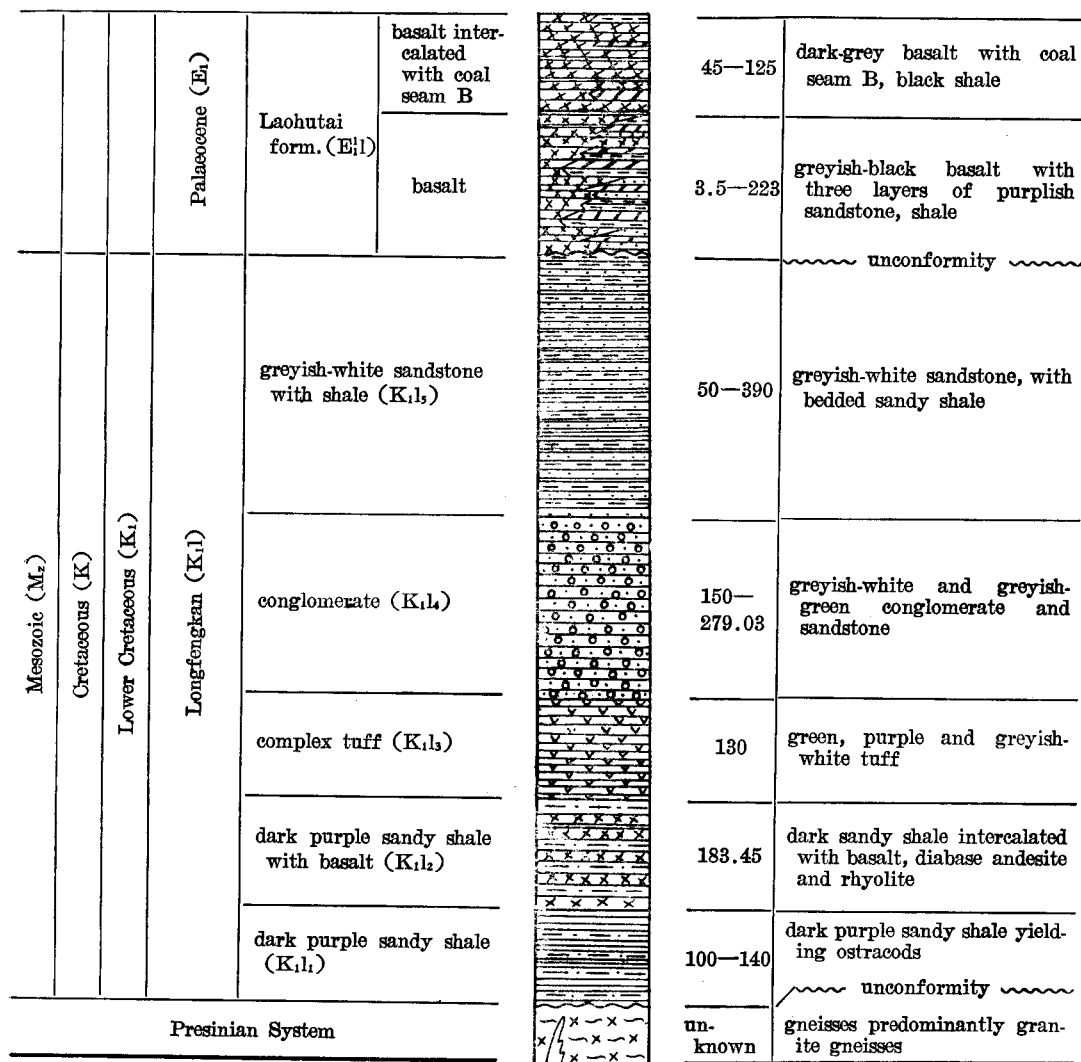


Fig. 1. Stratigraphic columnar section of Fushun Coalfield.

