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【Research report】

台灣圓飛蝨科若蟲(同翅目)【研究報告】

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Abstract

摘要

本文為臺灣圓飛蝨科若蟲第一部分，包括科界定，亞科檢索表及Tonginae 亞科分類。Tonginae 亞科包括二屬四種。敘述、繪圖Tonga westwoodi (Signoret)；T. betelensis Kato；Ecapelopterum mirum Chan and Yang 與E. yehyuensis Cheng and Yang。

Key words:

關鍵詞: 同翅目、圓飛蝨科、若蟲、分類、臺灣。

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Nymphs of Issidae of Taiwan (Homoptera)

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ABSTRACT

This paper on Taiwan nymphs of Issidae includes family diagnostics and a key to the subfamilies. In the subfamily Tonginae 2 genera and 4 species: *Tonga westwoodi* (Signoret); *T. botelensis* Kato; *Ecapelopterum mirum* Chan and Yang and *E. yehyuensis* Cheng and Yang are described and illustrated.

Key words: Homoptera, Issidae, nymph, taxonomy, Taiwan.

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摘　要

本文為臺灣圓飛蝨科若蟲第一部分，包括科界定，亞科檢索表及Tonginae亞科分類。Tonginae亞科包括二屬四種。敘述、繪圖*Tonga westwoodi* (Signoret); *T. botelensis* Kato; *Ecapelopterum mirum* Chan and Yang 與 *E. yehyuensis* Cheng and Yang.

關鍵詞：同翅目，圓飛蝨科，若蟲、分類、臺灣。

Intoduction

The family Issidae is the larger one of the Fulgoroidea. With a few exceptions, knowledge of its nymphal stage is poorly represented in the literature. For accumulating more basic information to reconstruct the relationships of the members of Issidae, the fifth instar nymphs are described and illustrated with as much detail as possible. The family Issidae and subfamily Tonginae are defined. Keys to subfamilies, genera and species of subfamily Tonginae are given.

Family ISSIDAE Spinola

Issidae Schaum, 1850, Allgemeine Encyklopädie Ersch und Gruber 51: 70.
Issites Spinola, 1839, Ann. Soc. Entomol. France 8: 158.

Body somewhat elongate. Vertex wider than long, anterior margin carinate, straight or produced forward medially, lateral margins carinate, median carina present. Frons as wide as long, lateral margins carinate, submedian carinae distinct, rather close to lateral carinae especially near base, some species lateral carinae at base invisible in ventral view, median carina present or absent. Frontoclypeal suture nearly straight. Postclypeus ecarinate. Rostrum 3-segmented, subapical segment longer than apical. Eyes in profile somewhat obliquely straight at basoventral angle. Antennae withfirst segment wider than long, second segment longer than wide, sensory organs with rather short lobe-like processes.

Pro-nota with lateral carinae as anterolateral margins or not, each with 8–58 pits. Meso- and meta-nota without pit. Anterior wing pads each with 2–14 pits near notum, 0–13 pits laterad. Posterior wing pads each with 0–10 pits near notum. Pro- coxae slender, ridged. Meso-coxae ridged, each at basoventral angle with process. Pro- and meso-femora at ventral portion each with 2 rows of spines, one side with lobe-like expanded ventrad. Meta-coxae each with meracanthus, plus meron crescent-shaped, immovable. Meta-trochanters with ridges rather short, gradually shortening to apex. Meta -tibiae ridged, each with 1-5 lateral teeth. Spinal formula of hind leg (6–10)-(2–23)-(2–3). Second meta-tarsal segment at apex conical. Pretarsi with claws widely divergent apically, claw 2-setose. Arolium large, with paired setae near middle.

Abdomen 9-segmented. Abdominal tergites III–VIII bear each side (including on pleurites) (0–12)-(1–11)-(1–10)-(1–10)-(2–11)-(2–10) pits, respectively, pits more laterad. Abdominal tergite VII bears each side a wax-pore plate on membranous area or not, if present, plate elongated or reduced to comtain only 2 pores. Abdominal tergite VIII reduced in species with wax-pore plate, entire in other species. Ninth abdominal segment each side with 0–6 pits. Anal combs lobe-like, arising laterad.

