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Hydatothrips and *Neohydatothrips* (Thysanoptera, Thripidae) of East and South Asia with three new species from Taiwan

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Abstract

The tribe Sericothripini is divided into three genera, *Sericothrips* Haliday, *Hydatothrips* Karny and *Neohydatothrips* John. The genera *Corcithrips* Bhatti, *Faureana* Bhatti, *Pyrothrips* Bhatti, *Sariathrips* Bhatti and *Zonothrips* Priesner are considered new synonyms of *Hydatothrips*. The genera *Elbuthrips* Bhatti and *Kazinothrips* Bhatti are considered new synonyms of *Neohydatothrips*. Keys to the 23 species of *Hydatothrips* and 16 species of *Neohydatothrips* in East and South Asia, including Taiwan, China, Korea, Japan, India, Malaysia and the neighboring areas are given. *Neohydatothrips pectinarius* Kudo is a new synonym of *N. medius* Wang, *N. populi* Han is new synonym of *N. elaeagni* Kudo, and *Z. luridus* Ananthakrishnan is a new synonym of *N. plynopygus* (Karny). This paper describes three new species from Taiwan, *H. flavidus*, *H. meriposa*, and *N. surrufus*, and records from Taiwan for the first time the following four species: *N. gracilipes* Hood, *N. plynopygus* (Karny), *N. samayunkur* Kudo and *N. tabulifer* (Priesner).

Key words: *Hydatothrips*, *Neohydatothrips*, Asia, Taiwan, new synonyms, new species

Introduction

Bhatti (1973) reviewed *Sericothrips* Haliday and related genera, and revised the concept of the tribe Sericothripini Priesner. As a result, *Sericothrips* is restricted to a small group of species all of which show a tendency toward wing-reduction. Most of the species of Sericothripini in Asia were described after 1970. Some of these species were grouped into genera or subgenera by Bhatti (1973) and also Kudo (1991, 1997), but the majority were placed in the genus *Hydatothrips* Karny and the genus (or subgenus) *Neohydatothrips* John. In the present paper only three genera are treated as valid, *Hydatothrips*, *Neohydatothrips* and *Sericothrips*. The species of *Corcithrips* Bhatti, *Faureana* Bhatti, *Pyrothrips* Bhatti, *Sariathrips* Bhatti and *Zonothrips* Priesner are considered as members of *Hydatothrips*, and the species of *Elbuthrips* Bhatti and *Kazinothrips* Bhatti are considered as members of *Neohydatothrips*.

Considering the described species from Taiwan (Chen, 1977, Wang, 1994), China (Han, 1997), Japan (Kudo, 1991), Korea (Woo, 1974), India (Ananthakrishnan, 1980; Bhatti, 1990), and Malaysia and its neighboring areas (Kudo, 1997), together with the three new species from Taiwan described in this paper, there are now 23 species of *Hydatothrips* and 16 species of *Neohydatothrips* recorded from this part of the world. Identification keys have been constructed and are presented here based on specimens from Taiwan and a review of the literature for the other species. Kudo gave detailed descriptions and figures for the 23 species he studied, and Ananthakrishnan, Bhatti and Han also gave keys and descriptions for the species they studied. Using the details provided by these authors it has proved possible to prepare identification keys to all of the species of the area now placed in *Hydatothrips* or *Neohydatothrips*.

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The specimens examined for this study were collected by the author unless otherwise stated. The type specimens of two new *Hydatothrips* and one new *Neohydatothrips* species are deposited in Division of Applied Zoology, Agricultural Research Institute, Taichung, Taiwan.

Tribe Sericothripini

Head transverse, 3 pairs of ocellar setae; antenna 7- or 8-segmented, segments III & IV each with a forked sense cone, segments V and VI with longitudinal sensorium; occipital apodeme (cervical sclerite) present; pronotum reticulated, with a chitinized plate (blotch); mesosternum with spinula; tarsus 2-segmented; first vein of forewing with a continuous row of setae, second vein with few distal setae or no setae, posterior fringe cilia wavy; abdominal segments with dense rows of microtrichia, and sublateral callosities on antecostal ridges of abdominal tergites II–VII.

Key to the genera of Sericothripini

1. Abdominal tergites II–VII completely covered with microtrichia, posteromarginal combs complete and of similar structure on each tergite, median setae similarly placed and of equal size .....*Sericothrips*
-. Abdominal tergites II–VII with dense microtrichia on lateral thirds, median area smooth or at most with sparse microtrichia, posteromarginal comb lacking or very short medially; median setae short on tergites II–IV, longer on V–VIII 2
2. Metasternum forming two arms with a median V-shaped apodeme (Fig. 1A).....*Hydatothrips*
-. Metasternum connected in the middle with a T-shaped or Y-shaped apodeme (Fig. 1B) ..*Neohydatothrips*

Genus *Hydatothrips* Karny

Hydatothrips Karny, 1913: 281.Type species: *Hydatothrips adolfifriderici* Karny
Corcithrips Bhatti, 1973: 409. Type species: *Corcithrips hartwigi* Bhatti. **syn**. **n**.
Faureana Bhatti, 1973: 411. Type species: *Zonothrips smutsi* Faure. **syn**. **n**
Hydatothrips (*Pyrothrips*) Bhatti, 1973: 424. Type species: *Sericothrips* (*Hydatothrips*) *boerhaaviae* Seshadri & Ananthakrishnan, 1954. **syn. n.**
Sariathrips Bhatti, 1990: 247. Type species: *Sericothrips masrensis* Priesner. **syn. n**.
Zonothrips Priesner, 1926: 260. Type species: *Zonothrips karnyi* Priesner. **syn**. **n**.

The genus *Corcithrips* was erected for one new species based on a single female specimen from India. The original description and key to genera of Sericothripini (Bhatti, 1973) distinguished this genus from other Sericothripini by a difference in the position of setae on abdominal sternites II–VI, and the shape of the pronotal blotch. *Corcithrips* was described as having the sternal setae arising far ahead of the posterior margin, and the pronotum without a blotch but with a strong transverse apodeme across the middle. Since the position of the median pair of sternal setae is known to be variable in some other genera of Thripidae (such as *Megalurothrips*, *Thrips*), and the shape and degree of chitinization of the blotch varies between species, *Corcithrips hartwigi* Bhatti is here considered a member of *Hydatothrips*, and the genus placed in synonymy.

The genus *Faureana* was erected for one South African species, *Zonothrips smutsi* Faure. This species has the head and most of the pronotum unsculptured, lacks median pores on the abdominal tergites, and has minute setae on tergite IX (Bhatti, 1973). Considering the variation in form of the sculpture on the head and pronotum among *Hydatothrips* species, and the lack of median pores in some tergites of different individuals of species such as *H. liquidambara* Chen, *Faureana* is here considered a synonym of *Hydatothrips*.

Pyrothrips was proposed as a subgenus of *Hydatothrips*, but was later considered as a full genus (Bhatti, 1990: 247), and included a single species in which all of the tergal setae arose in front of the posterior margin, as in *Corcithrips*. Similarly, *Sariathrips* was erected for a single species in which the mesosternal spinula is absent and the forewing cilia are straight. These two genera are here considered as synonyms of *Hydatothrips*.

Zonothrips was erected for one species, *Z. karnyi* Priesner from Indonesia. It was considered to be close to *Sericothrips* Haliday, but with 7-segmented antennae (Priesner, 1926). There are currently four species placed in this genus, *besar* Kudo, *karnyi* Priesner, *latisensibilis* Kudo, and *noro* Kudo. The syntypes of *Z. karnyi* from Museum Buitenzorg, and two females and two males of *noro* identified by Kudo were examined. This genus is here considered a synonym of *Hydatothrips* because of the similarity of all the other characteristics. The 7-segmented antennae are considered more likely to be due to variation within *Hydatothrips* rather than having any evolutional significance. As noted below, reduction to a 7-segmented condition also occurs in the antennae of some species of *Neohydatothrips*.

Diagnosis: Head broad. Antennae 7- or 8-segmented, segments III and IV each with a forked sensorium, segment VI with a linear sensorium. Pronotum with a blotch; head and pronotum covered with transverse or reticulated striae; metasternum divided into 2 plates by a V-shaped apodeme; wings usually fully developed in both sexes, forewing first vein setal row complete, second vein with 02 distal setae; abdominal tergites I–VII laterally with dense microtrichia; tergites II–VII with posterior marginal comb, longer laterally, short or lacking medially; posterior marginal comb on tergite VIII complete. Median paired setae on tergites II–IV close to each other, more widely separated on tergites V–VIII.

There are 23 *Hydatothrips* species listed here from East and South Asia, of which six species are known from Taiwan, including the two new species, *H. flavidus* and *H. meriposa*.

Hydatothrips species of East and South Asia

abdominalis Kurosawa, 1937: 115. *Sericothrips*. Japan, Korea.

H. (*Hydatothrips*) *abdominalis*; Kudo, 1991: 517.

ananthakrishnani Bhatti, 1973: 417. India.

atactus Bhatti, 1973: 418. *H. (Hydatothrips*). India, Pakistan.

aureus Bhatti, 1973: 420. India.

besar Kudo, 1997: 350. *Hydatothrips (Zonothrips*). Sarawak.

boerhaaviae Seshadri & Ananthakrishnan, 1954: 210. *Sericothrips (Hydatothrips*). India.