Table 1
Stratigraphic Subdivisions of Fushun Coalfield

Overlying Strata: Quaternary (Q)					
Palaeogene (E)	Fushun group (E _{1-f})	Eocene (E ₂)	Middle-upper Eocene (E _{2¹⁻⁴})	Gengjiajie form.(E _{2g})	Brown shale with green mudstone and sandstone, 111.37—338.05 m
				Xilutian form.(E _{2x})	Green mudstone intercalated with brown shale and greenish marl, 102.08—600 m
				Jijuntun form.(E _{2j})	Brown oil shale, 48—190 m
				Lower Eocene (E ₂)	Guchengzi (E _{2g})
		Palaeocene (E ₁)	Lizigou form.(E _{1l})	Greyish-green tuff and black coarse-grained tuff with coal seam A ₁ (E _{1l} ³), 1—5 m	
				Coal seam A ₂ intercalated with shale and sandstone (E _{1l} ²), 0.5—10 m	
				Greyish-green tuff (E _{1l} ¹), 75—100 m	
	Laohutai form.(E _{1l})		----- Disconformity -----		
			Basalt intercalated with tuff (E _{1l} ³), 35—223 m		
			Basalt intercalated with coal seam B (E _{1l} ²), 45—125 m		
	Cretaceous (K)	Lower Cretaceous (K ₁)	Longfengkan (K _{1l})	----- Unconformity -----	
				Greyish-white sandstone with shale (K _{1l} ³), 50—390 m	
				Conglomerate (K _{1l} ⁴), 150—279.03 m	
				White, purple, green tuff (K _{1l} ³), 130 m	
				Dark purple sandy shale with basalt (K _{1l} ²), 183.45 m	
				Dark purple sandy shale (K _{1l} ¹), 100—140 m	
----- Unconformity -----					
Underlying strata: Presinian system, gneisses predominantly granite-gneisses.					

5) Greyish-white sandstone and sandy shale (K₁³). It consists of greyish-green, greyish-white sandstone, with its lower part composed of sandy shale and thin-bedded, greyish-black shale. 50—390 m thick. This formation is of lower Cretaceous in age on the basis of stratigraphic relationship and ostracods.



Fig. 2. Stratigraphic section of Fushun Coalfield. (after Hong You-chong et al., 1974)

	Complex tuff		Brown oil shale
	Basalt		Green mudstone
	Main coal shale		Grey-white tuffaceous sandstone and shale

(3) Fushun Group ($E_{1-2} f$). Overlying unconformably the Longfengkan formation, the Fushun group may be divided into six formations and subdivided into ten beds.

1. Palaeocene (E_1)

(1) Laohutai formation ($E_1^1 l$). It consists mainly of basalt, intercalated with coal seam B and may be subdivided into three beds:

1) Basalt ($E_1^1 l^1$). Predominantly of greyish-black basalt intercalated with three layers of purplish-red sandstone, sandy shale and dark shale. 3.5—223 m thick.

2) Basalt intercalated with coal seam B ($E_1^1 l^2$). Mainly of dark-greyish basalt intercalated with coal seam B, black shale and carbonaceous shale. 45—125 m thick.

3) Basalt intercalated with tuff ($E_1^1 l^3$). Mainly of dark grey compact basalt intercalated with tuff, thin-bedded carbonaceous shale, grey sandy shale and sandstone. 8—193 m thick. This formation yields spores and pollens.

(2) Lizigou formation ($E_1^2 l$). Overlying disconformably the Laohutai formation, this formation reaches 76.5—115 m in thickness and may be subdivided into the following three beds:

1) Greyish-green tuff ($E_1^2 l^1$). Greyish-green compact tuff. 1—5 m thick.

2) Coal seam A ($E_1^2 l^2$). Coal seam A intercalated with black, dark grey thin-bedded carbonaceous shale and dark grey siltstone. 0.5—10 m thick.

3) Black coarse-grained, dark greyish-green and greyish-white tuff with coal seam A ($E_1^2 l^3$). 75—100 m thick. This formation yields spores and pollens.

2. Eocene (E_2)

(1) Guchengzi formation overlies conformably the Lizigou formation. 0.5—195 m thick ($E_2^1 g$).

Main coal seam is intercalated with carbonaceous shale, thin-bedded siltstone and tuffaceous sandstone varying from 0.6 to 195 meters in thickness. It contains cannel coal and within coal seam, fossil insects, spiders and plants are preserved in amber. This formation is of Lower Eocene in age.

(2) Jijuntun formation ($E_2^2 g$). Brownish and dark brown medium-thin-bedded compact and hard oil shale, yielding fossil insects, fishes, plants, spores and pollens. 48 to 190 m thick.