Key to the subfamilies of Issidae

1.Abdominal segments VII–VIII each side with wax-pore plate; abdominal tergite VIII reduced; abdominal pleurites with pits 2
–.Abdominal segments VII–VIII without wax-pore plate; abdominal tergite VIII entire; abdominal pleurites without pit 3
2.Abdominal segment VII bear each side a wax-pore plate, as long as or longer than in VIII; posterior wing pads each with 8–10 pits; anterior wing pads each with 9–14 pits near notum ..... **Tonginae** Kirkaldy
–.Abdominal segment VII bear each side a wax-pore plate, reduced, which less than one-fourth of VIII; posterior wing pads each with 3 pits; anterior wing pads each with 5–8 pits near notum ..... **Issinae** Spinola

3.Body terete, subparallel; pits on abdominal tergites aggregate into 2 groups; second meta-tarsal segment with 2 apical teeth ····· ····· **Caliscelinae** Amyot and Serville

-.Body hemispherical or elongate ovate; pits on abdominal tergites arranging in a line; second meta-tarsal segment with 6–8 apical teeth·····4

4.Body elongate ovate; posterior wing pads each with 8 pits near notum; anterior wing pads each with 10 pits near notum····· ····· **Parahiracinae** Cheng and Yang

-.Body hemispherical; posterior wing pads each with 0–2 pits near notum; anterior wing pads each with 2–5 pots near notum·····**Hemisphaeriinae** Melichar

Subfamily TONGINAE Kirkaldy

Tonginae Kirkaldy, 1907, Bull. Hawaiian Sugar Pl. Assoc. Div. Entomol. 3 : 9.

Body slender. Vertex extremely long or quadrate. Rostrum with subapical segment as long as apical. Pro-nota each with about 50 pits distributed on lateral area. Anterior wing pads each with 9–14 pits near notum, 7–13 pits laterad. Posterior wing pads each with 8–10 pits near notum. Abdominal tergites III–VIII bear each side (4–7)-(5–8)-(5–9)-(5–7)-(5–7)-(4–6) pits respectively. Abdominal pleurites III–VIII bear each side (4–7)-(3–5)-(3–5)-(3–5)-(3–4)-(3–5) pits respctively. Abdominal segment VII bears each side elongate wax-pore plate which as long as or longer than in VIII. Abdominal tergite VIII reduced into a very small plate at lateroventral angle of wax-pore plate. Ninth abdominal segment in profile] -shaped, each side with 4–5 pits, 1 dorsal, 1–2 medial, 2 ventral.

Key to the genera and the species of Tonginae of Taiwan

1.Vertex conical; rostrum with subapical segment slightly shorter than apical; meta-tibiae each with 5 lateral teeth; wax-pore plates of abdominal segment VII longer than in VIII (*Tonga* Kirkaldy)·····2

-.Vertex pentagonal; rostrum with subapical segment slightly longer than apical; meta-tibiae each with 4 lateral teeth; wax-pore plate of abdominal segment VII as long as in VIII (*Ecapelopterum* Chan and Yang)·····3

2.Conical process of vertex extremely long, 2.7 times longer in midline than wide at base; frons extremely long, 2.7 times longer in midline than wide at widest part; each side of frons with about 131 pits; ninth abdominal segment bears each side 5 pits ·····***T. westwoodi*** (Signoret)

-.Conical process of vertex elongate, 1.8 times longer in midline than wide at base; frons elongate, 2.2 times longer in midline than wide at widest part; each side of frons with about 93 pits; ninth abdominal segment bears each side 4 pits·····***T. botelensis*** Kato

3.Vertex 2.5 times wider at apex than long in midline; between anterior carina of vertex and submedian carinae of frons with a pentagonal area; anterior wing pads each with 12 pits near notum· ·····***E. mirum*** Chan and Yang

-.Vertex 2 times wider at apex than long in middle line; between anterior carina of vertex and submedian carinae of frons with a trapezoid area; anterior wing pads each with 9 pits near notum ·· ·····***E. yehyuensis*** Cheng and Yang

Tonga botelensis Kato

(Fig. 1)

Tonga botelensis Kato, 1913, Entomol. World 1 : 463.

General color pale brown or brown, with light brown spots scattered. Anterior-wing pads and abdominal tergites somewhat reddish orange, wing pads with brown near apical margins in case of pale

brown. Anterior wing pads and abdominal tergites somewhat yellowish orange or light yellow in case of brown. From vertex to end of abdominal segment VII with light pale brown longitudinal stripe at midline and reddish orange or partly reddish orange line at center of longitudinal stripe. Frons at base with 5 white marks scattered and somewhat black near white marks.

Vertex and frons forming long conical process, vertex 1.8 times longer in midline than widest part, widest at base. Frons very long, 2.2 times longer in midline than widest part, widest at lower level of eyes, lateral margins carinate, submedian carinae distinct, at base curved mesad then fused, apical ends reaching nearly to upper level of antennae and slightly incurved at apex, median carina only visible at apical third. Each side of frons with about 93 pits. Rostrum with subapical segment slightly shorter than apical, about 1 : 1.2. Antennae small, second segment longer than wide, about 1.3 : 1.

