台灣農業研究 (J. Taiwan Agric. Res.) 68(2):91–113 (2019)
DOI:10.6156/JTAR.201906_68(2).0001

Research Article

Taxonomic Description of Idolothripinae (Thysanoptera: Tubulifera: Phlaeothripidae) of Taiwan: II. Tribe Pygothripini

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Abstract

Wang, C. L., Y. J. Chen, and F. C. Lin. 2019. Taxonomic description of Idolothripinae (Thysanoptera: Tubulifera: Phlaeothripidae) of Taiwan: II. Tribe Pygothripini. J. Taiwan Agric. Res. 68(2):91–113.

This paper reviews 7 genera and 17 species of thrips in tribe Pygothripini of subfamily Idolothripinae in Taiwan. Identification keys are provided, and major characteristics are described and illustrated. There are 2 new species, *Ethirothrips rubeus* Wang and *Ethirothrips yangi* Wang. *Ethirothrips stenomelas* (Walker) was recorded for the first time in Taiwan. *Allothrips taiwanus* Okajima and *Scotothrips chui* Chen are new synonyms of *Allothrips nubillicauda discolor* Chen and *Ethirothrips tibialis* Okajima, respectively.

Key words: Taxonomy, Thysanoptera, Phlaeothripidae, Idolothripinae, Taiwan.

INTRODUCTION

The insects belonging to order Thysanoptera are divided into two suborders, Terebrantia and Tubulifera. The only family under suborder Tubulifera is Phlaeothripidae, and two subfamilies are recognized, Idolothripinae and Phlaeothripinae.

The spore-feeding Idolothripinae are devided into two tribes, Idolothripini and Pygothripini. Five genera and 11 species in tribe Idolothripini found in Taiwan were reviewed previously (Wang *et al*. 2018). Here Taiwanese species of tribe Pygothripini were described in this paper.

Karny (1913b) first described a new Idolothripinae species, *Rhaebothrips lativentris* (= *Nesothrips lativentris*). Moulton (1928) added 3 new species, *Machatothrips artocarpi*, *M. celosia* and *Smerinthothrips yuasari* (= *Nesothrips lativentris*). Chen (1980, 1982) made a survey in Taiwan and recognized 10 genera and 15 species which including 2 new species, *Scotothrips chui* and *S. virgulae*, and one new subspecies, *Allothrips nubillicauda discolor*. In the same paper, Chen also listed 3 new records, *Megathrips* (= *Bactrothrips*) *honoris* Bagnall, *Dichaetothrips indicus* (Bagnall), and *Scotothrips claripennis* (Moulton). Some of these specimens are re-identified and their taxonomic positions are altered in this paper. Okajima (1979) published a new species, *Gas-*

Received: May 25, 2018; Accepted: December 7, 2018.
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trothrips fuscatus from Taiwan. In 2006, he published 4 new *Acallurothrips* from Japan and Taiwan.

MATERIALS AND METHODS

Specimens studied were from four different sources: thrips collected by the authors from year 1993 to 2006 and deposited at Taiwan Agricultural Research Institute (TARI); slides deposited at TARI by R. Takahashi; slides deposited at TARI by L. S. Chen; slides loaned from Tokyo University of Agriculture, Japan.

Identification keys and characteristic descriptions were made by examination and comparison of these slides.

RESULTS AND DISCUSSION

Key to tribes of subfamily Idolothripinae

1 Metasternum without sternopleural sutures; pelta without campaniform sensilla; wing-retaining setae 2 pairs or more (except Hystricothripina with only one pair); tube with or without long setae ..... Idolothripini
– Metasternum with or without sternopleural sutures; pelta with or without campaniform sensilla; one pair of wing-retaining setae; tube without long setae ..... Pygothripini

Key to genera of tribe Pygothripini in Taiwan

1 Maxillary stylets close together medially in head 2
– Maxillary stylets wide apart or V-shaped in head 3
2 Ventral side of eyes normal; antennal segment IV with 2 (rarely 3 or 4) sense cones .. .. *Phaulothrips*
– Ventral side of eyes longer than dorsal side; antennal segment IV with 3 sense cones ..... subtribe Compsothripina (no records from Taiwan)
3 Antennal segments VII and VIII fused 4
– Antennal segments VII and VIII separated 5
4 Head with 3 pairs of expanded setae; tube short, not triangular ..... *Allothrips*
– Head without expanded setae; tube triangular ..... *Acallurothrips*
5 Female tarsal tooth present; femur enlarged, bearing several spurs ..... *Machatothrips*
– Female tarsal tooth present or absent; femur without spurs 6
6 Head square; pelta triangular, reticles irregular ..... *Gastrothrips*
– Head square or long; pelta hat-shaped, reticles dense and regular 7
7 Metathoracic sternopleural sutures absent; center of pelta covered with regular hexagonal reticles ..... *Ethirothrips*
– Metathoracic sternopleural sutures present; center of pelta covered with transverse hexagonal reticles ..... *Nesothrips*

Acallurothrips Bagnall (Fig. 1F)

Acallurothrips Bagnall, 1921:269. Type species: *Acallurothrips macrurus* Bagnall.

Female. Body size small to medium, macropterous; antennae 7 (or 8)-segmented, segments VII and VIII fused; segments III and IV with 2 and 4 sense cones, respectively (Fig. 1F); maxillary stylets wide apart, V-shaped; prosternal basantra present; metathoracic sternopleural suture present; forewings without duplicated cilia; tergites II–VII each with one pair of wing-retaining setae, short and straight; tube narrow toward apical end, shaped like a truncated cone, covered with numerous small tubercles.

Male. Apterous.

About 22 species were recorded in the world (ThripsWiki 2018).

Key to species of *Acallurothrips* in Taiwan

1 Metanotum with campaniform sensilla 2
– Metanotum without campaniform sensilla 3
2 Tube long; S2 setae on tergite IX smaller than S1 setae ..... *casuarinae*
– Tube short, about same as its width; S2 setae on tergite IX stronger and longer than S1

setae ..... *hagai*

3 S2 setae on tergite IX stronger and longer than S1 setae ..... *hanatanii*

– S2 setae on tergite IX smaller than S1 setae ..... *nonaki*

Acallurothrips casuarinae Okajima (Fig. 1G)

Acallurothrips casuarinae Okajima, 1993:87–89.

Female. Body length 1.6–2.0 mm on slide. Color dark brown, abdomen darker toward posterior segments, tube darkest; antennal segments I, II and basal half of III yellow, distal half of III and rest of segments brown to dark brown; forewings grayish brown; major setae yellow; femora yellow on distal end.

Head broad, width about 1.7 times its length; postocular setae sharp, slightly longer than eyes; maxillary stylets reaching posterior margin of eyes. Pronotum wider than long, major setae sharp; metanotum with a pair of campaniform sensilla; forewing without duplicated cilia; fore tarsal tooth present. Pelta triangular, posterior margin irregular (Fig. 1G); tube triangular, about same length of head, with numerous tubercles.

Male. Body smaller. Color similar to female; fore tarsal tooth present; S2 setae on tergite IX small; tube triangular, about same length as its width, and as long as head.

Distribution. Taiwan, Japan.

Specimens examined. 1F, Okinawa (Japan), dead leaves and branches, 4.ix.1989 (Okajima); 1M, Okajima (Japan), dead branches, 11.i.1991 (Okajima).

Acallurothrips hagai Okajima (Figs. 1A–1F)

Acallurothrips hagai Okajima, 1993:90–91

Female. Body length 1.7–2.0 mm on slide. Color dark brown, abdomen darker toward posterior segments, tube black; antennal segments I and II yellowish brown, basal half of III yellow and distal half brown, IV and V brown with yellow bases, rest segments brown; forewings greyish brown; major setae brown; femora grayish on distal end, tarsi yellow.

Head nearly quadrate, length about 1.2 times width (Fig. 1A); postocular setae sharp, slightly longer than eyes; maxillary stylets reaching posterior margin of eyes; antennal 8-segmented, segments VII and VIII fused (Fig. 1F). Pronotum wider than long, major setae sharp; metanotum with a pair of campaniform sensilla; fore leg with tarsal tooth. Pelta triangular, posterior margin irregular (Fig. 1C); S2 setae on tergite IX long and stout (Fig. 1D); tube width about same as its length, as long as head, laterally almost rounded, surface with numerous tubercles (Fig. 1E).

Male. Body smaller. Color similar to female; fore leg with tarsal tooth, femur usually larger than that of female (Fig. 1B).

Distribution. Taiwan, Japan.

Specimens examined. Paratypes: 1F1M, Hyogo (Japan), dead branches of ever-green tree, 6.i.1984 (Okajima); 1F, Chinjing Farm (Nantou), dead wood, 5.vi.1996.

Acallurothrips hanatanii Okajima (Fig. 1H)

Acallurothrips hanatanii Okajima, 1993:92–94.

Female. Body length 1.5–1.7 mm on slide. Color dark brown, abdomen darker toward posterior segments, tube yellowish, paler than segment IX; antennal segment I yellow, II brownish yellow, III brown with yellow base, rest of segments from brown to dark brown, darker toward apical segments; forewings grayish brown; main setae yellow; distal end of femora paler.

Head nearly quadrate, width about 1.3 times its length; postocular setae sharp, equal to or longer than length of eye; maxillary stylets reaching posterior margin of eyes. Pronotum wider than long, setae sharp; metanotum without campaniform sensilla; fore tarsal tooth present. Pelta with irregular margins (Fig. 1H); S2 setae stout and long, S1 setae about same length but slender; tube length about twice of its width, a little longer (L/W: 4.0/3.5) than head.

Male. Color similar to female, but smaller.

Distribution. Taiwan, Japan.

Specimens examined. Paratypes: 1F, Okinawa (Japan), dead leaves and branches, 4.ix.1989 (Okajima); 1M, Okinawa (Japan), dead leaves and branches, 28.iii.1990 (Okajima).

Acallurothrips nonakai Okajima (Fig. 1I)

Acallurothrips nonakai Okajima, 1993:96–98.

Female. Body length 1.9–2.1 mm on slide. Color dark brown, antennal segments I, II and basal half of III yellow, distal half of III and rest of segments brown to dark brown; fore-wings grayish brown; main setae yellow; distal end of femora yellow.