(3) Xilutian formation ($E_2^3 x$). Mainly green mudstone intercalated with brown shale, green thin-bedded and green medium-thin-bedded marl, richly fossiliferous (numerous ostracods, snails, spores and pollens, but only a few phyllopods and plants). 137—600 m thick.

(4) Gengjiajie formation ($E_2^4 g$). Mainly brown shale intercalated with thin-bedded sandstone, fine-grained sandstone and shale, as well as green thin-bedded mudstone. 111.37 to 338.05 m thick.

II. DESCRIPTION OF A NEW FOSSIL INSECT IN AMBER OF GUCHENGZI FORMATION ($E_1^2 g$)

Order Ephemeroptera

Suborder Plecoptera

Superfamily Siphonuridea

Family Ephemerellidae Klapalek, 1907

Philolimnias sinica Hong, gen. et sp. nov.

(Photo 1, Pl. I; Photos 1—2, Pl. II; Figs. 3—8)

*Type species*¹⁾. *P. sinica* Hong, gen. et sp. nov.; No. IV10054.

Measurements. Body length 11.63 mm; fore-wing 11 mm, width 4 mm; hind-wing length 3.5 mm, width 2 mm; antennae length 14.5 mm.

Description. Size very small; head broad, oval, flattened in front with oval eyes; mandible (Md) large and broad, arcuate at apex, apparently without tooth; labium (Lab) strong, toothed 1—2 (Fig. 3). Antennae (Ant) slender, its second joint about 2.5 times longer than the first joint (Fig. 4). Thorax broad, well developed, highly arched and long, but coxae very robust and about twice broader than femora. Tibiae very slender, but without spurs. Two clavas long and simple (Figs. 5, 6). Abdomen with nine segments, cylindrically compressed, with well-developed caudal appendages. Basistyle and distostyle of harpago strong and robust, arcuate at Aed slender (Fig. 7). Abdomen hairs usually quite short and inconspicuous; cerci with two segments; costal area narrow; subcostal area equal to radial area. Cu well-developed, with five branches, and reaching wing margin. CuP situated between the central part of the CuA_2 and A_1 , and more or less shorter than half the length of the CuA_2 . Five-branched veins situated between the regions of MP_1 and MP_2 ; three branches longer, the other two shorter. Cup of hind-wing longer than half length of CuA_2 . Exterior genitalia very long (Fig. 8).

Remarks. *Philolimnias* looks like the genus *Ephemerella*, but differs from the latter in the following characters: (i) CuA_1 well-developed with five branches; (ii)

1) Preserved in the Peking Geological Museum.

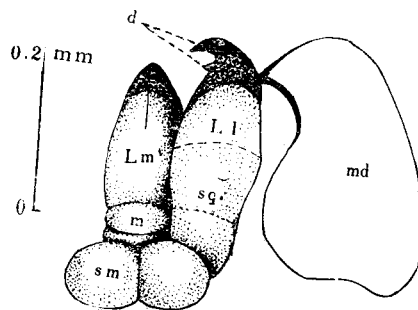


Fig. 3. *Philolimnias sinica* Hong, gen. et sp. nov. Character of labium and mandible.

Ll—lateral lobe of labium, Sg—labium segment, Lm—median lobe of labium, m—mentum, sm—submentum, d—denser, md—mandible.

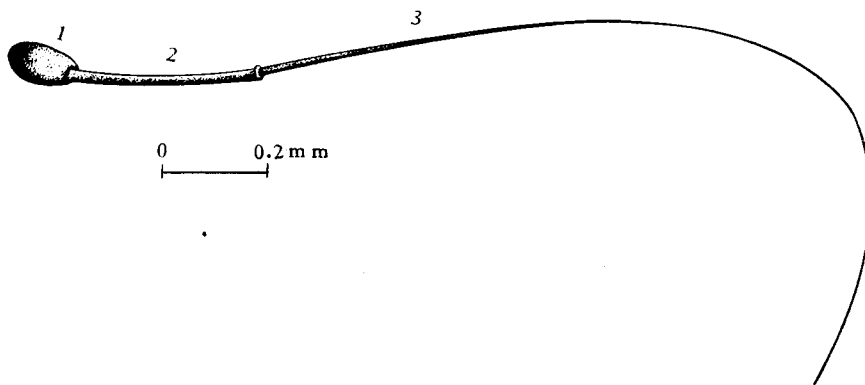


Fig. 4. *Philolimnias sinica* Hong, gen. et sp. nov. Character of antenna.