Pro-nota each with about 58 pits. Meso- and meta-nota with lateral carinae distinct. Anterior wing pads each with 13 pits near notum, 9 pits laterad. Posterior wing pads each with about 9 pits near notum, 3 pits at lateral side covered by anterior wing pad. Pro- and meso-femora at ventral margins with spines loosely, each with about 9–15, 12–15 spines respectively. Meta-trochanters each with 10 ridges. Meta-tibiae each with 5 lateral teeth, relative distance of teeth about 1.8 : 1.9 : 1.5 : 1. Spinal formula of hind leg 10–9–2.

Abdominal tergites III–VIII bear each side 7–8–9–7–6–5 pits respectively. Abdominal pleurites III–VIII bear each side 5–3–3–3–3–1 pits respectively. Abdominal segments VII–VIII each side with wax-pore plates, wax-pore plate of VIII longer than in VII. Ninth abdominal segment each side with 4 pits.

Length of body: 8.1 mm.

Specimens examined: Fifth instar nymph : 3, Orchid Island, Taitung Hsien, 8-VIII-1989, M. L. Chan; 2, Orchid Island, Taitung Hsien, 8-VIII-1989, C. L. Cheng; 2, Orchid Island, Taitung Hsien, 10-VIII-1989, M. L. Chan.

Determination: 1 male adult emerged, determined from appearance by C. L. Cheng.

Tonga westwoodi (**Signoret**) (Fig. 2)

Tonga westwoodi Distant, 1906, Fauna of Brititsh India: 355.

Cyrene westwoodi Signoret, 1862, Ann. Soc. Entomol. France(4): 124.

General color pale brown, with light brown spots scattered. Anterior wing pads somewhat reddish. From vertex to end of abdominal segment VII with light brown longitudinal stripe at midline and reddish or partly reddish line at certer longitudinal stripe. Frons light brown, at base with 5 white marks scattered inside of fusing point of submedian carinae and somewhat black near white marks. Each side of frons and genae pale brown above eyes. Clypeus and legs light brown with brown spots scattered.

Vertex and frons forming long conical process, vertex 2.7 times longer in midline than widest part, widest at base. Frons extremely long, 2.7 times longer in midline than widest part, widest at lower level of eyes, lateral margins carinate, submedian carinae distinct, at base curved mesad then fused, apical ends reaching lower level of antennae and incurved. Each side of frons with about 131 pits, median carina indistinct, slightly visible at apical third. Clypeus ecarinate. Rostrum with subapical segment slightly shorter than apical, about 1 : 1.1. Antennae small, second segment longer than wide, about 1.3 : 1.

Pro-nota each with lateral carina and a supernumerary carina, with about 51 pits. Meso- and meta-nota with lateral