Head nearly quadrate, width about 1.2 times length; postocular setae sharp, equal to or longer than length of eye; maxillary stylets reaching posterior margin of eyes. Pronotum wider than long, setae sharp; metanotum without campaniform sensilla; fore tarsal tooth

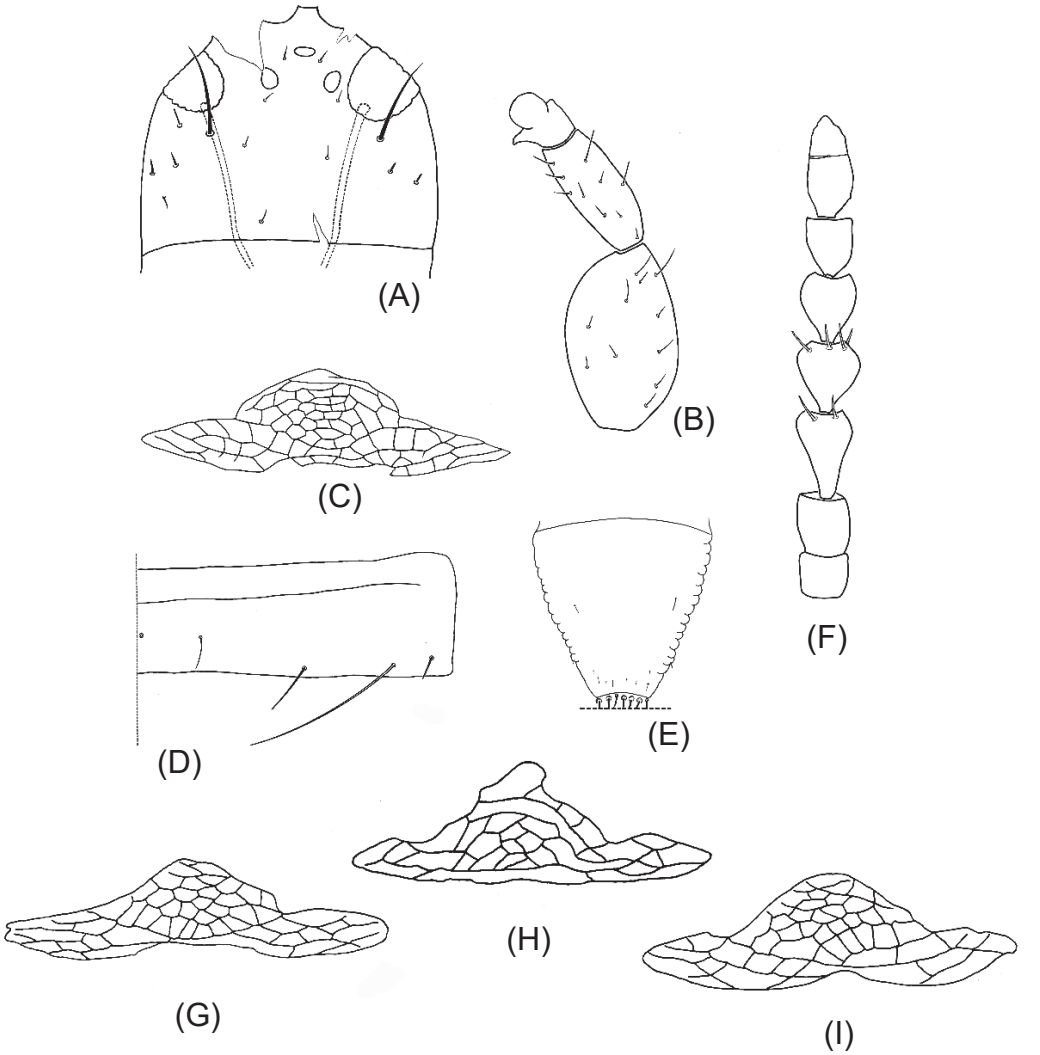

Fig. 1. *Acallurothrips* species: *hagai* Okajima (A–F): (A) head; (B) male fore leg; (C) pelta; (D) tergite III; (E) tube; (F) shape of antenna with sense cones on segments III and IV; pelta (G–I) of (G) *casuarinae* Okajima; (H) *hanatanii* Okajima; and (I) *nonakai* Okajima.

present. Pelta triangular, posterior margin irregular (Fig. 1I); S1 setae longer than S2; tube length about twice its width, longer than head (L/W: 10/7).

Male. Color similar to female, but smaller.

Distribution. Taiwan, Japan.

Specimens examined. Paratypes: 1F, Okinawa (Japan), dead leaves and branches, 28.iii.1990; 1M, Okinawa (Japan), dead branches, 11.i.1991 (Okajima).

Allothrips Hood (Figs. 2B and 2D)

Allothrips Hood, 1908:372–373. Type species: *Allothrips megacephalus* Hood.

Female. Small, wings usually retarded. Head length equal to its width or a little longer, dorsum of head bearing 3 pairs of stout setae, apex expanded; eyes composed of several separated ommatidia; antennae 7-segmented, segments short and rounded, segments II and III about same length, III and IV each with 2 sense cones (Fig. 2D); maxillary stylets wide apart, extended deeply to reach eyes. Prosternal basantra present; metathoracic sternopleural sutures present; fore tarsal tooth usually absent in female (Fig. 2B right). Pelta triangular; tube shorter than head.

Male. Color similar to female but smaller, fore tarsal tooth present (Fig. 2B left).

About 24 species were recorded in the world (ThripsWiki 2018).

Allothrips nubillicauda discolor Chen (Fig. 2)

Allothrips nubillicauda discolor Chen, 1982:54–56.

Allothrips taiwanus Okajima, 1987:150–152. syn. n.

Female (aptera). Body length 1.7 mm on slide. Bicolored: head, pterothorax, tergites IX and X, legs yellow; prothorax and abdominal segments II–VIII yellowish brown; antennal segments I brown, II and III yellow, IV grayish brown, V–VII brown.

Head longer than broad, length about 1.2 times its width (Fig. 2A), dorsum of head with reticulation, remarkable near neck; postocular setae, ocellar setae and cheek setae blunt; eyes composed of 5–6 ommatidia, ocellus lacking; maxillary stylets deep to posterior ommatidia; antennae 7-segmented, segments short and rounded (Fig. 2D). Pronotal setae blunt; prosternal basantra weak; fore tarsal tooth absent (Fig. 2B right). Pelta with a pair of campaniform sensilla; anterior surface smooth, posterior half clearly sculptured with reticles (Fig. 2C); setae on tergites II–IX stout; tube as long as head.

Male (aptera). Smaller, color similar to female, fore tarsus with tooth (Fig. 2B left).

Distribution. Taiwan.

Specimen examined. Holotype F, *A. nubillicauda discolor* Chen, Kukan (Taichung), leaf litter, 6.ix.1980; holotype F, *A. taiwanus* Okajima, Nanshanchi (Nantou), 26.vii.1975. (photos supplied by M. Masumoto, Japan); 2F1M, Feng-gu (Wufeng, Taichung), 23.vii.1993; 1F, Kending (Pingtung), *Acacia* sp., 13.iv.1993.

Remarks. There is only a single specimen of *A. taiwanus* in Okajima's collection. No difference can be found between it and *A. nubillicauda discolor* by the original descriptions of Okajima (1987). Photos of the type specimen supplied by M. Masumoto were also examined.

Ethirothrips Karny (Figs. 3–8)

Liothrips (*Ethirothrips*) Karny, 1925:133. Type species: *Liothrips thomasseti* Bagnall.

Scotothrips Priesner, 1939:75; Mound & Palmer, 1983:55.

Uredothrips Ananthakrishnan, 1969:184–185; Mound & Palmer, 1983:54–55.

Female. Body sizes medium to large, wings present or reduced. Head longer than broad, cheeks straight, compound eyes rather small; anterior ocellus often situated in a vertical position; isolated ommatidia-like structure may present; maxillary stylets wide apart, deeply retracted into head capsule; antennae 8-segmented, segments III with 2 sense cones, segment IV with 4 or 5 sense cones. Pronotum

shorter than head, prosternal basantra present, ferca well developed; metathoracic sternopleural sutures absent; female fore tarsal tooth present or absent; forewing (when present) with duplicated cilia. Pelta hat-shaped, covered with reticulations, usually reticles regular on center portion; with one pair of campaniform sensilla; major abdominal tergites each with one pair of wing-retaining setae; tube straight-sided or vertex.

Male. Fore tarsal tooth present.

About 30–35 species were recorded in the world.

Key to species of *Ethirothrips* in Taiwan

1 Fore tibia with distal spur ..... *tibialis*
– Fore tibia without distal spur 2
2 Tube slight-curved, not straight-sided ..... *virgulae*
– Tube straight-sided 3
3 Antennae bicolored, segments III, IV and most of V yellow, other segments brown ..... *yangi* sp. n.
– Antennal segments all brown, at most III yellow 4
4 Distance between posterior ocelli about or less than twice the diameter of ocellus ..... *stenomelas*
– Distance between posterior ocelli larger than 3 times the diameter of ocellus ..... *rubeus* sp. n.

Ethirothrips rubeus Wang, sp. n. (Figs. 3–4)

Female (macroptera or aptera). Body length

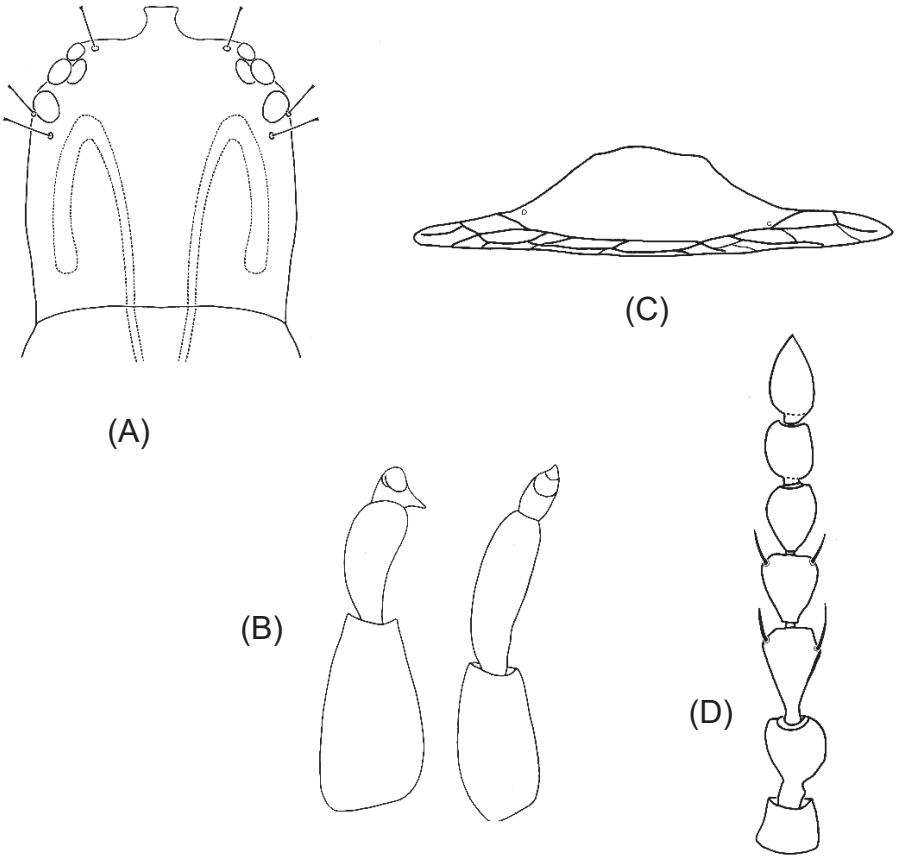

Fig. 2. *Allothrips nubillicauda discolor* Chen: (A) head; (B) fore legs of male (left) and female (right); (C) pelta; and (D) shape of antenna with sense cones on segments III and IV.