1, 2, 3—First to third joints of antenna.

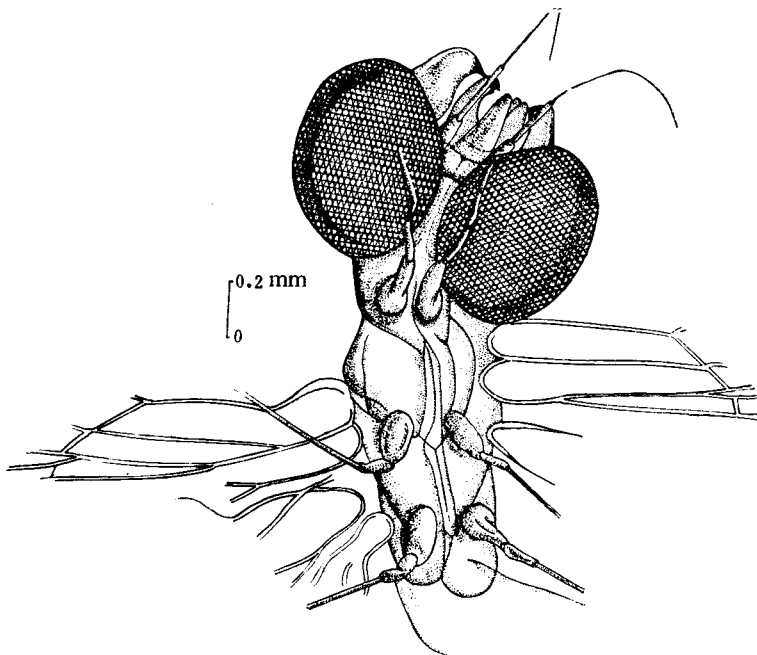


Fig. 5. *Philolimnias sinica* Hong, gen. et sp. nov. Character of ventral thorax (ventral view), showing the ventral thorax, pedes and ocelli.

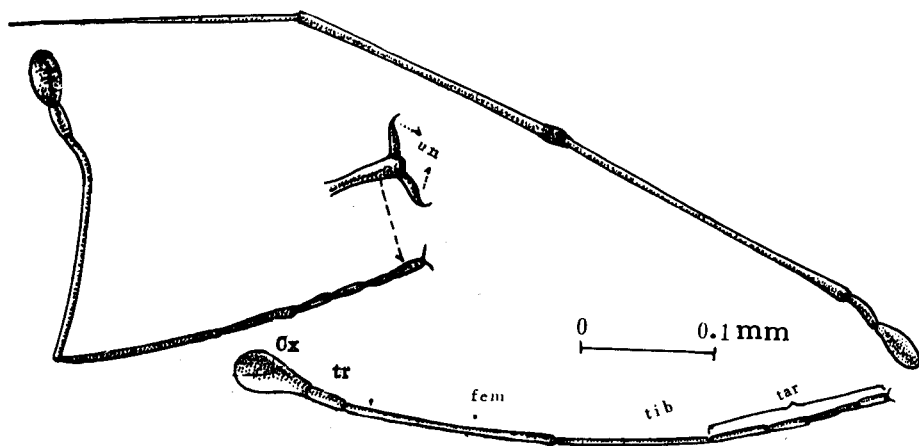


Fig. 6. *Philolimnias sinica* Hong, gen. et sp. nov. Character of pedes and unci.
Cx—coxa, tr—trochanter, fem—femur, tib—tibia, tar—tarsus, un—uncus.