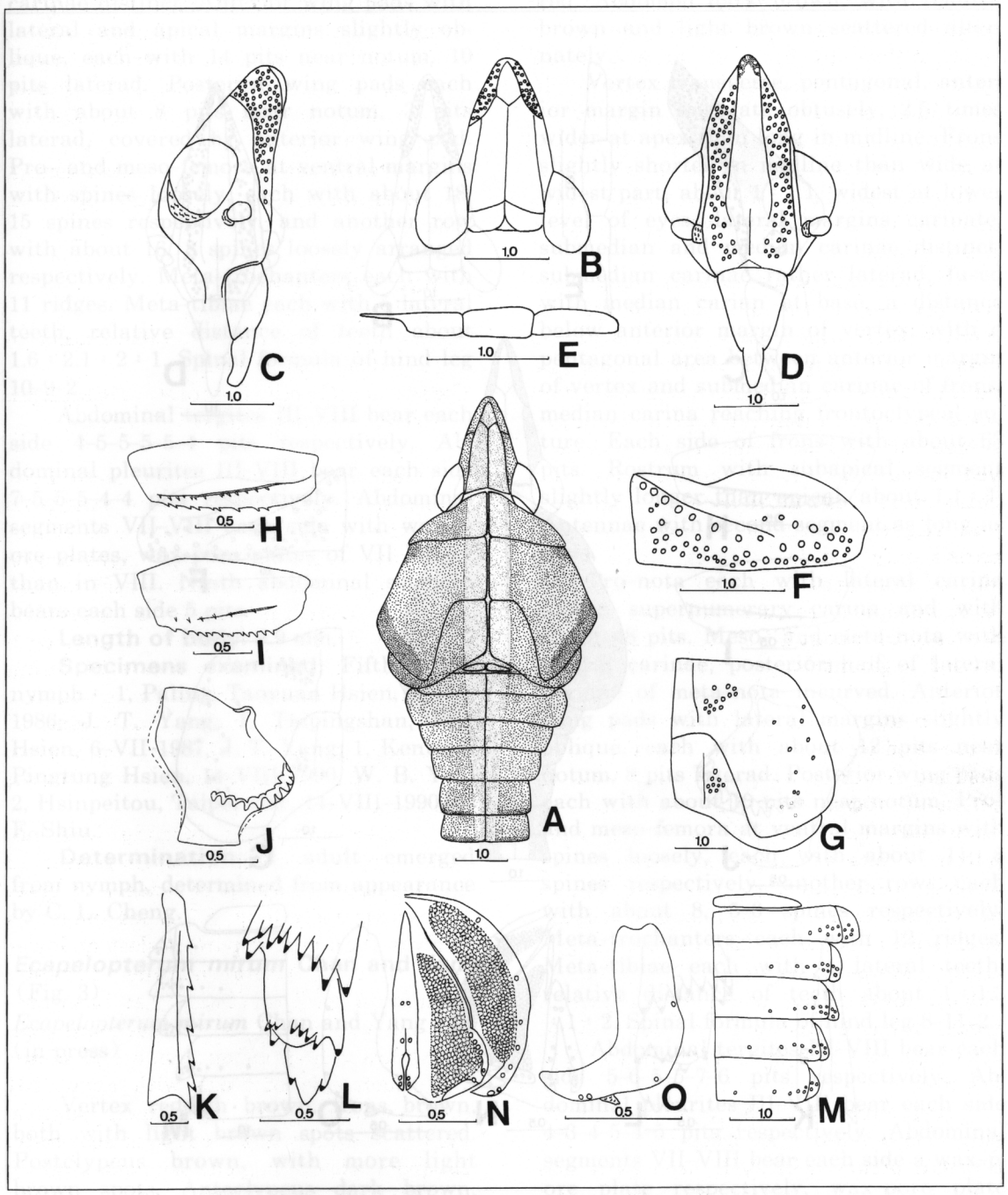

Fig.1. Nymph of *Tonga botelensis* Kato A, fifth instar nymph, dorsal view; B,head,dorsal view; C, the same, left side; D, the same, ventral view; E, rostrum,lateral view; F, pro-notum, flat surface; G, wing pads, flat surface; H, pro-femur; I, meso-femur; J, meta-trochanter; K, meta-tibia; L, teeth of meta-tibia and tarsi; M, abdominal tergites II-VII and abdominal pleurites III-VII, flat surface; N, abdominal segments VII-IX, caudal view; O, ninth abdominal segment, lateral side. (unit=mm.)