Hydatothrips boerhaaviae; Bhatti, 1973: 422.

dentatus Han, 1997: 170. China.

dorax Bhatti, 1973: 424. India

ekasi Kudo, 1991: 520. *H. (Hydatothrips)*. Japan.

flavidus sp. nov. Taiwan.

hartwigi Bhatti, 1973: 409. *Corcithrips*. India.

heteraureus Han, 1997: 171. China.

karnyi Priesner, 1926: 260. *Zonothrips*. Indonesia.

latisensibilis Kudo, 1997: 353. *Hydatothrips (Zonothrips*). Malaysia, Sarawak.

liquidambara Chen, 1977: 145. Taiwan, Japan.

longicaudalis Kudo, 1997: 332. *H. (Hydatothrips*). Sarawak.

meriposa sp. nov.. Taiwan.

multipunctatus Kudo, 1997: 334. *H. (Hydatothrips)*. Malaysia.

noro Kudo, 1997: 355. *Hydatothrips* (*Zonothrips*). Japan.

onari Kudo, 1997: 329. *H.(Hydatothrips)*. Japan, Sarawak.

palawanensis Kudo, 1997: 336. *H.(Hydatothrips)*. Phillipines.
proximus Bhatti, 1973: 426. India.
ramaswamiahi Priesner, 1926: 51. *Sericothrips*. India.
Hydatothrips ramaswamiahi; Karny, 1927: 188; Bhatti, 1973: 427.

Key to species of *Hydatothrips* from East and South Asia

1. Antenna 7 segmented; occipital apodeme not touching posterior margin of eye 2
-. Antenna 8 segmented; occipital apodeme touching or not touching posterior margin of eye 6
2. Abdominal tergites II–VIII with posteromarginal craspedum; tergite V posteromarginal comb short medially ..... *besar*
-. Abdominal tergites without posterior craspedum; tergite V posteromarginal comb absent medially 3
3. Anterior and posterior margins of pronotal blotch strongly concave (Fig. 5D) 4
-. Posterior margin of pronotal blotch concave, anterior margin even or slightly curved (Fig. 4B) 5
4. Abdominal tergites V–VI paler than other tergites; tergites IV–VI with 7–13 lateral discal setae ..... *noro*
-. Abdominal tergite VI paler than other tergites; tergites IV–VI with 5–7 lateral discal setae *meriposa* sp. n.
5. Antennal segment VI with a large, leaf-shaped sense cone, about same length as segment VII ..... *latisensibilis*
-. Sense cone on antennal segment VI less than 0.5 length of segment VII ..... *karnyi*
6. Forewing second vein with setae; setae may be lacking on one side, but at least one second vein with setae; abdominal tergites II–VI with or without posteromarginal comb medially 7
-. Forewing second vein without setae; abdominal tergites II–VI without posteromarginal comb medially 13
7. Forewing second vein with 4–5 setae ..... *dorax*
-. Forewing second vein with 1–2 setae 8
8. Color of abdominal tergite IV paler than tergites III and V 9
-. Abdominal tergites other color patterns 10
9. Body dark brown; posteromarginal comb of abdominal tergites II–VI complete, median posteromarginal comb of tergite V about half the length of comb laterally; posterior 2/3 of metanotum with dense longitudinal striae ..... *multipunctatus*
-. Body yellow; posteromarginal comb of abdominal tergites II–VI complete but minute medially (fig. 3F); posterior 2/3 of metanotum with reticulate sculpture (fig.3E) ..... *flavidus* sp. n.
10. Abdominal tergite V paler than tergites I–IV and VI–X ..... *liquidambara*
-. Abdominal tergite V not the palest 11
11. Marginal setae on abdominal sternites II–VI inserted far ahead of posterior margin ..... *hartwigi*
-. Marginal setae on abdominal sternites II–VI inserted marginally 12
12. Forewing second vein with 1 seta, first vein with 18–19 setae ..... *ananthakrishnani*
-. Forewing second vein with 0(15%), 1(25%) or 2(60%) setae; first vein with 26–36 setae ..... *onari*
13. Abdominal tergites IV & V paler than III and VI 14
-. Abdominal color pattern different:
    a. Abdominal tergites I–VI paler ..... *dentatus*
    b. Abdominal tergites II–VI paler, brown in middle ..... *heteraureus*
    c. Abdominal tergite V paler ..... *abdominalis*
    d. Abdominal tergites IV–VI paler ..... *atactus*
    e. Abdominal tergite IV paler ..... *longicaudalis*
14. One pair of pronotal posterior setae long, about same length as blotch ..... *palawanensis*
-. Pronotal posterior setae shorter than length of blotch 15

15. Pronotum in front of blotch between median pair of anteromarginal setae polygonally sculptured, not orientated in any direction.....*aureus*
-. Pronotum in front of blotch transversely reticulate 16
16. Forewing shaded in basal half, the rest much paler..... *boerhaaviae*
-. Forewing shaded in distal three fourths, not paler distally..... 17
17. Abdominal tergite X without microtrichia; male with shorter glandular areas only on sternites VI & VII . .....*proximus*
-. Abdominal tergite X with microtrichia; male sternites V–VII with transverse glandular areas 18
18. Anterior angles of blotch extended forward to form protruding ends (fig. 2H); anterior portion of sternite VII forms 2 protuberances (fig. 10H) .....*ramaswamiahi*
-. Anterior angles of blotch normal (fig. 2C); anterior portion of sternite VII without protuberances (fig. 2E) .....*ekasi*

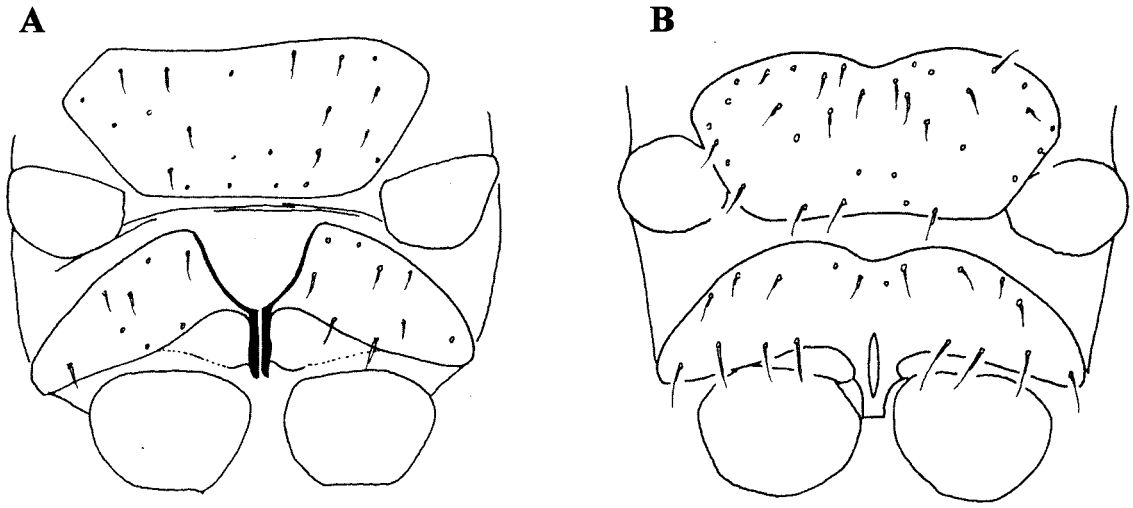

FIGURE 1. Metasternum: A. *Hydatothrips liquidambara*; B. *Neohydatothrips tabulifer.*

***Hydatothrips* species from Taiwan**

***Hydatothrips ekasi* Kudo**
(Fig. 2)

Hydatothrips (*Hydatothrips*) *ekasi* Kudo, 1991: 520

Female macropterous**:** Body generally brown, abdominal segments IV and V paler than other segments; antennal segments I–III yellow, IV dark brown with basal 1/4 yellow, V–VIII dark brown; forewing brown with a sub-basal pale band. Occipital apodeme touching posterior margin of eyes; ocellar setae III situated in front of posterior ocelli, inside ocellar triangle. Pronotum with dark lines of polygonal reticles outside blotch, most individuals without dots but a few with sparse dots; blotch with dense transverse striae, slightly concave anteromedially and extending to posterior margin of pronotum. Forewing second vein without distal setae. Abdominal tergites II–VI posterior marginal comb absent medially, tergite VII with comb short medially, tergite VIII posterior comb long and complete. Sternites without discal setae.

Male: Similar to female in color and shape but smaller. Abdomen with transverse glandular areas on sternites V–VII.

Specimens examined: **JAPAN**, Shizuoka, 3 female, 1 male paratypes from *Kummerovia striata*, 12-viii-1979 (I. Kudo). **TAIWAN: Taichung**, TARI, 3 females, 1 male on *Sesbania roxburghii*, 1990–1992; Wanfeng, 3 females on grasses, x-xii-1990; **Kending**, on grasses, xi-2001; **Nantou,** Shan-Lin Si, 2 females, 1 male on *Macaranga tanarius*, 8-x-1991; 1 female, 1 male on grasses, iii-1991, 3 females, 1 male, vi-1993.