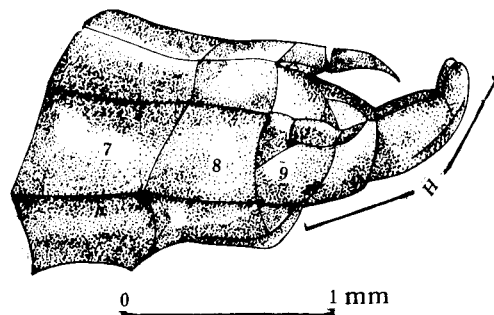


Fig. 7. *Philolimnias sinica* Hong, gen. et sp. nov. Character of harpago.
7-9—seventh to ninth of abdomen. H—harpago.

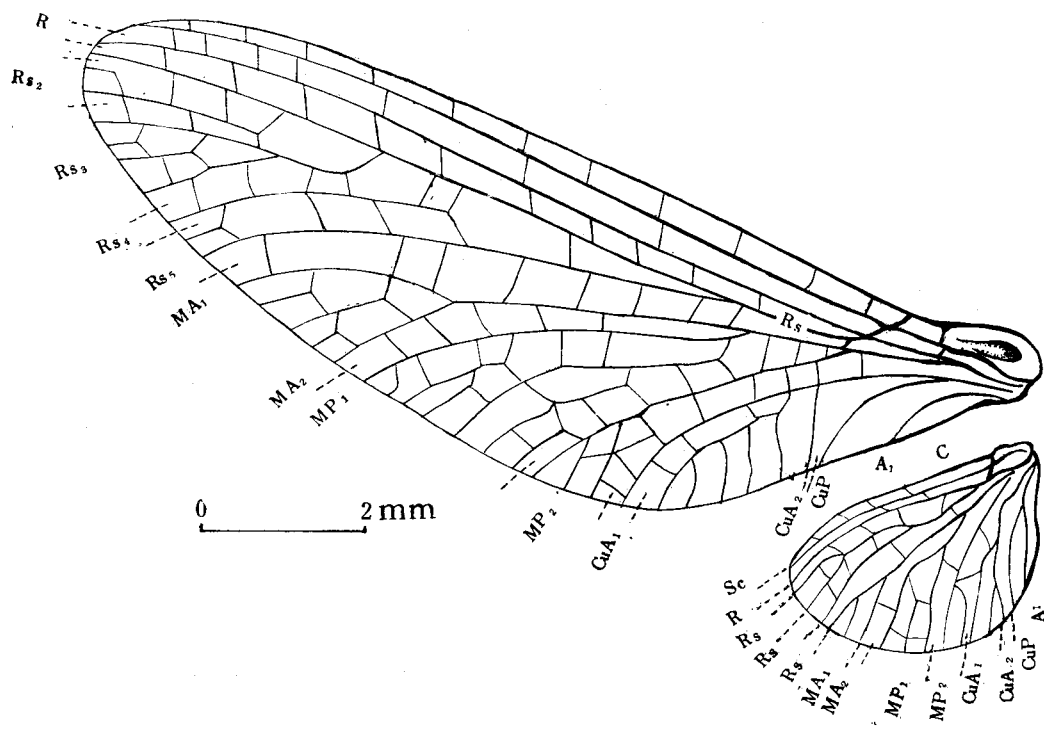


Fig. 8. *Philolimnias sinica* Hong, gen. et sp. nov. Character of wing venation.

costal area very narrow; (iii) intercalated vein well-developed between the regions of MP_1 and MP_2 ; (iv) antennae very slender.

Locality and Horizon. A single specimen in amber has been collected from the main coal seam of Guchengzi formation ($E_2^1 g$) of Lower Eocene, Xilutian of Fushun Coalfield, Liaoning Province.

REFERENCES

- [1] Hong You-chong et al.: *Acta Geologica Sinica*, (1974), 2, 113—150.
- [2] Chopra, B.: *Rec. Indian Mus.*, (1927), 29, 91—138.
- [3] Despax, R.: In Grassé, *Traité de Zoologie*, 9 (1949), 277—309.
- [4] Hsu Yin-chi: *Peking Nat. Hist. Bull.*, (1936), 11, 129—148.
- [5] Perrier, R.: *Faune de France*, (1934), 3, 41—50.
- [6] Tillyard, R. J.: *Pap. Proc. Roy. Soc. Tasmania*, (1935), 2, 23—59.
- [7] Tillyard, R. J.: *American Jour. Sci.*, (1935), 23, 97—134.
- [8] Чернова, О. А.: *Основы Палеонт. (Членистоногие)*, 9 (1962), 55—64.