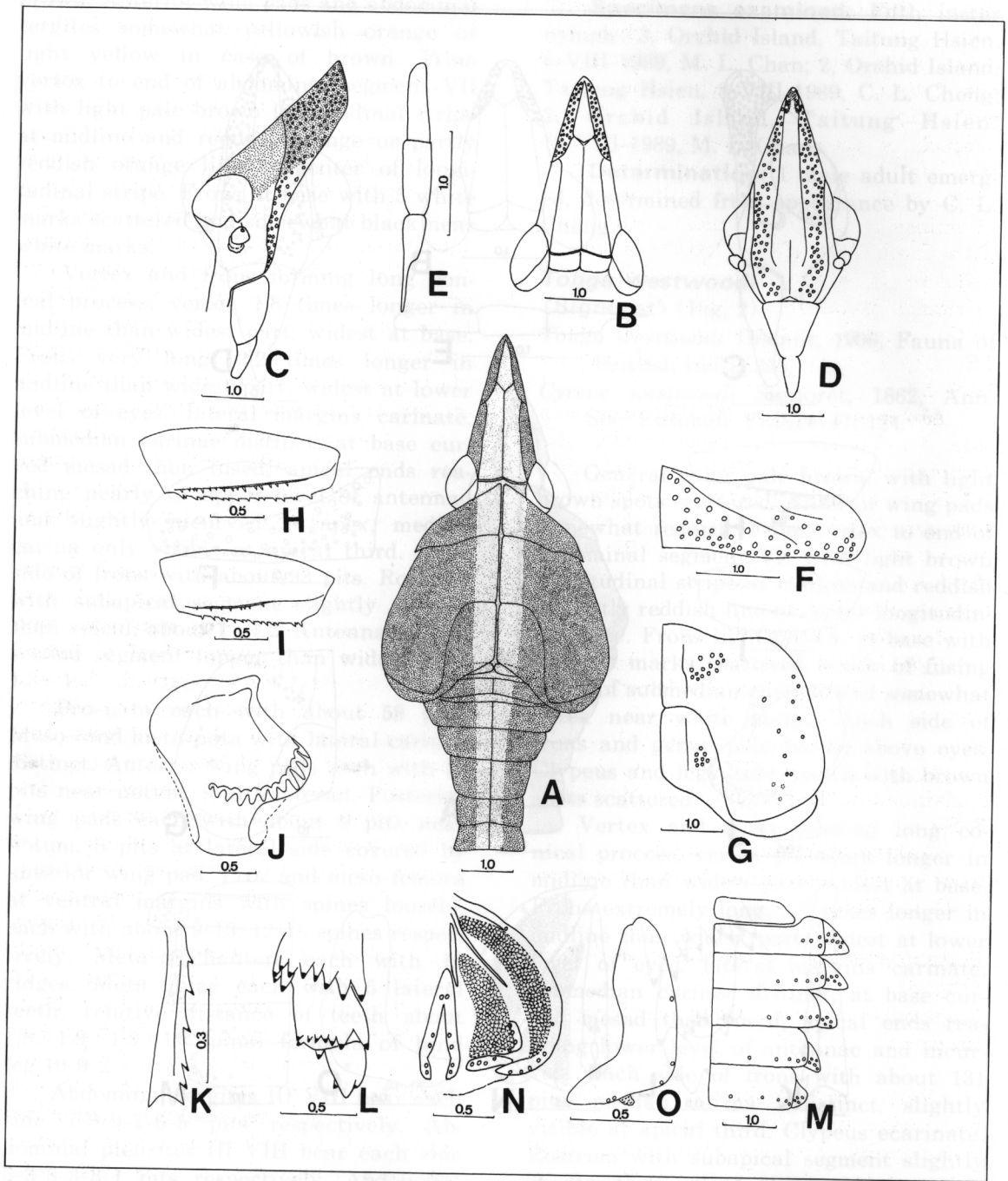

Fig.2. Nymph of *Tonga westwoodi* (Signoret) A, fifth instar nymph, dorsal view; B, head, dorsal view; C, the same, left side; D, the same, ventral view; E, rostrum, lateral side; F, pro-notum, flat surface; G, wing pads, flat surface; H, pro-femur; I, meso-femur; J, meta-trochanter; K, meta-tibia; L, teeth of meta-tibia and tarsi; M, abdominal tergites II-VII and abdominal pleurites III-VII, flat surface; N, abdominal segments VII-IX, caudal view; O, ninth abdominal segment, lateral side. (unit=mm.)

carinae distinct. Anterior wing pads with lateral and apical margins slightly oblique, each with 14 pits near notum, 10 pits laterad. Posterior wing pads each with about 8 pits near notum, 3 pits laterad, covered by anterior wing pad. Pro- and meso-femora at ventral margins with spines loosely, each with about 18, 15 spines respectively, and another row with about 16, 8 spines loosely arranged respectively. Meta-trochanters each with 11 ridges. Meta-tibiae each with 5 lateral teeth, relative distance of teeth about 1.6 : 2.1 : 2 : 1. Spinal formula of hind leg 10-9-2.

Abdominal tergites III-VIII bear each side 4-5-5-5-5-4 pits respectively. Abdominal pleurites III-VIII bear each side 7-5-5-5-4-4 pits respectively. Abdominal segments VII-VIII each side with wax-pore plates, wax-pore plates of VII longer than in VIII. Ninth abdominal segment bears each side 5 pits.

Length of body: 9.9 mm.

Specimens examined: Fifth instar nymph : 1, Paling, Taoyuan Hsien, 7-VII-1986, J. T. Yang; 1, Taipingshan, Ilan Hsien, 6-VII-1987, J. T. Yang; 1, Kenting, Pingtung Hsien, 14-VIII-1990, W. B. Yeh; 2, Hsinpeitou, Taipei city, 14-VIII-1990, T. F. Shiu.

Determination: 1 adult emerged from nymph, determined from appearance by C. L. Cheng.

Ecapelopterum mirum Chan and Yang (Fig. 3)

Ecapelopterum mirum Chan and Yang (in press)

Vertex reddish brown, frons brown, both with light brown spots scattered. Postclypeus brown, with more light brown spots. Anteclypeus dark brown, with light brown at middle. Pro-, meso--nota and wing pads reddish brown irregularly. Meta-nota dark brown, with light brown spots scatter-ed. Legs dark brown, with light reddish brown scattered. Abdomen dark brown, with reddish brown and light brown scattered alternately.