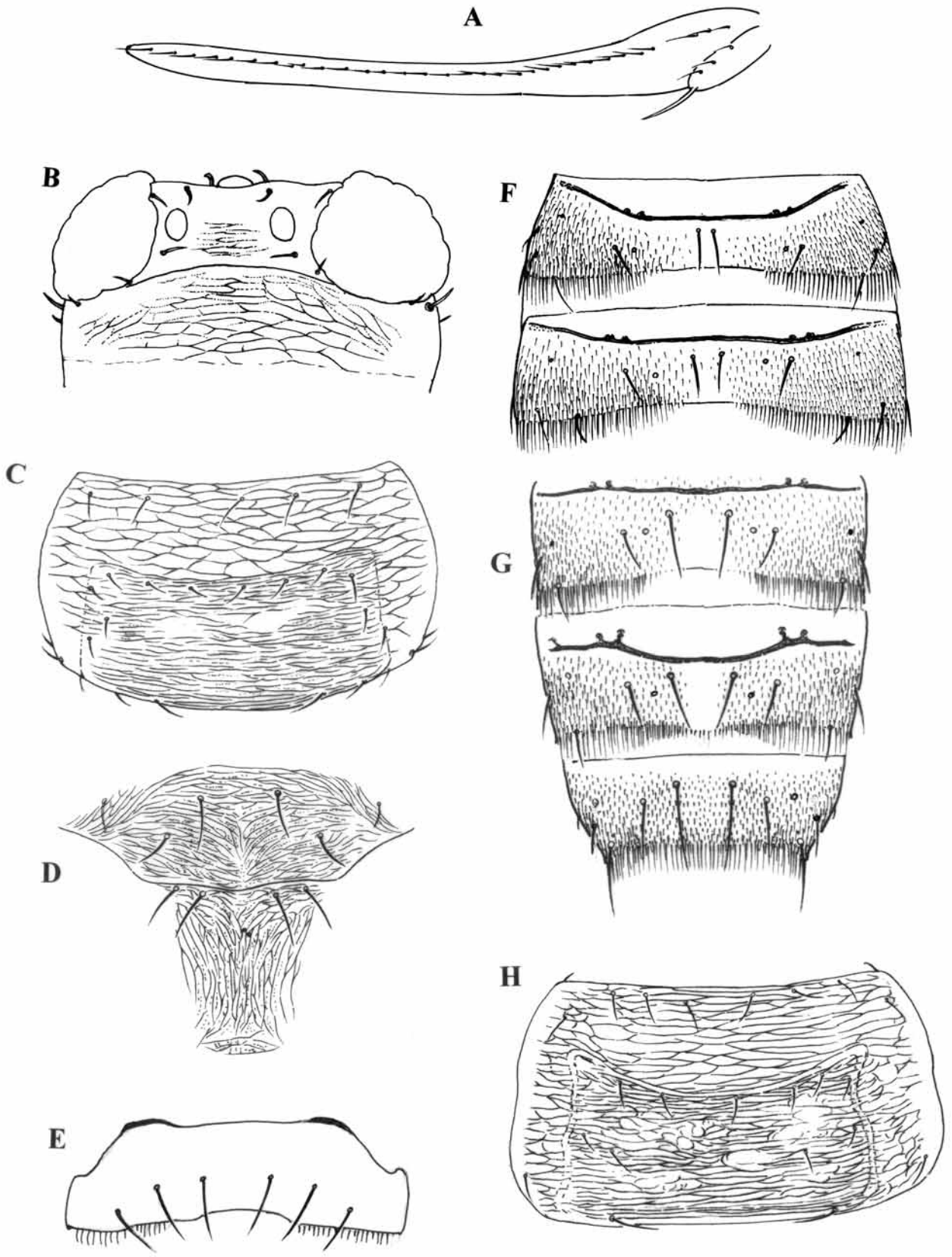

FIGURE 2. *Hydatothrips ekasi*: A. forewing; B. head; C. pronotum; D. meso- and metanotum; E. abdominal sternite VII; F. abdominal tergites III & IV; G. abdominal tergites VI–VIII; H. *Hydatothrips ramaswamiahi*: pronotum.

Remarks: This species is similar to *H. ramaswamiahi* (Priesner) but can be identified by the shape of the blotch and sternite VII as described in the key. The following specimens of *H. ramaswamiahi* were examined, loaned by R. zur Strassen from the Senckenberg Museum, Frankfurt, Germany: **India,** Coimbatore, 6 females, 1 male from Indigo leaves, 6-ix-1923 (A.G.R.).

***Hydatothrips flavidus* sp. n.**
(Fig. 3)

Female macropterous**:** Body light yellow to brownish yellow, abdominal tergites II, III, V & VI grayish brown, IV whitish yellow, VII–X yellow, antecostal ridges on tergites II–VI dark brown, on tergite VII grayish brown; antennal segments I–III yellow, IV and base of V grayish brown, VI-VIII brown; forewings brown but lighter toward apex, with a sub-basal pale area; legs yellow.

Head short, dorsum with dense transverse striae with wrinkles between them. Occiput large, apodeme touching posterior margin of eyes, transverse striae on anterior portion, followed by reticulate sculpture, weak markings inside. Ocellar setae III situated just in front of posterior ocelli, outside ocellar triangle. Mouth cone narrow and long, reaching posterior margin of pronotum; maxillary palpi 3-segmented. Antennae 8-segmented, segments V and VI each with a linear sensorium.

Pronotum outside of blotch with reticles, some with inner dotted wrinkles; distance between two anteromarginal median setae less than or nearly equal to length of setae. Pronotal blotch covered with dense transverse striae, 3 pairs of anteromarginal setae, 1 pair of anterior submarginal setae, 1 seta each on lateral margin, 2 pairs of posteromarginal setae. Mesonotum with dense striae with wrinkles, metanotum with irregular reticles medially, with wrinkles. Forewing first vein setal row complete, second vein with 2 distal setae.

Abdominal tergite I with rows of microtrichia on sides; tergites II–VII with dense rows of microtrichia on areas lateral to submedian setae, tergites II–VI with posterior marginal comb, minute medially; tergites VII and VIII posteromarginal comb long and complete, sublateral of antacostal ridge on tergite II–VII with forwardly protruded spots. Sternites without discal setae.

*Male***:** Similar to female in shape and structure; body length 0.96 mm on slide. Sternites VI & VII with transverse glandular area.

Measurements of holotype female in microns: Body length 1280. Head dorsum length 36. Pronotum length 108, width 192, blotch median length 68. Forewing length 780. Antennal segments I–VIII (L/W): 20/28, 32/28, 56/20, 60/20, 48/16, 56/16, 12/4, 12/4. Male body length 960, dorsum of head 28, forewing length 580.

Specimens examined: Holotype female: **TAIWAN**, **Hsinchu**, Wufeng, on *Acacia confusa*, 16-xii-1993.

Paratype: **TAIWAN**, **Miaoli**, Dahu , 1 male from *Phyllostachys* sp., vi-1993.

Remarks: Most of the species of this genus are in dark color, whereas this is a yellow species. Other characteristics are similar to *H. multipunctatus*, from which it can be distinguished by the short comb medially on tergites II–VI.

***Hydatothrips liquidambara* Chen**
(Fig. 4)

Hydatothrips liquidambara Chen, 1977: 145

Female macropterous**:** Body brown, abdominal segments V lighter than other segments; antennal segments I–III yellow, IV dark brown with basal 1/4 yellow, V–VIII dark brown; forewing brown with a sub-basal pale band. Occipital apodeme touching posterior margin of eyes; ocellar setae III situated in front of posterior

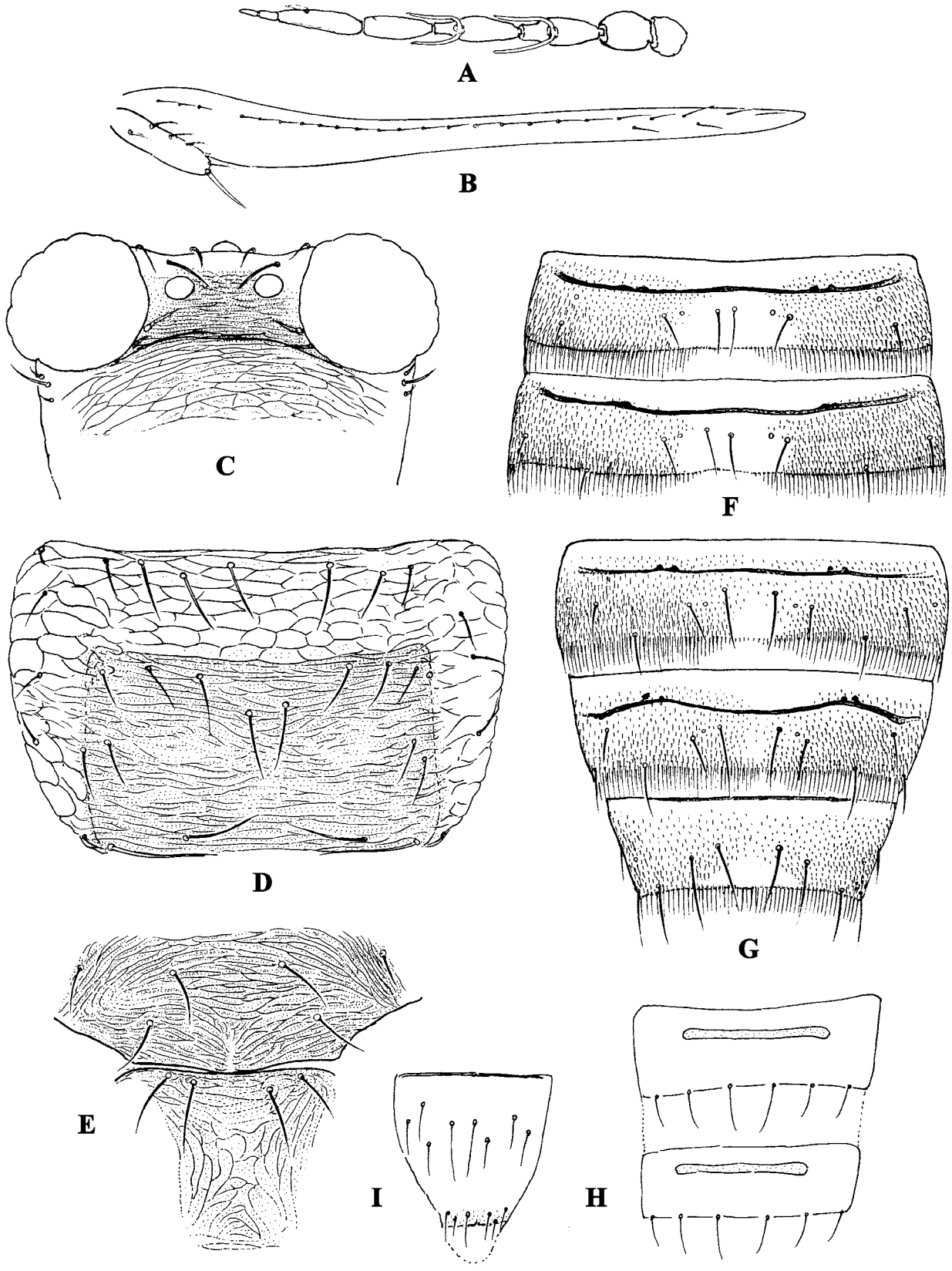

FIGURE 3. *Hydatothrips flavidus* sp. n.: A. antenna, B. forewing; C. head; D. pronotum; E. meso- and metanotum, F. abdominal tergites III & IV; G. abdominal tergites VI–VIII; H. male sternites VI & VII; I. male tergite X.