2.8–4.5 mm on slide. Color dark brown, with red pigment, tube blackish; antennal segments dark brown; fore tibiae and tarsi brown, fore femora and whole mid and hind legs dark brown; wings greyish brown if present.

Head slightly longer (L/W = 8/7) than wide, cheeks straight, with 3–5 pairs of short lateral setae; posterior ocelli wide apart; a pair of interocellar setae behind posterior ocelli; a pair of long postocular setae behind eyes; maxillary stylets retracted to postocular setae (Fig. 3A); antennae 8-segmented, segments III and IV each with 2 and 4 sense cones, respectively. (Fig. 3G).

Number of pronotal anteromarginal setae varied, usually 2 or 3 pairs, rarely 4 pairs; main setae sharp; basantra slender (Fig. 3B); mesonotum with 2 pairs of campaniform sensilla and one pair of small and faint pores; metanotum without campaniform sensilla; fore femora moderately enlarged; both male and female with fore tarsal tooth (Fig. 3D); forewing (if present) with 15–23 duplicated cilia.

Pelta with a pair of campaniform sensilla, anterior reticles near regular, posterior reticles transverse (Fig. 3C); tergite II laterally with

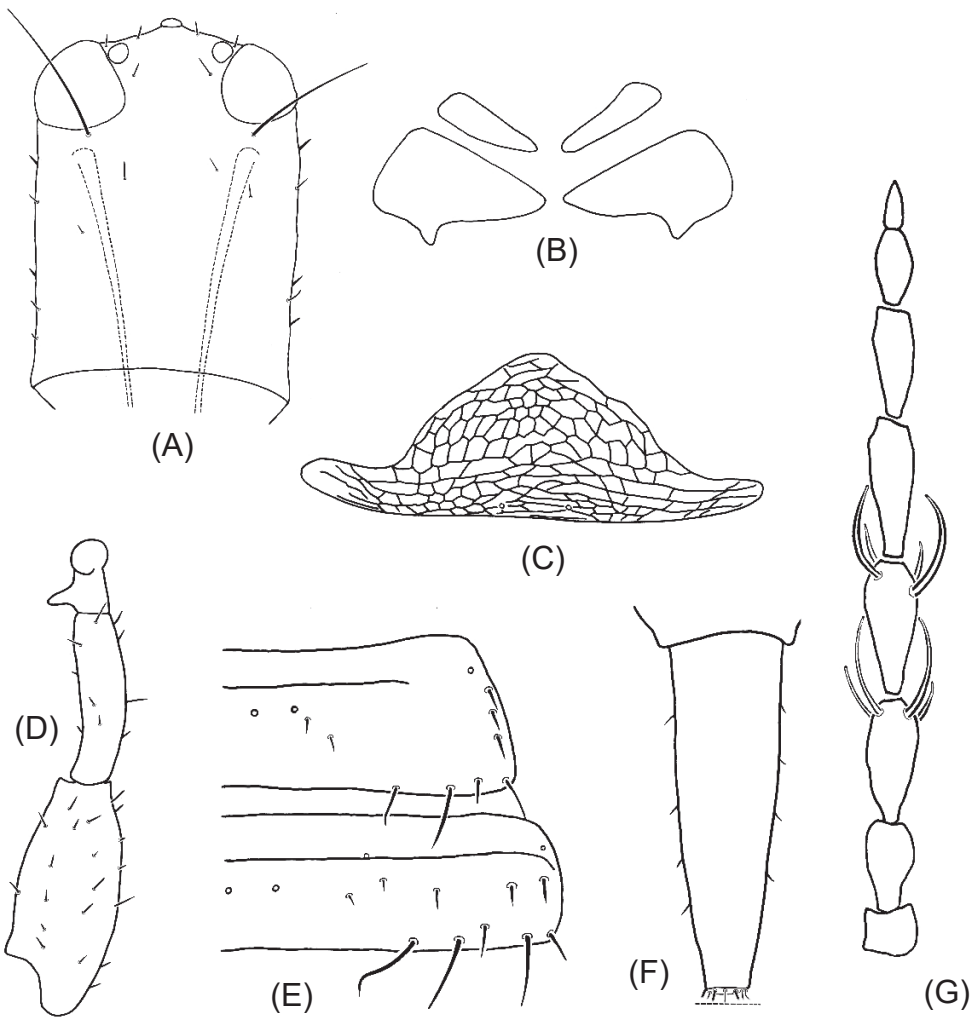

Fig. 3. *Ethirothrips rubeus* Wang, sp. n.: (A) head; (B) prosternal sclerites; (C) pelta; (D) fore leg; (E) tergites II and III; (F) tube; and (G) shape of antenna with sense cones on segments III and IV.

3 marginal setae; tergites II and III each with 1–2 tiny setae around each discal pore, tergites III–V with transverse row of 3–5 setae (Fig. 3E); tube straight-sided (Fig. 3F), about same length of head.

Measurements in µm (holotype). Body length (L) 3820, head [median L/largest Width (W)] 340/280, distance between posterior ocelli 80, postocular setae L 190; antennal segments I to VIII (L/W): 40/50, 40/60, 110/40, 130/40, 120/40, 100/30, 80/30, 40/20; pronotum (median L/W) 250/470; pelta (L/W) 110/320, forewing L 1420, tube (L/basal W) 420/140.

Male (macroptera or aptera). Body length 2.8–4.0 mm on slide. Color and shape similar to female; fore tarsal with tooth (Fig. 3D).

Measurements in µm (male macroptera no. 93263). Body L 2900, head (median L/largest W) 300/240; antennal segments I to VIII (L/W): 50/40, 60/30, 90/40, 100/40, 100/30, 80/30, 60/20, 40/10; pronotum (median L/W) 220/450, forewing L 1125; pelta (L/W) 120/320, tube (L/basal W) 300/100.

Distribution. Taiwan.

Specimens examined. Holotype macroptera; F, Kenting (Pingtung), dead wood, 14.iv.1993. Paratypes: macroptera: 3F, Fenggu (Wufeng), dead wood, 23.vii.1993; 2M, Kenting (Pingtung), dead wood, 13.iv.1993. Paratypes: aptera: 3F, Nanjen Mt. (Pingtung), dead wood and dried leaves, 15.iv.1993; 2F, Kenting (Pingtung), dead wood and grasses, 13.iv.1993; 2M, Nanjen Mt. (Pingtung), dead wood, 15.iv.1993.

Etymology. Latin, ruber = red; indicating the red pigment scattered on head, thorax and abdomen.

Remarks. This species is similar to *Ethirothrips boninensis* Okajima. These two species can be separated by the shape of the basantra, and the number of tergal setae. *Ethirothrips rubeus* has slender basantra; tergites II and III with 1–2 tiny setae around each discal pore; *Ethirothrips boninensis* with larger basantra (Fig. 4A), and tergites II and III with 6–7 tiny setae around each discal pore (Fig. 4B).

Ethirothrips stenomelas (Walker) new record (Fig. 5)

Phlaeothrips stenomelas Walker, 1859:224.
Ethirothrips stenomelas (Walker); Mound & Palmer, 1983:57.

Female (macroptera). Body length 3.5–5.0 mm on slides. Color dark brown; antennal segments dark brown; legs brown; forewings greyish brown.

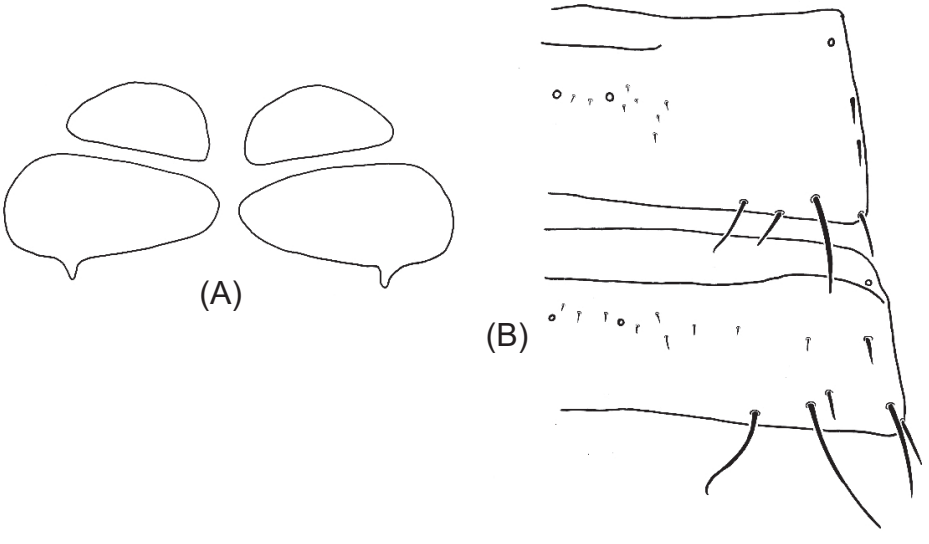

Fig. 4. *Ethirothrips boninensis* Okajima: (A) prosternal basantra and ferna; (B) tergites II and III.