Vertex transverse, pentagonal, anterior margin angulate obtusely, 2.5 times wider at apex than long in midline. Frons slightly shorter in midline than wide at widest part, about 1 : 1.1, widest at lower level of eyes, lateral margins carinate, submedian and median carinae distinct, submedian carinae rather laterad, fused with median carian at base, a distance below anterior margin of vertex, with a pentagonal area between anterior margin of vertex and submedian carinae of frons, median carina reaching frontoclypeal suture. Each side of frons with about 63 pits. Rostrum with subapical segment slightly longer than apical, about 1.1 : 1. Antennae with second segment as long as wide.

Pro-nota each with lateral carina and a supernumerary carina and with about 48 pits. Meso- and meta-nota with lateral carinae, posterior half of lateral cariane of meta-nota incurved. Anterior wing pads with lateral margins slightly oblique, each with about 12 pits near notum, 8 pits laterad. Posterior wing pads each with about 10 pits near notum. Pro- and meso-femora at ventral margins with spines loosely, each with about 11, 8 spines respectively, another rows each with about 8, 5-6 spines respectively. Meta-trochanters each with 12 ridges. Meta-tibiae each with 4 lateral teeth, relative distance of teeth about 1 : 1.3 : 1 : 2. Spinal formula of hind leg 8-11-2.

Abdominal tergites III-VIII bear each side 5-6-5-5-7-6 pits respectively. Abdominal pleurites III-VIII bear each side 4-3-4-5-4-5 pits respectively. Abdominal segments VII-VIII bear each side a wax-pore plate respectively, wax-pore plate rather large. Ninth abdominal segment each side with 5 pits, 1 dorsal, 2 medial, 2 ventral.

Length of body: 6.4mm.