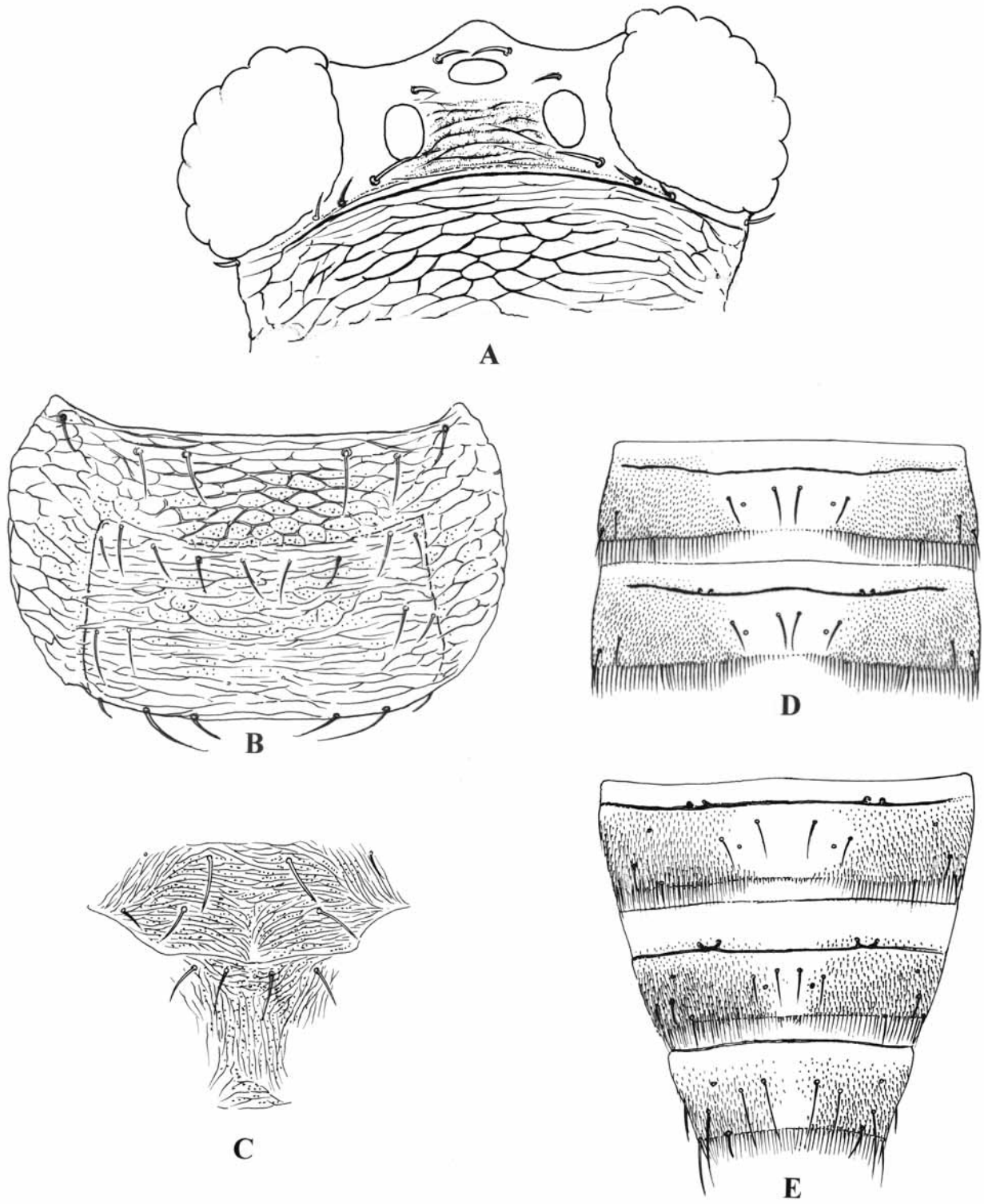

FIGURE 4. *Hydatothrips liquidambara*: A. head; B. pronotum; C. meso- and metanotum; D. abdominal tergites III & IV; E. tergites VI–VIII.

ocelli, outside ocellar triangle. Pronotum with polygonal reticles outside blotch, with dots in most reticles; blotch with dense transverse striae, slightly concave anteromedially and extending to posterior margin of pronotum. Forewing second vein with 12 distal setae. Abdominal tergites II–VII posteromarginal comb complete but short medially, tergite VIII posterior comb long and complete. Sternites without discal setae.

Specimens examined: **TAIWAN**: **Chiayi**, Fenchifu, 1 female paratype from *Liquidambar formosana*; 30-xii-1975; **Nantou**, Meifeng, 1 male from *Morus australis*, 24-x-1978; **Nantou**, 1 male from *Cunninghamia lanceolata*, 10-i-1991; **Nantou**, 2 females, 4 males from grass, i, v, vii, x-1992; **Nantou**, 1 female from bamboo, 25-vi-1992; **Taichung**, TARI, 2 males on grasses, 9-vii-1992; **Tainan**, 12 females from *Areca catechu*, 1-iv-1993; same locality 1 female on *Firmiana simplex*; **Pingtung**, 1 female on *Arachis hypogaea*, 21-iv-1992.

***Hydatothrips meriposa* sp. n.**
(Fig. 5)

Female macropterous**:** Body yellowish brown, abdominal tergites I–V grayish brown, VI whitish yellow, VII–X brown; antecostal ridges on tergites II–VII dark brown; antennal segments I, II and basal half of III–V whitish yellow, VI & VII grayish brown; forewings brown but lighter toward apex, with sub-basal pale area; legs yellow, mid femur brown medially, hind femur brown and lighter on both ends .

Head short, dorsum with dense transverse striae and wrinkles between them; occiput very short, with dense transverse striae, occipital apodeme not reaching posterior margin of eyes; ocellar setae III situated in front of posterior ocelli, inside ocellar triangle; mouth cone reaching posterior margin of pronotum; maxillary palpi 3-segmented. Antennae 7-segmented, segments V and VI each with a linear sensorium.

Pronotum outside of blotch with reticles, some reticles with dotted inner wrinkles, anteromarginal median setae wide apart, much longer than length of setae. Pronotal blotch with anterior and posterior margins concave, median length about 0.5 lateral length, covered with dense transverse striae, 1 pair of anteromarginal median setae, 2 pairs of anterior submarginal setae, 23 setae each on lateral margin, 1 pair of posteromarginal setae. Mesonotum and metanotum with dense striae and wrinkles. Forewing first vein setal row complete, second vein with 2 distal setae.

Abdominal tergite I with rows of microtrichia laterally; tergites II–VII with dense rows of microtrichia on areas lateral to submedian setae, tergites II–VI with posteromarginal comb lacking medially and minute submedially; tergite VII median posterior comb short, tergite VIII posterior comb long and complete; tergites II–VII sublateral of antecostal ridge on with forwardly protruded spots. Sternites without discal setae.

Male unknown.

Measurements of holotype female in microns: Body length 1140. Head dorsum length 64. Pronotum length 108, width 184, blotch median length 32. Forewing length 760. Antennal segments I–VII (L/W): 20/28, 40/24, 76/16, 68/12, 52/12, 64/16, 28/4.

Specimens examined: Holotype female: **TAIWAN**, **Nantou**, Hui-Sun Forest Station, on *Murraya paniculata*, 3-viii-1993.

Remarks: Though known only from one female, the clear body structures suggest that this is a valid species. *Meriposa* means butterfly, and describes the shape of the pronotal blotch of this species.

Genus *Neohydatothrips* John

Neohydatothrips John, 1929: 33. Type species: *Neohydatothrips latereostriatus* John.
Elbuthrips Bhatti, 1973:410. Type species: *Elbuthrips latis* Bhatti. **syn. n**.
Kazinothrips Bhatti, 1973: 432. Type species: *Zonothrips luridus* Ananthakrishnan, 1967. **syn. n.**