Head length about twice its width, cheeks straight with 3–5 pairs of short setae; distance between posterior ocelli about or less than 2 diameters of ocellus; a pair of postocellar setae, a pair of long postocular setae and a pair of long dorsal setae; maxillary stylets retracted to postocular setae (Fig. 5A); antennae 8-segmented, segments III and IV with 2 and 5 sense cones, respectively.

Pronotal main setae pointed; mesonotum with 2 pairs of campaniform sensilla; metanotum without campaniform sensilla or small and faint pores; fore femur width less than half width of head; both male and female with fore tarsal tooth (Fig. 5C); forewing with approximately 30 duplicated cilia.

Pelta with a pair of campaniform sensilla, median portion with regular hexagonal reticles (Fig. 5B); tergite II laterally with a series of 6 strong setae, tergites III with a series of 4 stout

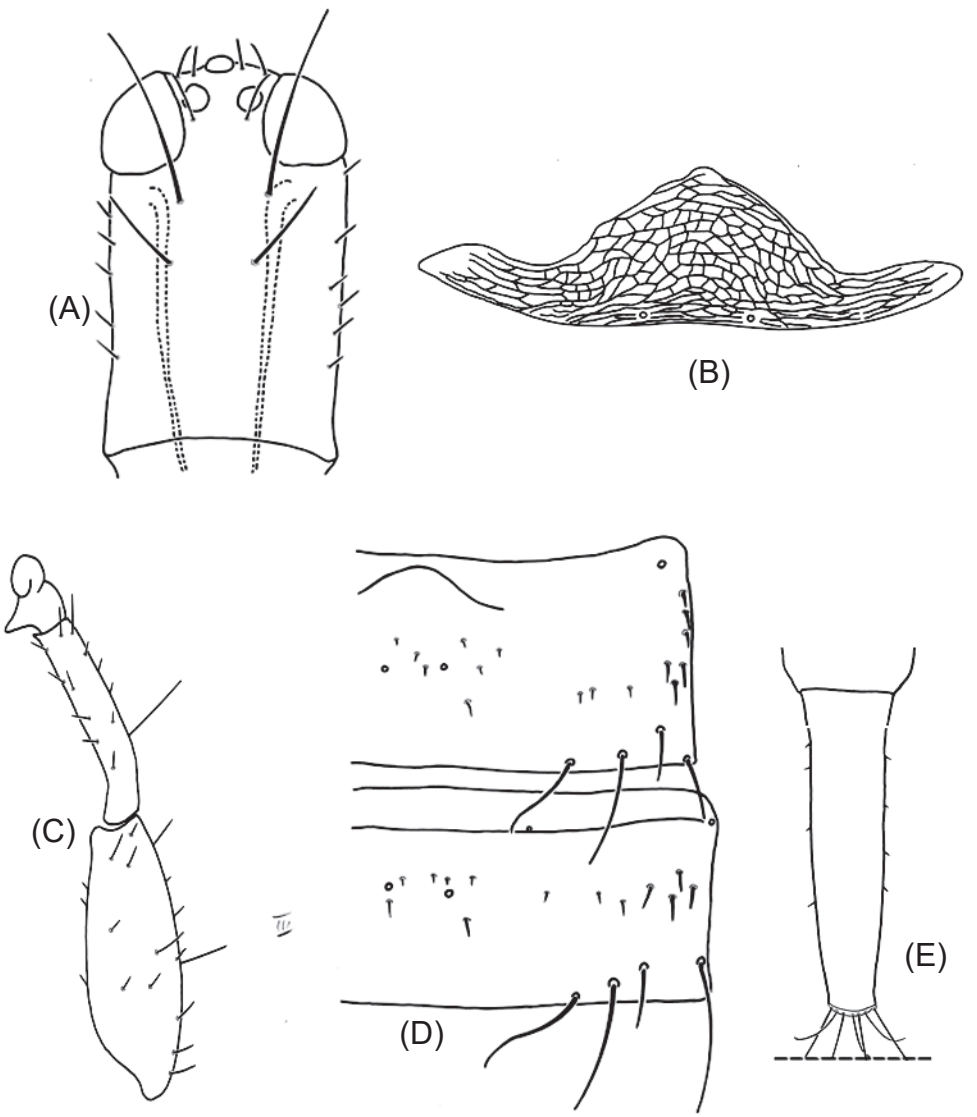

Fig. 5. *Ethirothrips stenomelas* (Walker): (A) head; (B) pelta; (C) fore leg; (D) right half of tergites II and III; and (E) tube.

setae (Fig. 5D); tube straight-sided, about same length of head (Fig. 5E).

Male (macroptera). body length 4.0–4.2 mm, color and shape similar to female; fore tarsus with tooth.

Distribution. Taiwan, Japan, India, Hawaii, Mexico, Panama, Jamaica, Trinidad, South Africa.

Specimens examined. 1F1M, Okinawa (Japan), dead branches, 11.i.1991; 2F2M, Fenggu (Wufeng, Taichung), dead wood, 23.vii.1993.

Ethirothrips tibialis (Okajima) (Fig. 6)

Uredothrips tibialis Okajima, 1975:16–19.

Ethirothrips tibialis (Okajima), Mound & Palmer, 1983:56.

Scotothrips chui Chen, 1982:64–65. **syn. n.**

Female (macroptera). Body length 2.8–3.2 mm on slide. Color dark brown, abdomen darker than head and thorax, abdominal segments V–X darker than anterior segments; antennal segments I–II, basal half of III yellow, rest of segments brown; all femora and tibiae brown, all tarsi yellowish brown; forewings light yellow.

Head square, length may a little longer than its width, cheeks with several pairs of strong setae; eyes small, one pair of long pos-

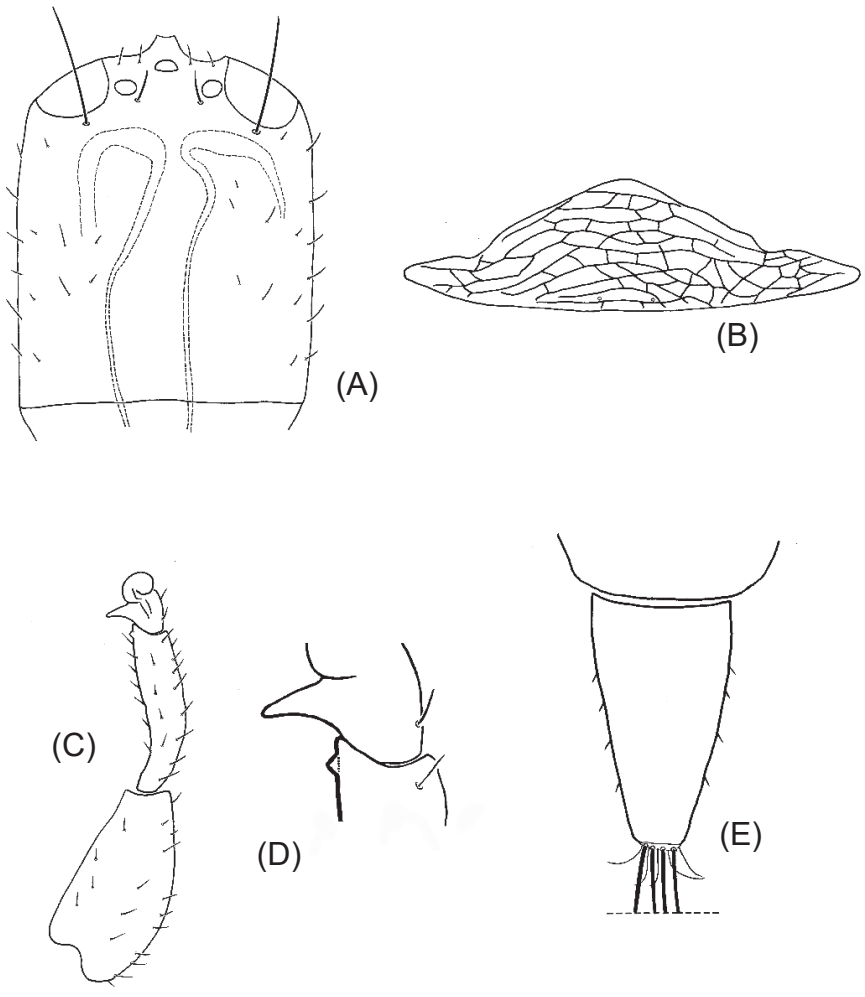

Fig. 6. *Ethirothrips tibialis* (Okajima): (A) head; (B) pelta; (C) fore leg; (D) tibial pur; and (E) tube.

tocular setae; maxillary stylets retracted almost to postocular setae, broad and curved at distal ends beneath eyes (Fig. 6A); antennae 8-segmented, segments III and IV with 2 and 4 sense cones, respectively. Pronotal major setae sharp; mesonotum with 2 pairs of campaniform sensilla; metanotal campaniform sensilla absent, with a pair of small and faint pores; fore femur enlarged; fore tibia with a tubercle at apex (Figs. 6C and 6D); both male and female with fore tarsal tooth; forewing with 15–17 duplicated cilia. Pelta with a pair of campaniform sensilla (Fig. 6B); tube curve-sided (Fig. 6E), about same length as head.

Male (aptera). Body length 2.5–2.8 mm on slide, color and shape similar to female; fore tarsal tooth present.

Distribution. Taiwan.

Specimens examined. *Scolothrips chui*: holotype F, Shenkeng (Taipei Hsien), *Callicarpa formosana* (fresh twig), collected 10.xi.1979; paratypes: 1M, same data as holotype: 4F1M, same data as holotype. *Ethirothrips tibialis*: 1F1M, Okinawa (Japan), dead branches, 8/9. iii.1990.

Remarks. Japanese specimens have longer head and tube than Taiwanese specimens, the other characteristics are similar.

Ethirothrips virgulae Chen (Fig. 7)

Scotothrips virgulae Chen, 1980:180–181.
Ethirothrips virgulae (Chen); Mound & Palmer, 1983:57.
Dichaetothrips indicus (Bagnall), recorded by Chen 1982:56
Scotothrips claripennis (Moulton), recorded by Chen 1982:65.

Female (macroptera). Body length 2.8–3.2 mm on slide. Color dark brown to brown, tube darkest; antennae brown, distal end of segment II yellow, color of segment III varied: brown or greyish yellow or yellow, rest segments brown; fore tibia, pelta and abdominal segments II–IV brownish yellow; fore tarsi yellowish brown; forewings greyish brown.