Specimens examined: Fifth instar

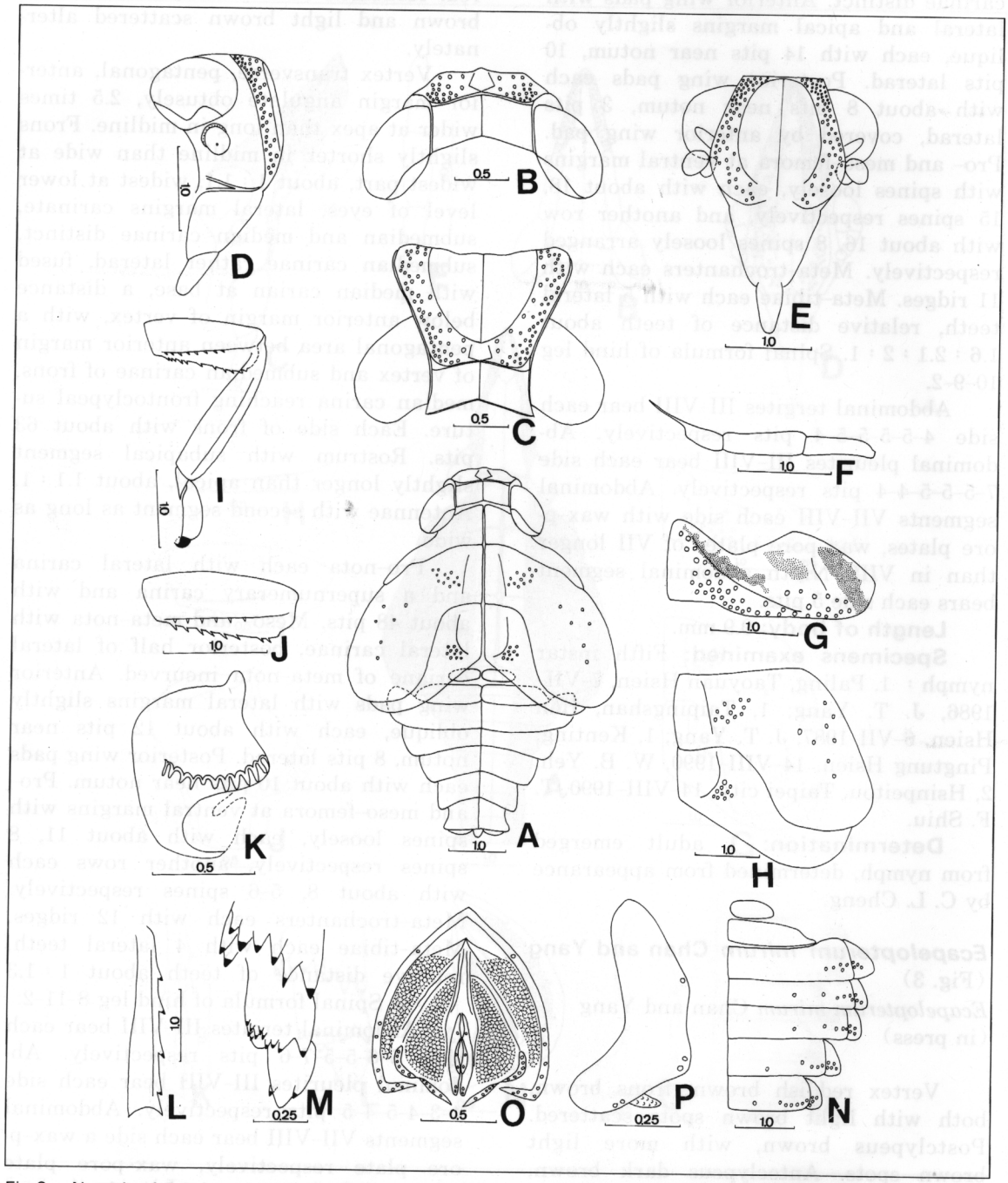

Fig.3. Nymph of *Ecapelopterum mirum* Chan and Yang A, fifth instar nymph, dorsal view; B, head, dorsal view; C, the same, anterodorsal view; D, the same, left side; E, the same, ventral view; F, rostrum, lateral side; G, pro-notum, flat surface; H, wing pads, flat surface; I, pro-femur; J, meso-femur; K, meta-trochanter; L, meta-tibia; M, teeth of meta-tibia and tarsi; N, abdominal tergites I-VII and abdominal pleurites III-VII, flat surface; O, abdominal segments VII-IX, caudal view; P, ninth abdominal segment, lateral side. (unit=mm.)