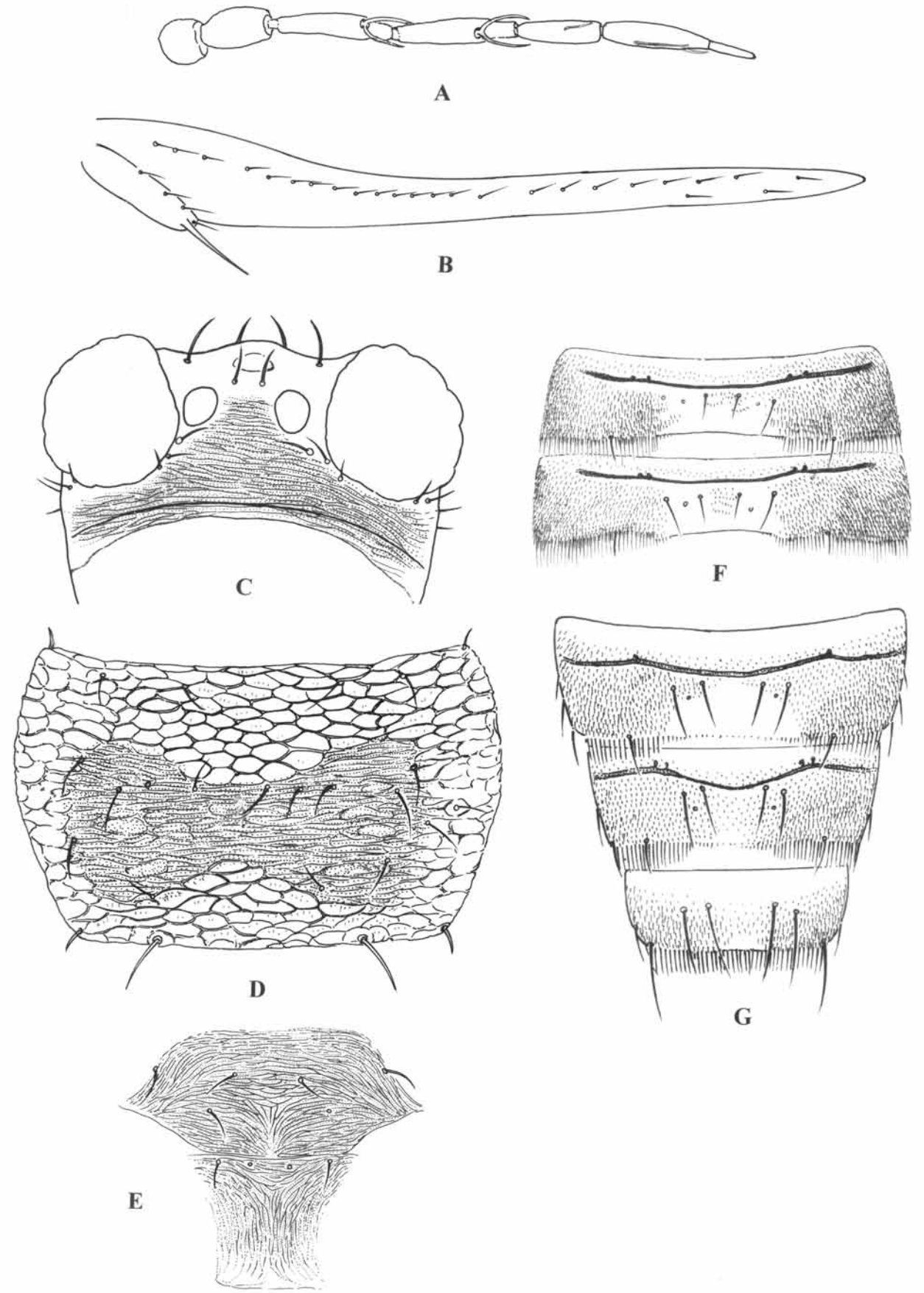

FIGURE 5. *Hydatothrips meriposa* sp. n.: A. antenna, B. forewing; C. head; D. pronotum; E. meso– and metanotum, F. abdominal tergites III & IV; G. abdominal tergites VI–VIII.

The genus *Elbuthrips* was erected for one new species based on a single male from India. It was distinguished from other genera in this group because the marginal setae on the abdominal sternites arise in front of the margin. *Elbuthrips* is here regarded as a synonym of *Neohydatothrips*.

Kazinothrips was erected for two species transferred from *Zonothrips*, *Z. luridus* Ananthakrishnan 1967 from India, and *Z. osmundae* (J. C. Crawford) from North America. Three more species *K. bifurcisetosus* Kudo, *K. reticulatus* Kudo from Japan and *K. xestosternitus* Han & Cui from China were included afterwards. As indicated by Bhatti (1973), *Kazinothrips* is distinguished from *Neohydatothrips* only by the 7-segmented antennae, and this difference seems more likely to have arisen among the species of *Neohydatothrips* than to represent a separate evolutionary lineage. *Kazinothrips* is therefore here considered a synonym of *Neohydatothrips*.

Neohydatothrips is morphologically similar to *Hydatothrips*, but the metasternum is not divided medially or divided only in the front part with a Y-shaped apodeme. Six species of *Neohydatothrips* are here recorded from Taiwan, *gracilipes*, *medius*, *plynopygus*, *samayunkur*, *surrufus* and *tabulifer*, of which *surrufus* is a new species, and *gracilipes*, *plynopygus*, *samayunkur* and *tabulifer* are new records for Taiwan..

Neohydatothrips species of East and South Asia

bifurcisetosus Kudo, 1997: 348. *Hydatothrips* (*Kazinothrips*). Thailand, Burma.
elaeagni Kudo, 1991: 535. *Hydatothrips (Neohydatothrips*). Japan, China
    populi Han, 1991: 499, 453. **Syn.n.**
gracilicornis Williams, 1916: 222. *Sericothrips*
    Hydatothrips (*Neohydatothrips*) *gracilicornis*; Kudo, 1991: 526. Europe, Morocco, Turkey, Israel, Iran.
gracilipes Hood, 1924: 149. *Sericothrips*
    Neohydatothrips gracilipes; Mound & Marullo, 1996: 168. Taiwan, Thailand, India, Australia, Mexico, Costa Rica, Trinidad, Jamaica.
kenidai Kudo, 1997: 340. *Hydatothrips* (*Neohydatothrips*). Malaysia.
latis Bhatti, 1973: 411. *Elbuthrips*. India.
medius Wang, 1994: 257. Taiwan, Malaysia.
    pectinarius Kudo, 1997: 338. *Hydatothrips (Neohydatothrips*). **Syn.n.**
mitubautugi Kudo, 1991: 532. *Hydatothrips (Neohydatothrips)*. Japan.
plynopygus Karny, 1925: 29. *Anaphothrips*. **Comb.n.** Taiwan, Burma, India, Indonesia, Malaysia, Sarawak, Thailand.
    luridus Ananthakrishnan, 1967: 115. *Zonothrips*. **Syn.n.**
ponyaunpe Kudo, 1991: 529. *Hydatothrips (Neohydatothrips)*. Japan.
reticulates Kudo, 1991: 523. *Hydatothrips (Kazinothrips)*. Japan.
samayunkur Kudo, 1995: 169. *Hydatothrips (Neohydatothrips*). Japan, Taiwan, US (Florida, Hawaii), Costa Rica, Australia, Sri Lanka, Kenya.
surrufus sp. nov. Taiwan.
tabulifer Priesner, 1935: 351. *Sericothrips*. Japan, Malaysia, Taiwan
    Hydatothrips (Neohydatothrips) tabulifer Kudo, 1997: 343.
trypherus Han, 1991a: 451, 453. China.
xestosternitus Han, 1991b:1, 6. *Kazinothrips*. Nepal
    Hydatothrips (*Kazinothrips*) *xestosternitus*; Kudo, 1997: 345.

Key to species of *Neohydatothrips* from East and South Asia

1. Antenna 7 segmented..... 2
-. Antenna 8 segmented..... 5
2. Median pair of setae on pronotal posterior margin forked at apex ..... *bifurcisetosus*
-. Median pair of setae on pronotal posterior margin simple 3

3. At least certain antecostal ridges on abdominal tergites II–VII pale or absent (fig. 8E) ..... *plynopygus*
-. All antecostal ridges on abdominal tergites II–VII dark 4
4. Abdominal tergites VI–VII lighter than other tergites ..... *xestosternitus*
-. Abdominal tergites I–VII lighter ..... *reticulates*
5. Posterior margins of abdominal tergites with craspedum ..... *gracilicornis*
-. Posterior margins of abdominal tergites without craspedum 6
6. Pronotal blotch weakly sclerotized (fig. 6C); abdomen yellow, tergites II–VI with brown areas posterior antecostal ridge laterally ..... *gracilipes*
-. Pronotal blotch well sclerotized with clear margin; abdomen entirely brown or with paler and darker tergites 7
7. Forewing second vein with at least 1 seta 8
-. Forewing second vein without setae 12
8. Mid and hind tibiae brown ..... *medius*
-. Mid and hind tibiae yellow 9
9. Abdominal tergite VI paler than other tergites ..... *surrufus* sp. n.
-. Abdominal tergites VI not paler than other tergites 10
10. Anterior and posterior margins of pronotal blotch parallel ..... *ponyaunpe*
-. Anterior and posterior margins of pronotal blotch strongly concave 11
11. Abdominal tergites IV–VI with 47 setae lateral to discal setae III ..... *mitubautugi*
-. Abdominal tergites IV–VI with less than 4 setae lateral to discal setae III ..... *elaeagni*
12. Occipital apodeme touching posterior margin of eyes 13
-. Occipital apodeme not touching posterior margin of eyes 14
13. Abdominal tergites IV–V yellow, tergites I–III and VI with brown semi-elliptical areas clearly separated from median yellow areas (fig. 11D) ..... *tabulifer*
-. Abdominal tergites without such brown semi-elliptical areas ..... *kenidai*
14. Body bicolored, brown on head, pronotal blotch, most of pteronotum, laterals of tergites I–III, anterior of abdominal tergite IV, and tergites VII–X, the rest parts yellow ..... *samayunkur*
-. Body pale yellowish, laterals of abdominal tergites II–III and tergite VIII grayish shaded 15
15. Male abdominal sternites III–VI each with a small circular glandular area ..... *latis*
-. Male abdominal sternites without glandular area ..... *trypherus*

Neohydatothrips **species from Taiwan**

Neohydatothrips gracilipes **(Hood)**

(Fig. 6)

Sericothrips gracilipes Hood, 1924: 149

Female macropterous: Body generally yellow, pronotal blotch with brown markings; abdominal tergites II–VII with dark brown antecostal ridge, also brown areas laterally on these segments behind antecostal ridges; antennal segments grayish brown, segments III and basal halves of IV–V lighter; legs grayish yellow; forewings grayish yellow with a sub-basal pale band.