Head squared or a little longer, shapes of cheeks and eyes make anterior half of head semicircular; one pair of long postocular setae; maxillary stylets retracted to postocular setae (Fig. 7A); antennae 8-segmented, segments III and IV each with 2 and 4 sense cones, respectively. Pronotal major setae blunt to sharp; mesonotum with 2 pairs of campaniform sensilla and a pair of faint pores; metanotum without significant campaniform sensilla, but with a pair of small and faint pores (Fig. 7B); fore femora enlarged (Fig. 7D); both male and female with fore tarsal tooth; forewing with 14–22 duplicated cilia. Pelta with a pair of campaniform sensilla (Fig. 7C); tube curve-sided, about same length as or a little shorter than head (Fig. 7E).

Male (macroptera). Body length 4 mm on slide; color and shape similar to female; fore tarsal tooth present.

Distribution. Taiwan, Japan.

Specimens examined. 1. Holotype F, *Scotothrips virgulae*, Chisinliao (Chiayi Hsien), *Morus australis*, 14.vi.1978; paratypes: 1M, same data as holotype; 1F1M, same data as holotype. 1M, Chutyhu (Taipei City), *Mallotus repandus*, 14.vii.1979; 1F, Kukuan (Taichung Hsien), *Trema orientalis*, 6.ix.1980. 2. Specimens labeled as *Scotothrips claripennis* (Moulton): 2F2M, Neiku (Taipei City), *Citrus maxima* (twig), 12.v.1979; 5F, Hsichin (Taipei Hsien), *Prunus campanulata*, 18.v.1978; 1F, *Machilus thunbergii*, 12.v.1979. 3. One female specimen abled as *Dichaetothrips indicus* (Bagnall), Tapu (Chiayi Hsien), *Morus australis* (dead twig), 27.ix.1978.

Remarks. 1. Chen (1980) remarked that this species is very similar to *S. claripennis* and can be differentiated by the color of antennal segment III. The authors examined all the 6 Chen's *virgulae* specimens and found that color of antennal segment III is not stable. Unlike the other 5 specimens with brown antennal segment III, one paratype female has yellowish antennal segment III. Besides, all 10 specimens of *claripennis* had no metanotal campaniform sensilla. So the authors think that

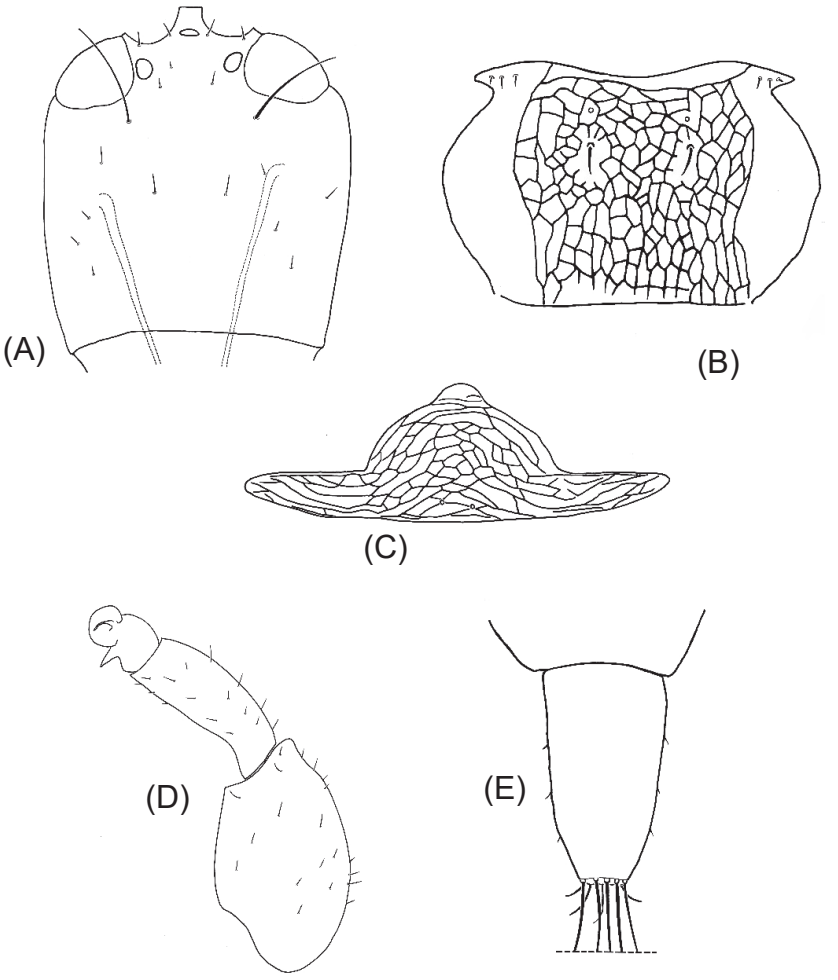

Fig. 7. *Ethirothrips virgulae* Chen: (A) head; (B) metanotum; (C) pelta; (D) fore leg; and (E) tube.

Chen's specimens labeled as *claripennis* are *virgulae*. 2. One female specimen labeled as *Dichaetothrips indicus* (Bagnall) was re-identified as *E. virgulae* Chen. 3. *Ethirothrips virgulae* can be separated from *E. brevis* by (1) *E. brevis* with longer head and tube; (2) fore femur enlarged in *virgulae*; while normal in *brevis*; (3) color of antennae and fore tibia. (*E. brevis* examined: 1F1M, Okinawa, Japan, dead branches, III-7-1990, Det. Okajima)

Ethirothrips yangi Wang sp. n. (Fig. 8)

Female (brachyptera). Body length 3.2 mm on slide. Color dark brown, with red pigment, tube blackish. Antennae bicolored: segments I and II dark brown, concolorous with head, segments III, IV and basal half of V yellow, distal half of V dark brown, VI–VIII blackish brown; all legs dark brown with tarsi lighter; wings greyish brown.

Head longer than wide; one pair of interocellar setae between posterior ocelli, one pair of long postocular setae on dorsum of head; maxillary stylets retracted near postocular setae (Fig. 8A); antennae 8-segmented, segments II–VIII slender, length of III and IV more than 3 times of its width (Fig. 8G).

Pronotal main setae near sharp; anterior margin of pronotum with 2 pairs of long setae and one pair of short setae; basantra with ir-

regular lateral margin (Fig. 8B); mesonotum with 2 pairs of campaniform sensilla; metanotum without campaniform sensilla; fore femur normal; fore tarsal tooth tiny (Fig. 8E); wing reduced to a short wing pad, grayish brown; about same length as head.

Pelta covered with reticles; holotype specimen with only single campaniform sensilla, and 2 short setae on opposite side (Fig. 8C); tergite II laterally with 3 marginal setae; tergites II and III with 4–6 tiny setae around each discal pore, tergites III with transverse row of

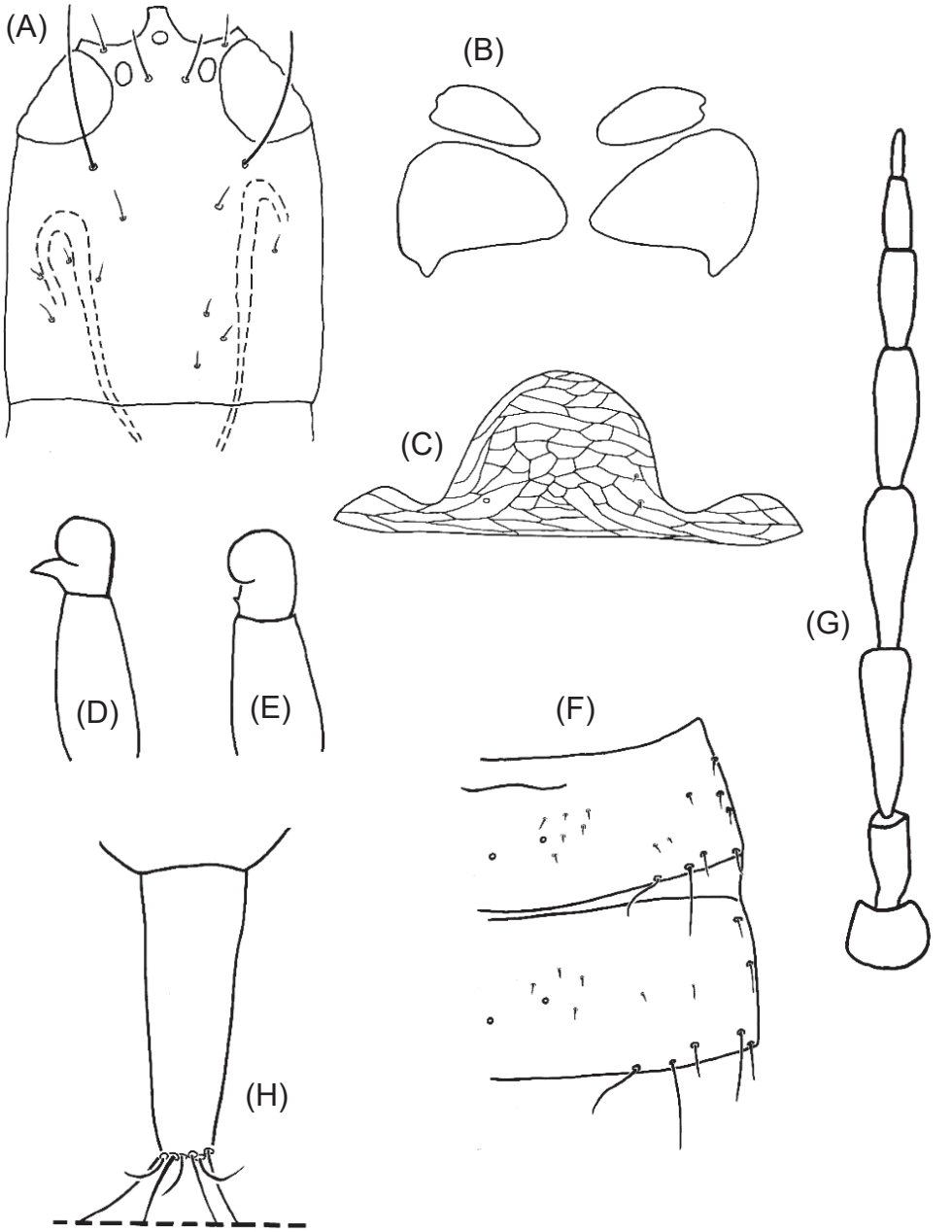

Fig. 8. *Ethirothrips yangi* Wang, sp. n.: (A) head; (B) prosternal basantra and ferna; (C) pelta; (D) male fore tarasal tooth; (E) female fore tarsal tooth; (F) right half of tergites II and III; (G) shape of antenna; and (H) tube.