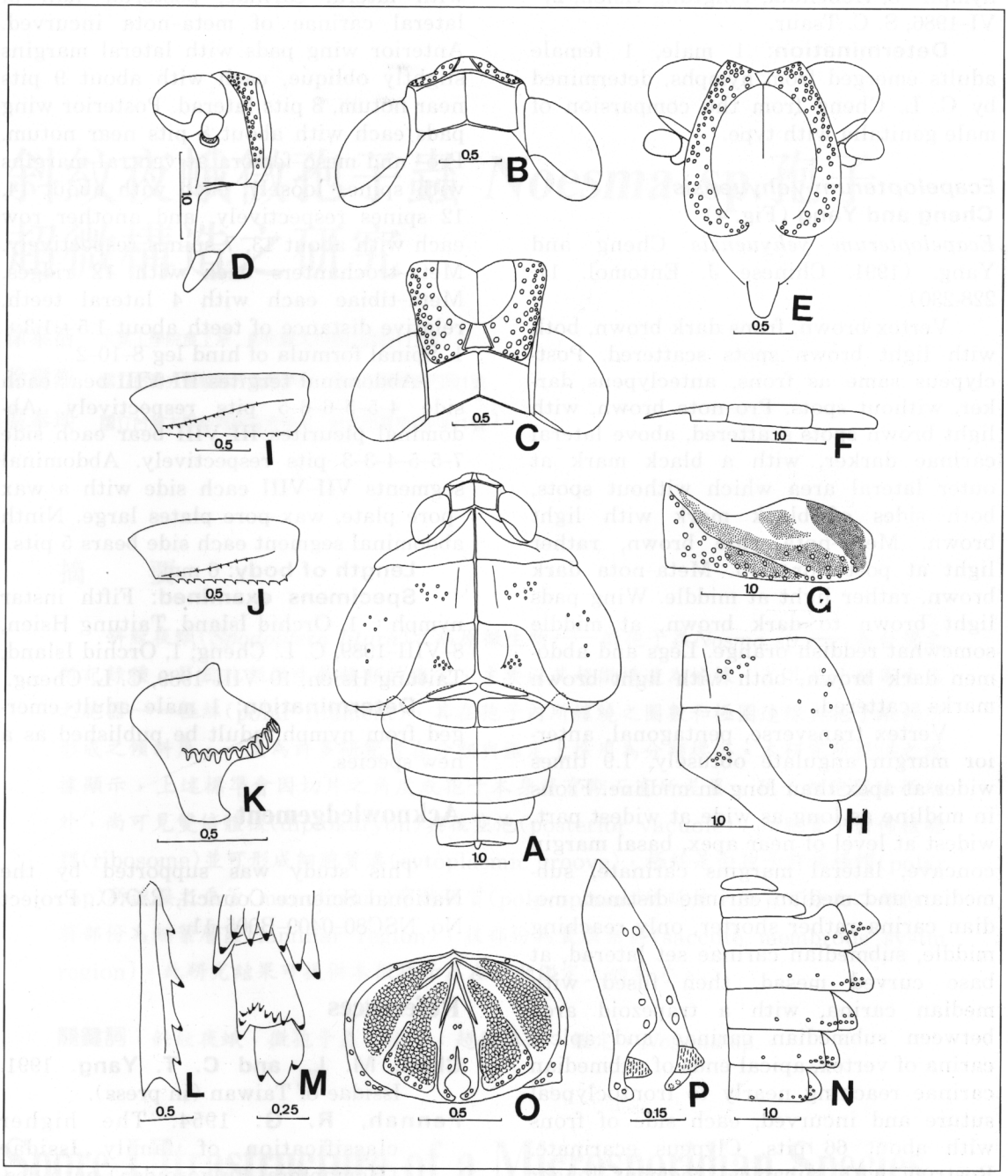

Fig.4. Nymph of *Ecapelopterum yehyuensis* Cheng and Yang A, fifth instar nymph, dorsal view; B, head, dorsal view; C, the same, anterodorsal view; D, the same, left side; E, the same, ventral view; F, rostrum, lateral side; G, pro-notum, flat surface; H, wing pads, flat surface; I, pro-femur; J, meso-femur; K, meta-trochanter; L, meta-tibia; M, teeth of meta-tibia and tarsi; N, abdominal tergites I-VII and abdominal pleurites III-VII, flat surface; O, abdominal segments VII-IX, caudal view; P, ninth abdominal segment, lateral side. (unit=mm.)

nymph : 3, Henchum, Pingtung Hsien, 27-VI-1986, S. C. Tsaur.

Determination: 1 male, 1 female adults emerged from nymphs, determined by C. L. Cheng from the comparsion of male genitalia with type.

Ecapelopterum yehyuensis Cheng and Yang (Fig. 4)

Ecapelopterum yehyuensis Cheng and Yang. (1991. Chinese J. Entomol. 11: 228-230)

Vertex brown, frons dark brown, both with light brown spots scattered. Postclypeus same as frons, anteclypeus darker, without spots. Pro-nota brown, with light brown spots scattered, above lateral carinae darker, with a black mark at outer lateral area which without spots, both sides of black mark with light brown. Meso-nota pale brown, rather light at posterior half. Meta-nota dark brown, rather light at middle. Wing pads light brown to dark brown, at middle somewhat reddish orange. Legs and abdomen dark brown, both with light brown marks scattered.

Vertex transverse, pentagonal, anterior margin angulate obtusely, 1.9 times wider at apex than long in midline. Frons in midline as long as wide at widest part, widest at level of near apex, basal margin concave, lateral margins carinate, submedian and median carinae distinct, median carina rather shorter, only reaching middle, submedian carinae set laterad, at base curved mesad, then fused with median carina, with a trapezoid area between submedian carinae and apical carina of vertex, apical ends of submedian carinae reaching nearly to frontoclypeal suture and incurved, each side of frons with about 66 pits. Clypeus ecarinate. Rostrum with subapical segment longer than apical, about 1.3 : 1. Antennae with second segment longer than wide, about 1.5 : 1.

Pro-nota with lateral carinae, each with about 47 pits. Meso- and meta-nota with lateral carinae, posterior half of lateral carinae of meta-nota incurved. Anterior wing pads with lateral margins slightly oblique, each with about 9 pits near notum, 8 pits laterad. Posterior wing pads each with about 8 pits near notum. Pro- and meso-femora at ventral margins with spines loosely, each with about 14, 12 spines respectively, and another row each with about 13, 7 spines respectively. Meta-trochanters each with 12 ridges. Meta-tibiae each with 4 lateral teeth, relative distance of teeth about 1.5 : 1.3 : 1. Spinal formula of hind leg 8-10-2.

Abdominal tergites III-VIII bear each side 4-5-5-6-6-5 pits respectively. Abdominal pleurites III-VIII bear each side 7-5-5-4-3-3 pits respectively. Abdominal segments VII-VIII each side with a wax-pore plate, wax-pore plates large. Ninth abdominal segment each side bears 5 pits.

Length of body: 6 mm.

Specimens examined: Fifth instar nymph : 1, Orchid Island, Taitung Hsien, 8-VIII-1989, C. L. Cheng; 1, Orchid Island, Taitung Hsien, 10-VIII-1989, C. L. Cheng.

Determination: 1 male adult emerged from nymph, adult be published as a new species.

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