Head short, cheeks about same length as eyes; ocellar setae III situated behind front ocellus, inside ocellar triangle. Antennae 8-segmented, segment VII about half the length of VIII. Pronotal blotch weakly sclerotized without a clear margin, posteroangular pair of setae on blotch well developed, about same length as blotch. Mesonotum and metanotum with dense transverse or longitudinal striae. Anterior margin of metasternum straight. Forewing first vein setal row complete, second vein without distal setae. Abdominal tergites II–VII

with posteromarginalcombs present laterally but not medially; tergites VII and VIII with long and complete posterior comb. Sternites I–VII with complete posteromarginal comb, without discal setae.

Male: unknown.

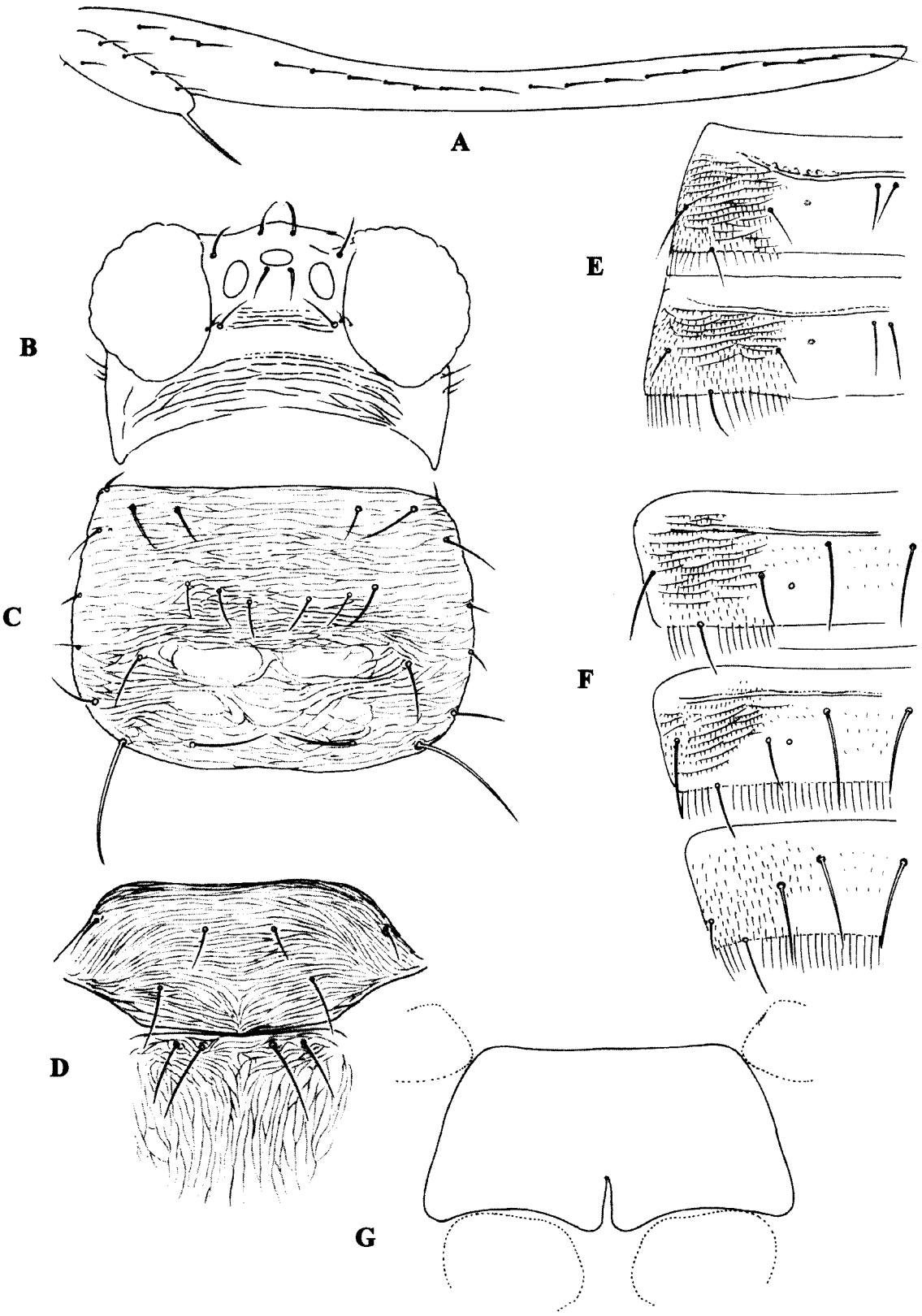

FIGURE 6. *Neohydatothrips gracilipes*: A. forewing; B. head; C. pronotum; D. meso- and metanotum, E. abdominal tergites II & III; F. abdominal tergites VI–VIII; G. metasternite.

Specimens examined: **TAIWAN, Taichung**, Wufeng, 28 females on *Gossypium indicum* (wild cotton), 12-ix-2003, coll. C. C. Ho; **Kingmen**, 1 female on *Sida acuta* (narrow-leaved sida), 6-xii-2001, coll. C. C. Ho.

Remarks: This species is recorded from Mexico, Costa Rica, Trinidad, Jamaica, Australia, Thailand and India, and this is the first record for Taiwan. Most records are from Malvaceae, particularly species of *Sida*, but many specimens were taken in Taiwan from cotton, the plant from which this thrips was originally described. The irregular brownish markings on blotch and abdominal tergites as well as pleurites are characteristics of this species. Besides, the form of striae on the metanotum distinguishes it from other species.

***Neohydatothrips medius* Wang.**
(Fig. 7)

Neohydatothrips medius Wang, 1994: 257
Hydatothrips (Neohydatothrips) pectinarius Kudo, 1997: 338. **syn.n.**

Female macropterous**:** Body dark brown, abdominal segments V and VI yellowish; antennal segments I and II pale yellow, III and IV yellowish gray, V–VIII dark gray with base of V paler; forewing brown with a subbasal paler band. Head short, occipital apodeme touching posterior margin of eyes; ocellar setae III situated in front of posterior ocelli, outside ocellar triangle. Pronotal reticles inside and outside blotch strongly transverse, with inner wrinkles, blotch anterior margin slightly concave medially. Forewing with 2 distal setae on second vein. Abdominal tergites II–VII posterior comb complete but shortmedially, tergite VIII posterior comb long and complete.

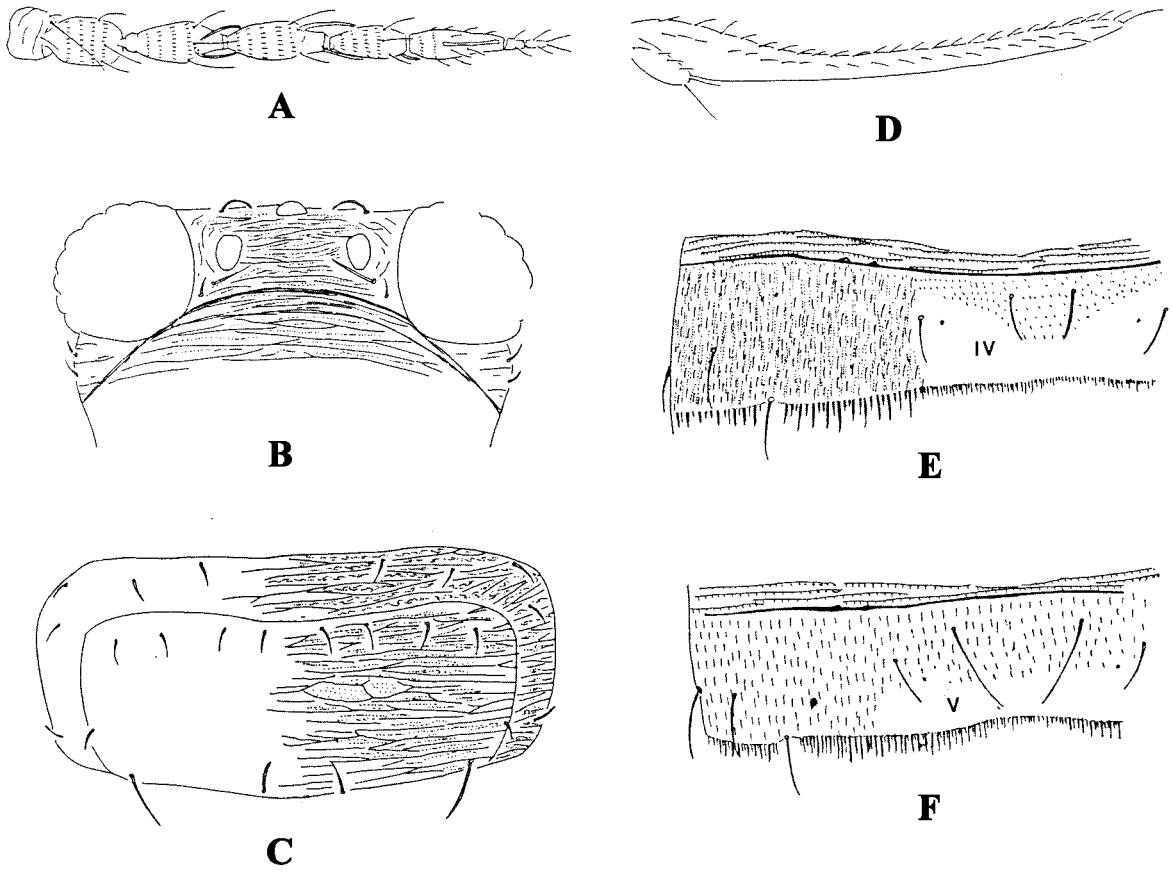

FIGURE 7. *Neohydatothrips*. *medius*: A. antenna; B. head; C. pronotum; D. forewing; E. abdominal tergite IV; F. tergite V. (Wang, 1994).