3–5 setae (Fig. 8F); tube straight-sided, a little shorter than head (Fig. 8H).

Measurements in µm (holotype). Body length 3230, head (median L/largest W) 360/280, distance between posterior ocelli 50, postocular setae L 50; antennal segments I to VIII (L/W): 44/60, 60/36, 130/40, 120/40, 100/32, 80/28, 55/24, 40/10; pronotum (median L/W) 180/420; pelta (L/W) 120/400; forewing L 390, tube (L/basal W) 350/100.

Male (macroptera). Body length 3 mm on slide. Color and shape similar to female, forewings hyaline; fore tarsal tarsus with tooth (Fig. 8D); forewing normal, with 20 duplicated cilia.

Measurements in µm (male). Body length 2930, head (median L/largest W) 320/260; antennal segments I to VIII (L/W): 40/56, 60/24, 120/36, 112/36, 100/32, 76/20, 48/16, 40/8; pronotum (median L/W) 200/490, forewing L 1220; pelta (L/W)110/300, tube (L/basal W) 320/120.

Distribution. Taiwan.

Specimens examined. Holotype F, Green Island (Taitung), *Miscanthus* sp., 7.iv.2006; paratype 1M, same data as holotype.

Etymology. This species was named for Mr. Chin-Han Yang, who collected the specimens.

Remarks. The specimens were collected from offshore Island (Green Island = Lyudao). The shape and color of antennae make this species easily separated from most of the other members of this genus.

Gastrothrips Hood (Figs. 9H and 9I)

Gastrothrips Hood, 1912:156. Type species: *Gastrothrips ruficauda* Hood.

Small to medium, macropterous, brachypterous or apterous. Head square; maxillary stylets V-shaped; antennae 8-segmented (Figs. 9H and 9I), segment III with 1 or 2 sense cones, segment IV with 3 sense cones. Prosternal basantra present, metathoracic sternopleural sutures present. Pelta triangular, reticles irregular; abdominal tergites with one pair of wing-retaining setae. About 38 species were recorded in the world (ThripsWiki 2018).

Key to species of *Gastrothrips* in Taiwan

1 Antennal segment II brown; antennal segments VII and VIII separated ..... *acutulus*
– Antennal segment II yellow; antennal segments VII and VIII fused ..... *fuscatus*

Gastrothrips acutulus Okajima (Figs. 9A, 9B, and 9F–9H)

Gastrothrips acutulus Okajima, 1979:511–513.

Female (macroptera). Body length 1.8–2.2 mm on slide. Color dark brown; antennal segment III yellow but distal end grayish brown; legs brown; forewings grayish brown; main setae yellowish.

Head square, postocular setae long, sharp or slightly blunt; maxillary stylets V-shaped, distal ends wide apart, retracted to about half the length of head (Fig. 9A); antenna 8-segmented (Fig. 9H). Pronotal setae blunt or near sharp; fore tibia with tiny spur, fore tarsal tooth absent (Fig. 9G); forewing without duplicated cilia. Center of pelta rounded, with a pair of campaniform sensilla (Fig. 9B); tube straight-sided, as long as head.

Male. Body length 1.4–1.8 mm on slide, color similar to female, fore tibia with inner spur, fore tarsal tooth present (Fig. 9F).

Distribution. Taiwan, Japan, Malaysia, Thailand, Philippines, Borneo.

Specimens examined. 1F1M, Miyake-jima Is. (Isu Isis), 26.x.1985 (Okajima); 1F, Tienhsiang (Hwalang), Cauliflower, 21.ix.1993; 1F, Nanjen Mt. (Pingtung), Camphor tree, 14.iv.1993.

Gastrothrips fuscatus Okajima (Figs. 9C, 9D, 9E, and 9I)

Gastrothrips fuscatus Okajima, 1979:513–515.

Female (aptera). Body length 1.8–2.0 mm on slide. Color dark brown; abdominal segments I–V in lighter color than head and thorax; antennal segment II and III yellow, rest of

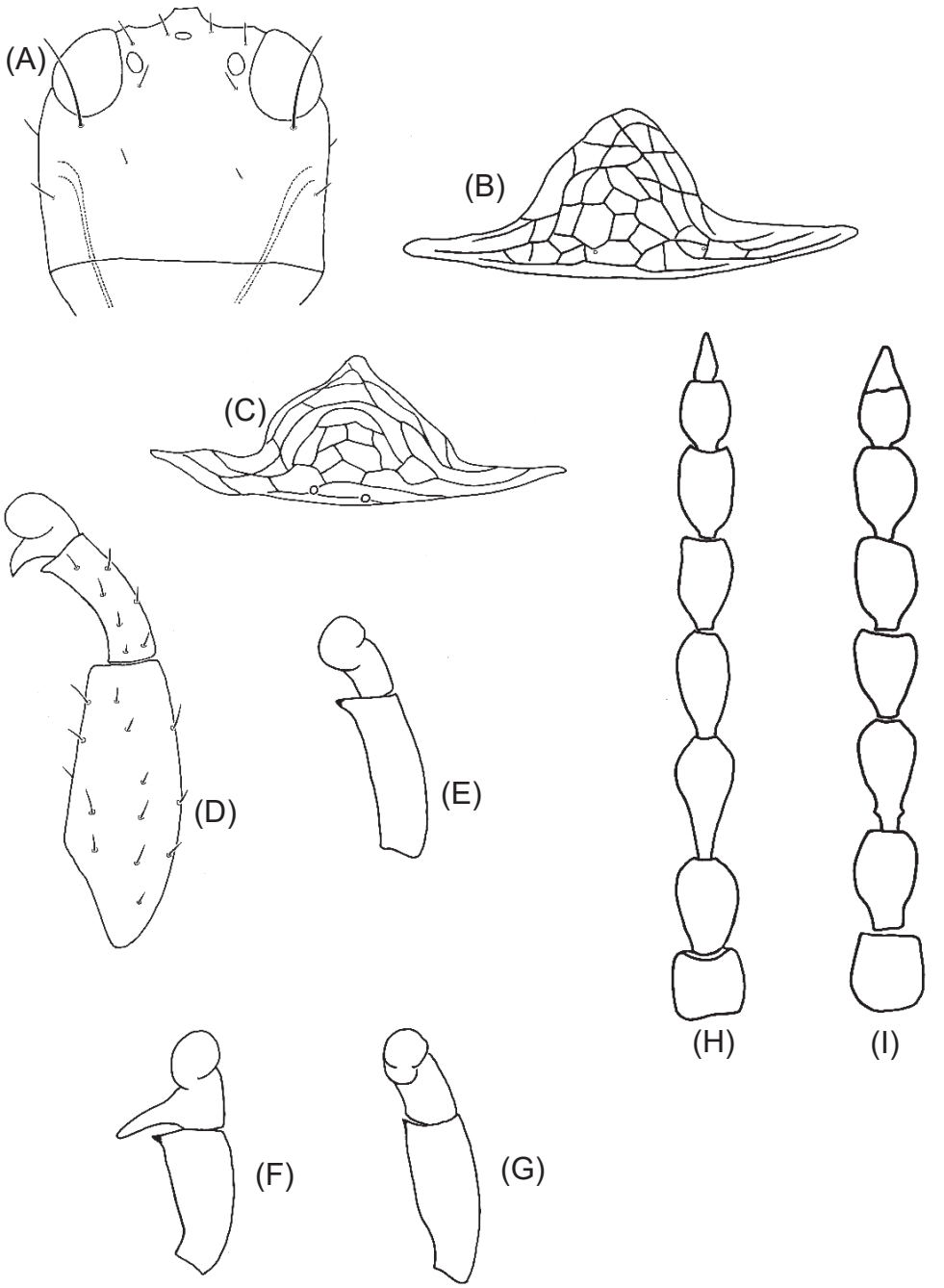

Fig. 9. *Gastrothrips* species: *acutulus* Okajima (A, B, F, G, H): (A) head; (B) pelta; (F) male fore tibia and tarsus; (G) female fore tibia and tarsus; (H) shape of antenna; *fuscatus* Okajima (C, D, E, I): (C) pelta; (D) male fore leg; (E) female fore tibia and tarsus; and (I) shape of antenna.

segments concolorous with head; fore tibiae brown, paler at distal end; mid and hind tibiae brownish yellow; forewings hyaline; main setae yellowish.

Head square, postocular setae long, sharp or slightly blunt; maxillary stylets V-shaped,

distal ends wide apart, retracted to about half the length of head; antennal segments VII and VIII fused (Fig. 9I). Pronotal setae blunt or near sharp; fore tibia with obvious distal spur; fore tarsal tooth absent (Fig. 9E); forewing without duplicated cilia. Pelta triangular, with a pair of campaniform sensilla, lateral lobes slender (Fig. 9C); tube straight-sided, as long as head.

Male (aptera). Color similar to female, both fore tarsal tooth and fore tibia spur present (Fig. 9D).

Distribution. Taiwan.

Specimens examined. 1F, Kuantzulin (Tainan), dead leaves and branches, 1.iv.1993 (Okajima); 1M, Nanshanchi (Nantou), dead branches, 24.iii.1984 (Okajima).

Machatothrips Bagnall (Fig. 10D)

Machatothrips Bagnall, 1908:189. Type species: *Machatothrips biuncinatus* Bagnall.

Female. Body large, macropterous, head long, interocellar setae long, cheeks with several stout setae; antennae 8-segmented, segments VII and VIII about same length, III and IV with 2 and 4 sense cones, respectively (Fig. 10D); maxillary stylets wide apart, reaching eyes; prosternal basantra present, metathoracic sternopleural sutures absent. Fore femur enlarged, female fore femur with a row of 3–6 teeth on inner side, basal tooth largest.

Male. Rarely with femoral teeth; both female and male with tarsal tooth; forewing with duplicated cilia. Fourteen species were recorded in the world (ThripsWiki 2018).

Key to species of *Machatothrips* in Taiwan

1 Female fore femur with 3–5 teeth .... *artocarpi*

– Female fore femur with 6 teeth ..... *celosia*

Machatothrips artocarpi Moulton (Figs. 10A–10C)

Machatothrips artocarpi Moulton, 1928:322–325.