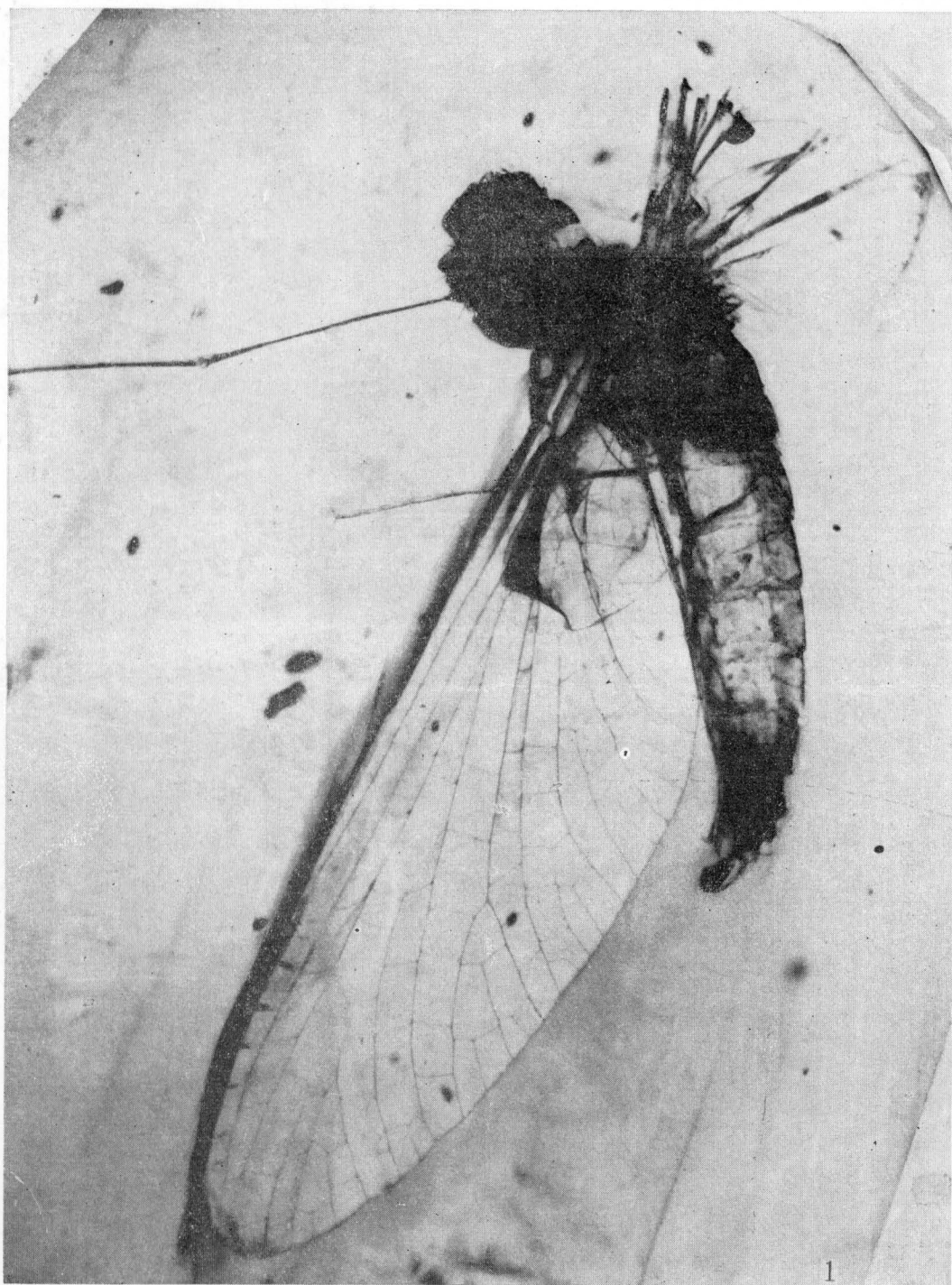
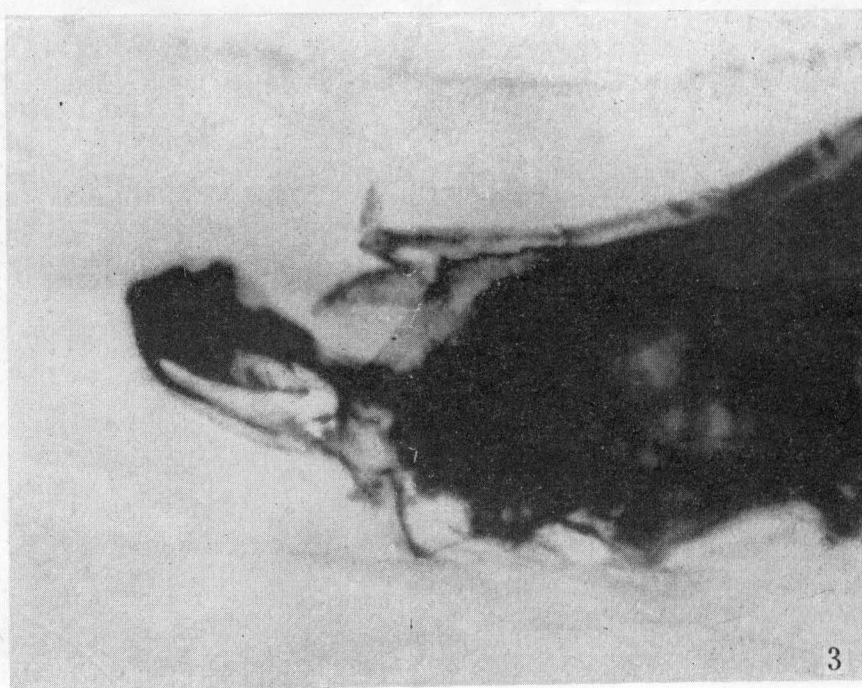
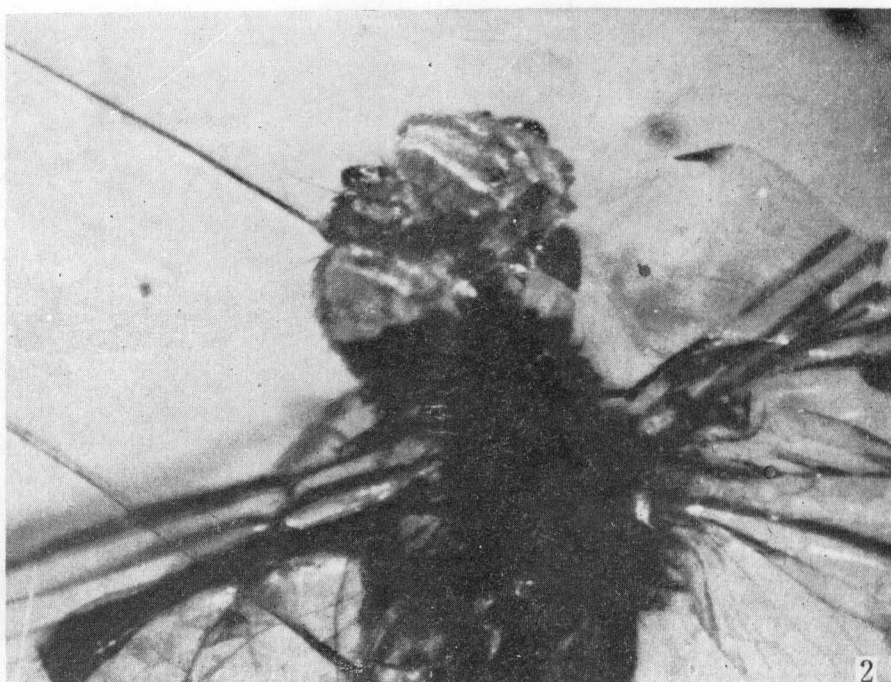


Photo 1. *Philolimnias sinica* Hong, gen. et sp. nov. Side view. $\times 14$; No. 10054; Guchengzi formation (E₁g) of Lower Eocene, Xilutian of Fushun Coalfield.



Photos 2, 3. *Philolimnias sinica* Hong, gen. et sp. nov.

2. Characters of oculi and trophi, $\times 40$; No. 10054.
3. Character of harpago, $\times 40$; No. 10054.