*Remarks***:** *N. pectinarius* was described from a single female collected in Malaysia. This specimen has been examined and is considered to be the same species as *N. medius* from Taiwan.

Specimens examined: **TAIWAN**, **Pingtung**, holotype female, 12 paratype females, 2 paratype males of *H. medius*, from *Cinnamomum camphora*, 21-iv-1992; 3 females with similar data from *Acacia confusa*. **MALAYSIA** , **Pinang**, holotype female of *H. pectinariius* from *Pleocnemia irregularis* (Dryopteridaceae); 17-xi-1991.

***Neohydatothrips plynopygus* (Karny). comb. n.**
(Fig. 8)

Anaphothrips plynopygus Karny 1925: 29.
Zonothrips luridus Ananthakrishnan 1967: 115. **syn. n**.

Female macropterous**:** Body brown, abdominal tergites V–VI, median 1/3 to 1/4 of tergites I–VI yellowish brown, tergite X yellow; antecostal ridge broken medially o tergite I, pale medially on IV–VII or VIII; antennal segments I–V grayish white except apex of IV & V grayish, VI & VII grayish brown; all femora dark brown, tibiae and tarsi yellow; forewings brown with sub-basal, submedian and apical pale bands. Ocellar setae III situated between front and posterior ocelli, outside ocellar triangle; occipital apodeme close to posterior margin of eyes, but not touching. Pronotum including blotch covered with transversely reticulated striae, clear longitudinal wrinkles between the striae. Forewing first vein setal row complete, second vein with 2 distal setae. Median pair setae on abdominal tergites II–VII situated on antecostal ridges; posterior margin of II–VI without comb medially; tergites VII & VIII with long and complete comb. Sternites II–VI with paired specialized sclerites laterally, anterior portion of sternite VII forming 2 protuberances, sternites without discal setae.

*Male***:** Similar to female in color and shape. Abdominal sternites III–VII with large glandular areas; sternite VII normal without protuberances, no glandular area.

*Specimens examined***: TAIWAN**, **Pingdung**, Kending, 9 females, 7 males on *Imperata cylindrical* var. *major*, 14-iv-1993; **Pingdung**, Manshu, 28 females, 1 male on grasses, 21-xi-2001.

*Remarks***:** The holotype of *Anaphothrips plynopygus* Karny from Indonesia (Sumatra) and specimens of *Zonothrips luridus* Anathakrishnan from India were examined in the Senckenberg Museum, Frankfurt, Germany by R. zur Strassen and L. A. Mound. The synonymy was indicated on the World list of Thysanoptera (Mound, 2007) but has not previously been formally published. There are specimens of this species in the Australian National Insect Collection, Canberra, from Bali and from northern Australia (Darwin) (teste L.A. Mound).

***Neohydatothrips samayunkur* Kudo**
(Fig. 9)

Hydatothrips (*Neohydatothrips*) *samayunkur* Kudo, 1995: 169

Female macropterous**:** Body generally brown, median of abdominal tergites I–III and tergites IV–VI paler. Antennal segments I & II brown, III–V yellowish with apical brown area more significant posteriorly, VI–VIII brown. Forewing with sub-basal, median and apical paler areas.. Ocellar setae III situated outside of ocellar triangle. Occiput apodeme with a distance to posterior margin of eyes. Pronotum with weak reticles outside of blotch, blotch with dense transverse striae. Forewing second vein without seta, posterior comb on abdominal segements II–VI lacking in the median, tergite VII and VIII with posterior comb complete. Sternites without discal setae.

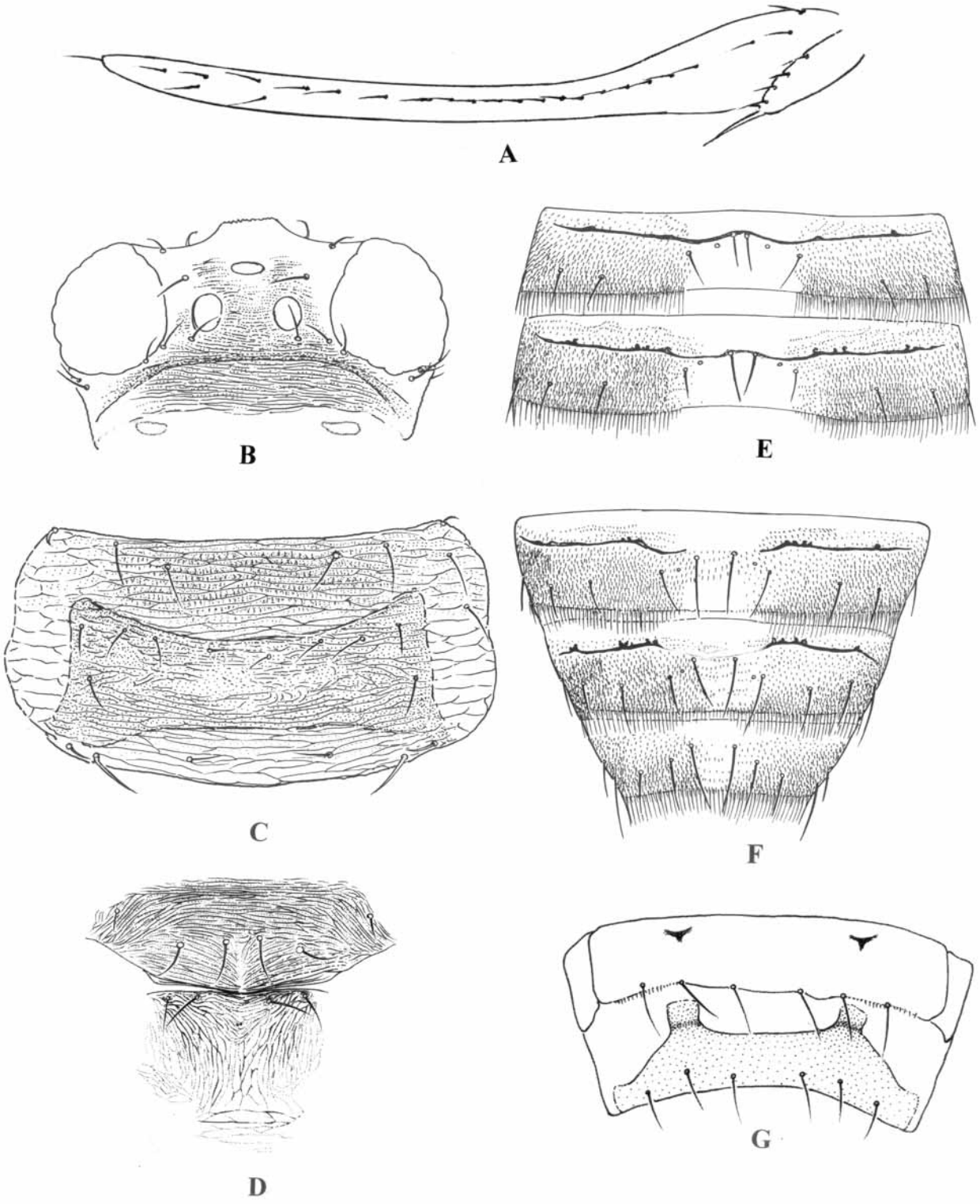

FIGURE 8. *Neohydatothrips plynopygus*: A. forewing; B. head; C. pronotum; D. meso– and metanotum, E. abdominal tergites III & IV; F. abdominal tergites VI–VIII; G. abdominal sternites VI & VII.

Specimens examined: **TAIWAN**, **Nantou**: Hsin-I, 15 females on *Tagetes patula* (marigold), 18-i-2000; **Nantou**: Rnai, 23 females on *Artemisia capillaris*, 25-i-2002; **Nantou**: Chingjing, 10 females on *Artemisia capillaris*, 1-ii-2002.