Female (macroptera). Body length 3.6 mm on slide. Color dark brown, legs lighter; distal end of antennal segment II and base of III yellow, rest segments dark brown, same color as head; forewings grayish brown, with lighter base; major setae yellow.

Head length about 1.5 times of width, cheeks with several strong and blunt setae; interocellar setae and postocular setae blunt; maxillary stylets retracted to postocular setae (Fig. 10A). Pronotal setae blunt; fore femur with 3–5 teeth (mostly 4) on inner distal side, basal tooth longest; fore tarsal tooth short and triangle-shaped (Fig. 10B); forewing with dense fringe, about 55 duplicated cilia. Laterals and center of pelta well connected (Fig. 10C); tube long and straight-sided, a little longer than head.

Male (macroptera). Body length 3.8 mm on slide. Color similar to female; fore femur without teeth, fore tarsal tooth large; forewing with approximately 40–60 duplicated cilia.

Distribution. Taiwan, Japan, Philippines, New Guinea, Solomon, Guan.

Specimens examined. 9F1M, Fenggu (Wufeng, Taichung), dead *Vernicia* sp., 23.vii.1993; 1F, Santimen (Pingtung), *Dimocarpus longan*, 21.iv.1992; 1M, Nanjen Mt. (Pingtung), dead wood, 22.xi.2001; 1M, Wufeng (Hsinchu), pine, 5.v.1994.

Machatothrips celosia Moulton

Machatothrips celosia Moulton, 1928:325–327.

Female (macroptera). Body length 4.5 mm on slide. Color dark brown; antennal segments dark brown; all legs dark brown with yellowish tarsi; forewings grayish brown, lighter at base; major setae yellow.

Head length about 1.6 times of width, head and eyes similar to *M. artocarpi*, but larger; interocellar setae, postocular setae and cheek setae blunt; postocular setae II about 0.5–0.7 times the length of postocular setae I. Pronotal setae blunt; fore femur bear 6 inner distal teeth, basal tooth longest; fore tarsal tooth short; forewing with dense fringe, about

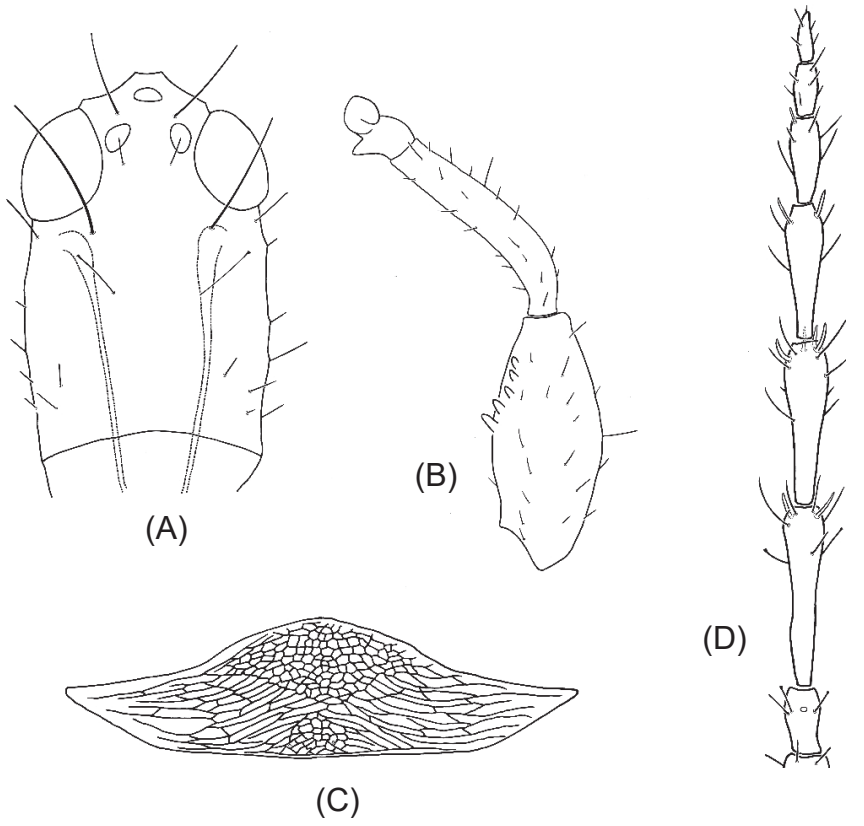

Fig. 10. *Machatothrips artocarpi* Moulton: (A) head; (B) fore leg; (C) pelta; and (D) antenna.

60 duplicated cilia.

Male. Unknown.

Distribution. Taiwan.

Remarks. These two similar species (*M. celosia* and *M. aetocarpi*) published by Moulton (1928) in the same paper. *M. celosia* has pronotal anterior setae longer than anteroangular setae, while *Machatothrips artocarpi* has anterior setae shorter than or equal to anteroangular setae (Palmer & Mound 1978; Chen 1982). For *celosia*, length of antennal segment III is 4.7 times of its width, while for *artocarpi* it is 3.5–4.4 times (Palmer & Mound 1978; Han 1997).

Nesothrips Kirkaldy (Figs. 11B and 11F)

Nesothrips Kirkaldy, 1907:102. Type species: *Nesothrips oahuensis* Kirkaldy.

Oedemothrips Bagnall, 1910:680; Bianchi, 1944:31–38.

Rhaebothrips Karny; Mound & Palmer, 1983:13.

Female. Body small to medium, macropterous, brachypterous or apterous. Head square or slightly longer; ventral side of eyes longer than dorsal side; maxillary stylets V-shaped; antennae 8-segmented, segments III and IV each with 2 and 4 sense cones, respectively (Figs. 11B and 11F). Prosternal basantra present, metasternopleural sutures present; forewing, if present, with duplicated cilia. Pelta hat-shaped, center with transverse hexagonal reticles; main tergites with one pair of wing-retaining setae.

Male. With fore tarsal tooth, absent with female.

About 30 species were recorded in the world (ThripsWiki 2018).

Key to species of *Nesothrips* in Taiwan

1 Head longer than its width; antennal segments I and II concolorous with head .... *lativentris*
– Head wider than its length; antennal segments I and II yellow ..... *brevicollis*

Nesothrips brevicollis (Bagnall) (Figs. 11A–11D)

Oedemothrips (?) brevicollis Bagnall, 1914: 29–30.
Neosmerinthothrips formosensis Priesner, 1935:368–370. Mound & Palmer, 1983:48.
Neosmerinthothrips formosensis var. *karnyi* Priesner, 1935:370. Mound & Palmer, 1983:48.
Nesothrips brevicollis (Bagnall), Mound, 1974:162–163.

Female (aptera). Body length 2 mm on slide. Head brownish yellow, thorax and abdomen brown, median segments dark brown, tube darker than segment IX; antennal segments I and II in lighter color than head, segments I–V yellow, VI brown except distal end yellow, VII and VIII brown; all legs yellow.

Head width about 1.3 times its length, setae sharp, posterior ocelli wide apart; maxillary stylets V-shaped, reaching middle of head (Fig. 11A); antenna 8-segmentd (Fig. 11B). Pronotal setae sharp or blunt; fore tarsal tooth absent. Pelta hat-shaped, margin irregular, a pair of campaniform sensilla (Fig. 11C); tube length about 0.9 times head length.

Female (macroptera). Body length about 2.2 mm on slide. Color similar to brachypterous, forewings grayish brown; 7–9 duplicated cilia; wing-retaining setae on tergites II–VII short and straight; fore tarsal tooth absent.

Male (aptera). Body length 1.5–2 mm on slide, color similar to brachypterous female, fore tarsal tooth present (Fig. 11D).

Distribution. Taiwan, Japan.

Specimens examined (aptera). 4F, Nanjen Mt. (Pingtung), *Gelonium aequoreum*, 14.iv.199; 6F, Kending (Pingtung), reed, 14.iv.1993; 3F, Kending (Pingtung), *Pandanus tectorius*, 14.iv.1993; 2F, Bijun Temple (Nantou), *Manihot esculenta*, 5.v.1993; 2F, Nanjen Mt. (Pingtung), Fern, 22.xi.2001; 3F, Kending (Pingtung), trees and grasses, 13/15.v.1993; 1F, Manchou (Pingtung), grasses, 21.xi.2001; 1F, Fushan (Pingtung), *Calocedrus formosana*, 15.vi.1994. 2M, Kending (Pingtung), grasses, 14.iv.1993; 2M, Manchou (Pingtung), grasses, 21.xi.2001.

Specimens examined (macroptera). 5F, Nanjen Mt. (Pingtung), *Pandanus tectorius*, 14.iv.1993; 1F, Liuqiu (Pingtung), Leguminosae, 5.xii.1991.

Nesothrips lativentris (Karny) (Figs. 11E–11H)

Rhaebothrips lativentris Karny, 1913a:129–130.
Smerinthothrips yuasai (Moulton): Takahashi, 1936:443. Mound & Palmer, 1983:48.
Nesothrips lativentris (Karny); Mound & Palmer, 1983:48.

Female (aptera). Body length 2.5–3.6 mm on slide. Color brown, tube dark brown; antennal segments I and II brown, same color as head, segment III yellow but distal end greyish brown, IV distal half brown and basal half yellow, V brown with yellow base, VI and VIII dark brown; femora yellow, tibiae brownish yellow.

Head length about 1.3 times as its width, setae sharp; maxillary stylets V-shaped, reaching middle of head (Fig. 11E); antennae 8-segmented (Fig. 11F). Pronotal setae sharp or blunt; fore tarsal tooth absent. Pelta hat-shaped, margin irregular, with one pair of campaniform sensilla (Fig. 10G); tube straight-sided, as long as head.

Female (macroptera). Body length 2.5–3.6 mm on slide. Color and shape similar to apterous; forewing with 13–21 duplicated cilia; tergites II–VII each with a pair of sigmoid wing-retaining setae; fore tarsal tooth absent.

Male (macroptera, brachyptera or aptera). Body length 2.4–3.3 mm on slide, color and shape similar to female, fore tarsal tooth present (Fig. 11H).

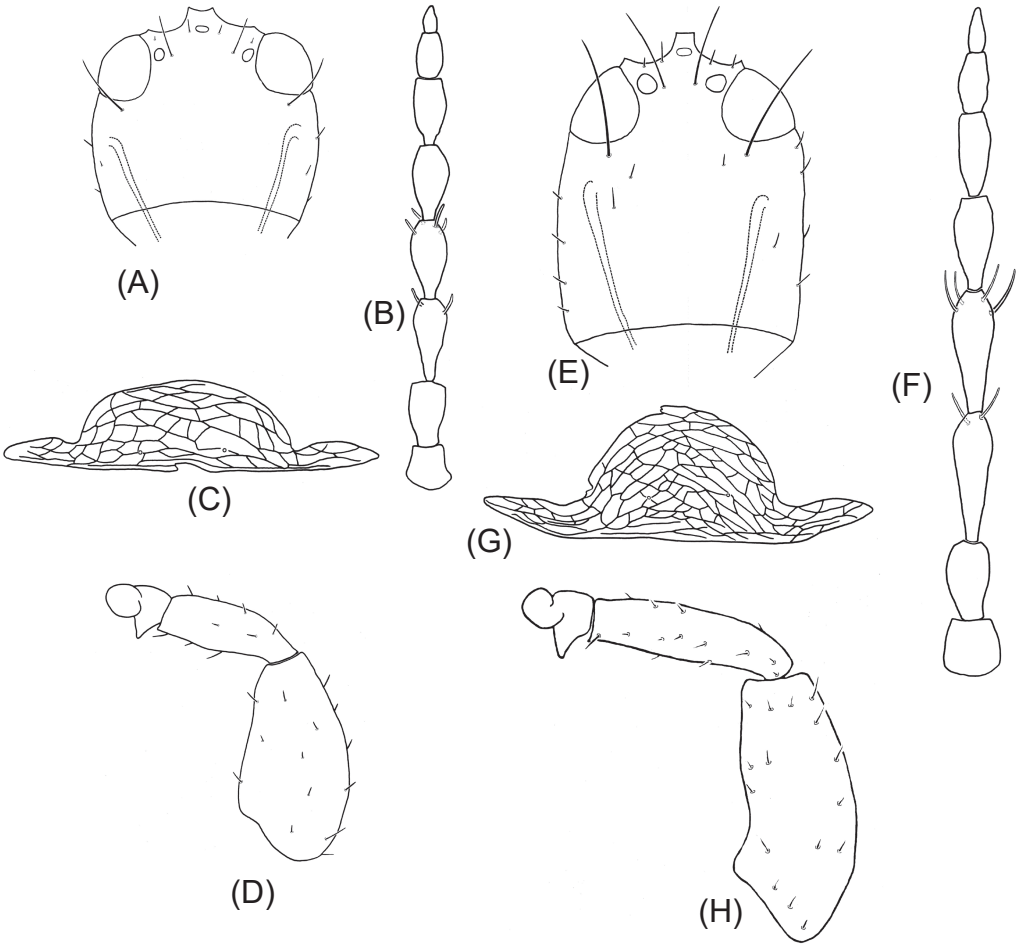

Fig. 11. *Nesothrips* species: *brevicollis* (Bagnall) (A–D): (A) head; (B) shape of antenna with sense cones on segment III and IV; (C) pelta; (D) male fore leg; *lativentris* (Karny) (E–H): (E) head; (F) shape of antenna with sense cones on segment III and IV; (G) pelta; and (H) male fore leg.

Distribution. Taiwan, Japan, Southeast Asia, Fiji, Seychelles.

Specimens examined. Female (macroptera). 9F, Wufeng (Hsinchu), dried leaves and mulberry dead branches, 5.v.1994; 5F, TARI (Taichung), Tea, 31.xii.1991; 4F, TARI (Taichung), mulberry and grasses, 16.iii.1991; 5F, Liuqiu (Pingtung), Leguminosae, 5.xii.1991; 7F, Puli (Nantou), dead branches of maple and longan, 24.v.1994; 4F, Kuantzuling (Tainan), *Areca catechu* & *Cycas revolute*, 1.iv.1993.

Female (aptera). 2F, Nanjen Mt. (Pingtung), *Stachytarpheta jamaicensis*, 4.iv.1993.

Male (macroptera). 2M, Nanjen Mt. (Pingtung), *Vitis amurensis* & *Murraya paniculata*, 14.iv.1993; 4M, Guanshan (Pingtung), grasses & *Macaranga tanarius*, 8/9.v.1991; 7M, Wufeng (Hsinchu), dried leaves and branches, 5.v.1994.

Male (brachyptera). 1M, Guanshan (Pingtung), grasses, 8.v.1991.

Male (aptera). 1M, Manchou (Pingtung), grasses, 21.xi.2001.

Phaulothrips Hood

Phaulothrips Hood, 1918:146–147. Type species: *Phaulothrips vuilleti* Hood.

Female. Body large, macropterous or brachypterous; head long, antennae 8-seg-

mented, segments III and IV each with 2 sense cones (Fig. 12E); maxillary stylets at least reaching postocular setae, close together in middle of head; prosternal basantra present, metathoracic sternopleural sutures present; both sexes with fore tarsal tooth; forewing if present, broad and with duplicated cilia; pelta with one or more pairs of campaniform sensilla. Twenty species were recorded in the world (ThripsWiki 2018).

Phaulothrips solifer Okajima (Fig. 12)

Phaulothrips solifer Okajima, 1989:132–134.

Female. Body length 4.5–5.5 mm. Color dark brown, head and tube darker; metathorax and basal segments of abdomen yellowish; antennae dark brown, distal end of segment II yellow, III brownish yellow but distal end brown; forewings hyaline; median of tergites III–VII with dark brown bow-tie-shaped area, covered with obvious reticles.

Head length about twice of its width; interocellar setae, postocular setae and cheek setae blunt; maxillary stylets reaching eyes, close together in middle of head (Fig. 12A); antennae 8-segmented (Fig. 12E). Pronotum setae blunt; fore tarsal tooth present (Fig. 12B), forewing with 20–25 duplicated cilia.

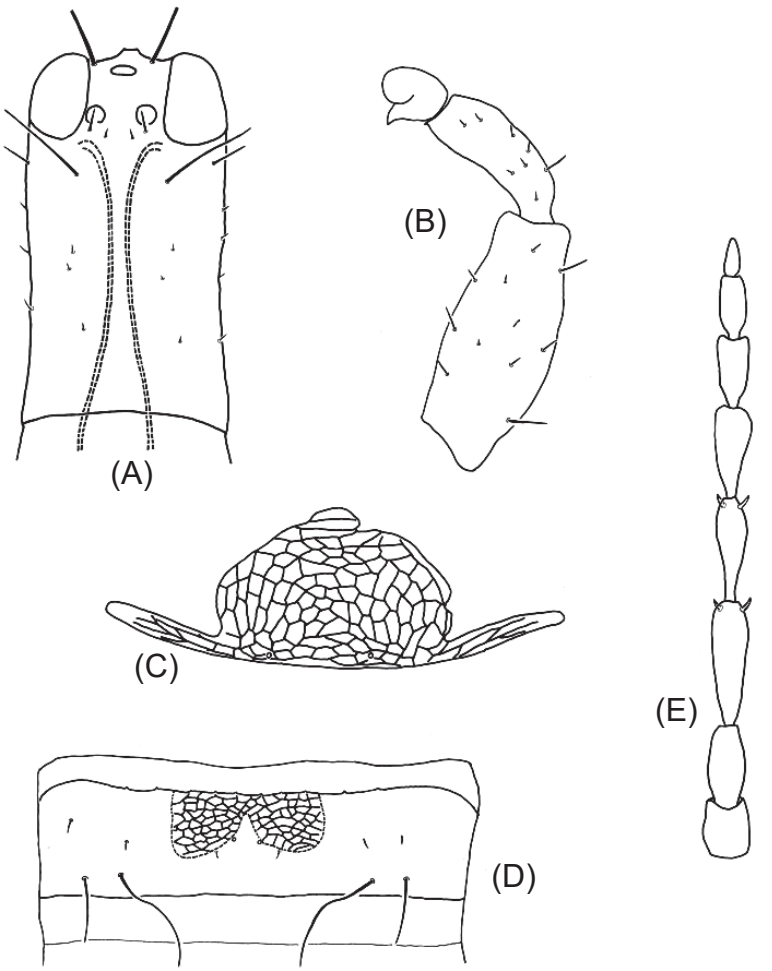

Fig. 12. *Phaulothrips solifer* Okajima: (A) head; (B) fore leg; (C) pelta; (D) tergite IV; and (E) shape of antenna with sense cones on segment III and IV.

Pelta rounded, with 2 slender lateral lobes (Fig. 12C); median of tergites III–VIII with a bow-tie-shaped brown area, covered with clear reticles (Fig. 12D), tube as long as head.

Male. Body length 3.5–5.0 mm, color similar to female, except antennal segment III darker than head; fore tarsal tooth present.

Distribution. Taiwan, Japan.

Specimens examined. Paratypes: 1F, Mt. Yonaha-dake (Okinawa, Japan), dead *Casuarina* branches, 15.ix.1988; 1M, Yamato-son (Kagoshima-ken, Japan), 8.vii.1989.

ACKNOWLEDGEMENTS

The authors thank Dr. M. Masumoto, Plant Protection Station of Japan, for the loan of the thrips specimens deposited at Tokyo University of Agriculture.

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摘要

王清玲、陳怡如、林鳳琪。2019。台灣寬薊馬亞科 (纓翅目：管尾亞目：管尾薊馬科) 之分類描述：II. 單毛薊馬族。台灣農業研究 68(2):91–113。

本文記錄與描述台灣寬薊馬亞科 (Idolothripinae) 單毛薊馬族 (Pygothripini) 7 屬 17 種之分類特徵，族內每屬與同屬內之每種均製作檢索表，包括 2 新種：紅高盾薊馬 (*Ethiro thrips rubeus* Wang, sp. n.) 與楊高盾薊馬 (*Ethirothrips yangi* Wang, sp. n.)，1 新紀錄種：*Ethirothrips stenomelas* (Walker)；此外，*Allothrips taiwanus* Okajima 與 *Scotothrips chui* Chen 分別鑑定為 *Allothrips nubillicauda discolor* Chen 與 *Ethirothrips tibialis* Okajima 之異名。

關鍵詞：分類、纓翅目、管薊馬科、寬薊馬亞科、台灣。

投稿日期：2018 年 5 月 25 日；接受日期：2018 年 12 月 7 日。
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