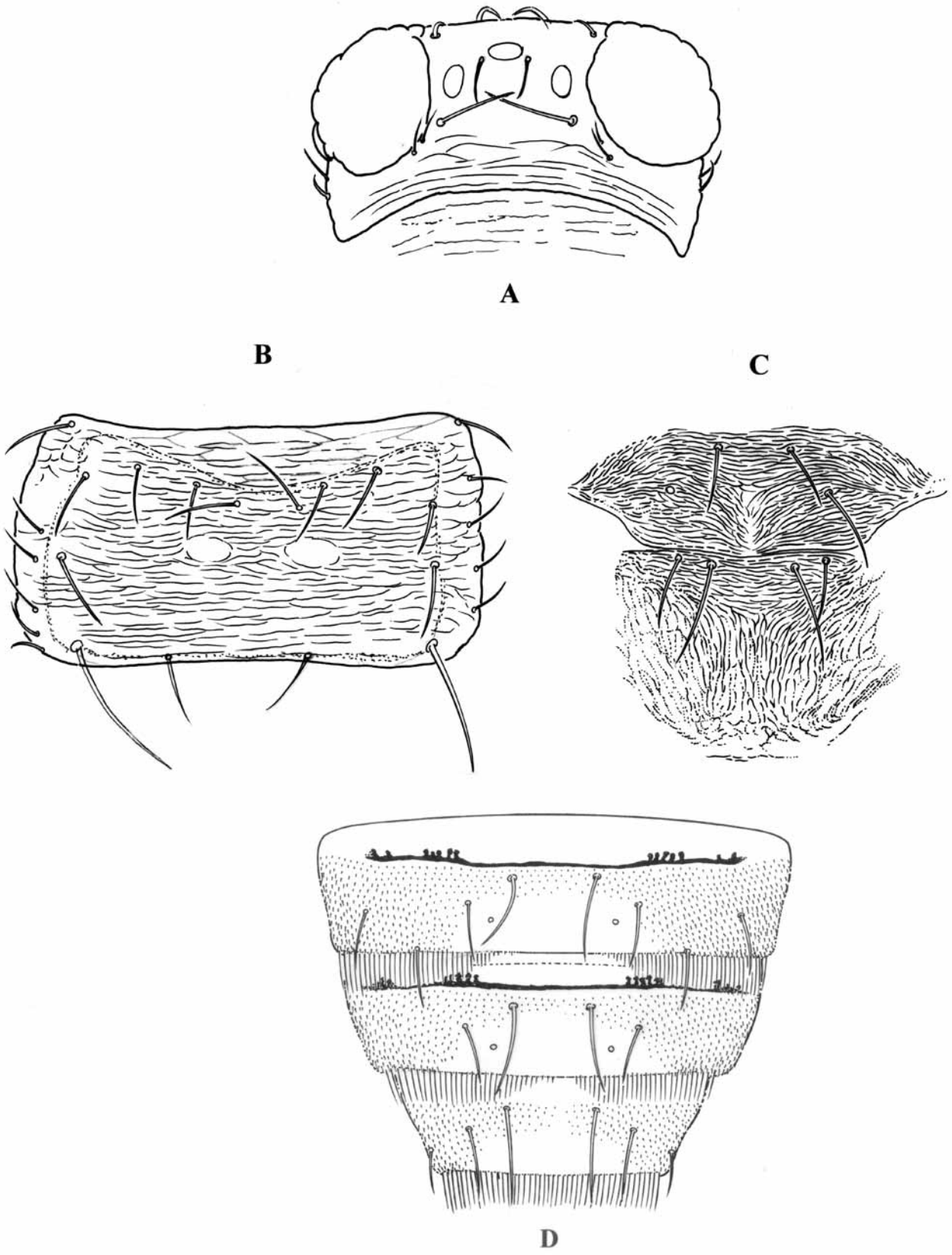

FIGURE 9. *Neohydatothrips samayunkur*: A. head; B. pronotum; C. meso- and metanotum; D. abdominal tergites VI–VIII.

Remarks: This thrips was found at high densities on its host plant, and the leaves turned to a gray color. Its distribution includes Asia, Central and South America, Australia (Nakahara, 1999). The reported hosts were

all marigolds (*Tagetes erecta*, *T. minuta* and *Tagetes* spp.). This is the first record of the species from plants of the genus *Artemisia* (Asteraceae).

***Neohydatothrips surrufus* sp. n.**
(Fig. 10)

Female macropterous**:** Body with red pigment; dorsum of head, pronotal blotch, meso- and metanotum, abdominal tergites I–V grayish brown, tergite VI whitish; tergites VII–X brown; antecostal ridges of tergites I–VIII dark; antennal segments I–III grayish white, IV–VII brown except base of IV grayish; tibiae and tarsi yellow, fore femur grayish brown, mid and hind femora brown; forewings brown with a sub-basal pale band.

Head short, anterior half with transverse striae, occipital apodeme touching posterior margin of eyes; weak wrinkles between striae on head and occiput; ocellar setae III situated on either side of front ocellus, outside ocellar triangle; maxillary palpi 3-segmented. Antennae 8-segmented, segments II–VI with microtrichia, segment VII about equal in length to VIII.

Pronotum outside of blotch with reticulate striae, blotch with transverse striae and weak wrinkles between striae; blotch with 34 anterior marginal setae on each side, 12 lateral setae, 2 pairs of posteromarginal setae, outer pair longer. Mesonotum and metanotum with dense transverse or longitudinal striae and weak wrinkles. Forewing first vein setal row complete, second vein with 2 distal setae.

Abdominal tergite I with rows of microtrichia laterally; tergites II–VIII with dense rows of microtrichia on areas lateral to submedian setae, longitudinal wrinkles between microtrichia on tergites II–V; tergites II–VII with median posterior comb, especially minute on II–VI; posterior comb on tergite VIII long and complete. Sublateral to antecostal ridges on tergite II–VII with forwardly protruded callosities; median pair of setae situated on antecostal ridge of tergite II–VII. Sternites III–VI with specialized sclerites, anterior portion of sternite VII forming 2 protuberances; sternites without discal setae.

Male unknown.

Measurements of holotype female in microns: Body length 1200. Head dorsum length 48. Pronotum length 108, width 240, blotch median length 60, lateral longest length 80. Forewing length 800. Antennal segments I–VII (L/W): 24/24, 36/24, 56/20, 60/16, 44/20, 48/12, 12/8, 8/4.

Specimens examined: Holotype female: **TAIWAN**, **Pingdung**, Kending, on *Imperata cylindrical* var. *major*, 14-iv-1993.

Remarks: This species is unique by its abdominal shape and color and the obvious protrudings on abdominal sternite VII.

***Neohydatothrips tabulifer* (Priesner) comb. n.**
(Fig. 11)

Sericothrips tabulifer Priesner, 1935: 351.
Hydatothrips (Neohydatothrips) tabulifer (Priesner); Kudo, 1997: 343.

Female macropterous**:** Body bicolored, abdominal tergites II, III & VI with clear lateral oval or semielliptical brownish areas; antennal segments I–III, basal 2/3 of IV, and basal 1/2 of V yellow, apicex of IV & V and segments VI–VIII brown; forewing brown with a sub-basal transparent band. Occipital apodeme touching posterior margin of eyes; ocellar setae III situated in front of posterior ocelli, outside ocellar triangle. Pronotum outside of blotch with reticulate striae, blotch with transverse striae, weak wrinkles between striae. Forewing second vein without setae. Abdominal tergites II–VI posteromarginal comb complete, minute medially, tergites VII and VIII posterior comb complete, shorter medially on VII.

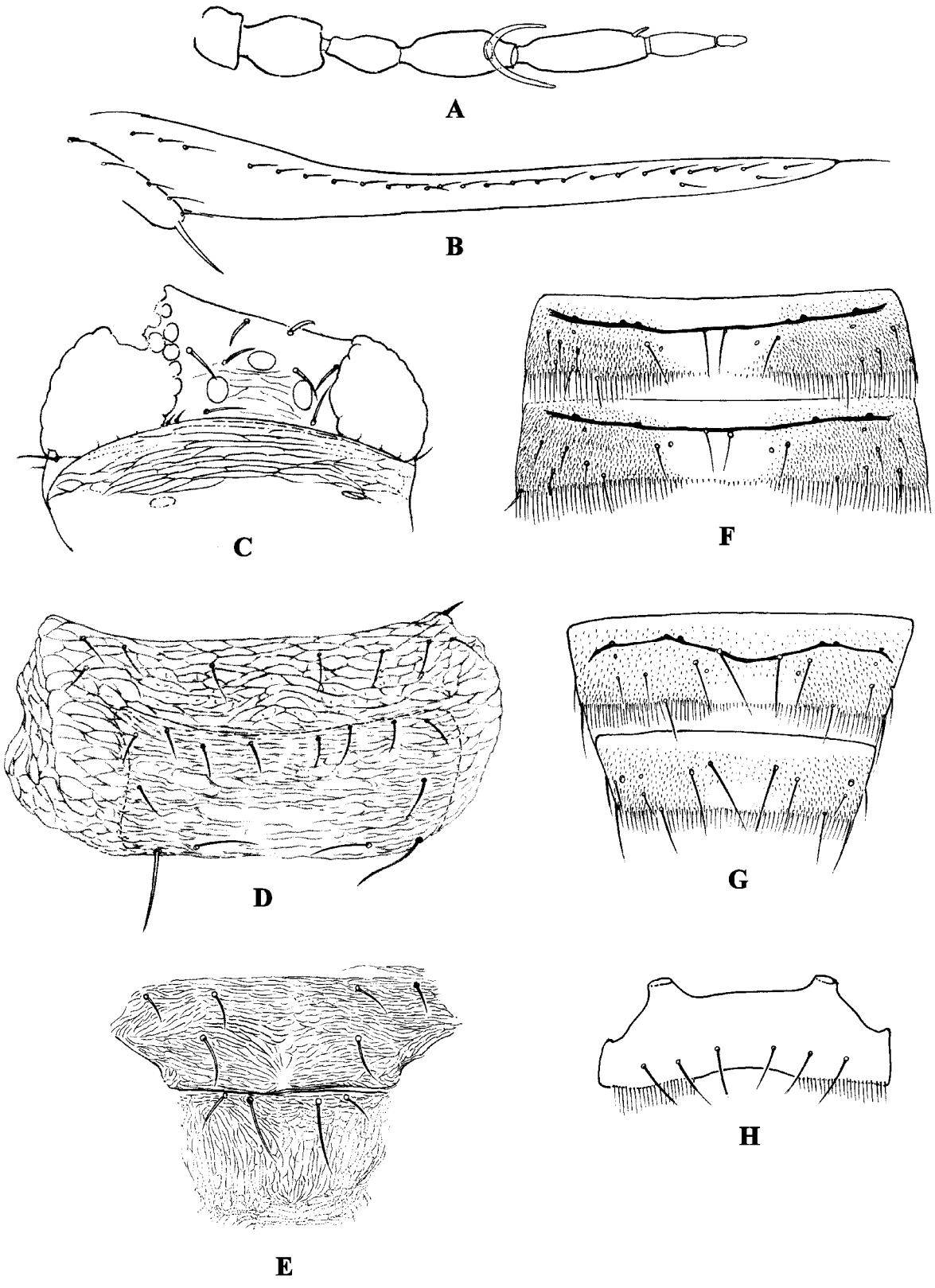

FIGURE10. *Neohydatothrips surrufus* sp. n.: A. antenna; B forewing; C. head; D. pronotum; E. meso- and metanotum, F. abdominal tergites III & IV; G. abdominal tergites VII & VIII, H. protrudings on sternite VII.

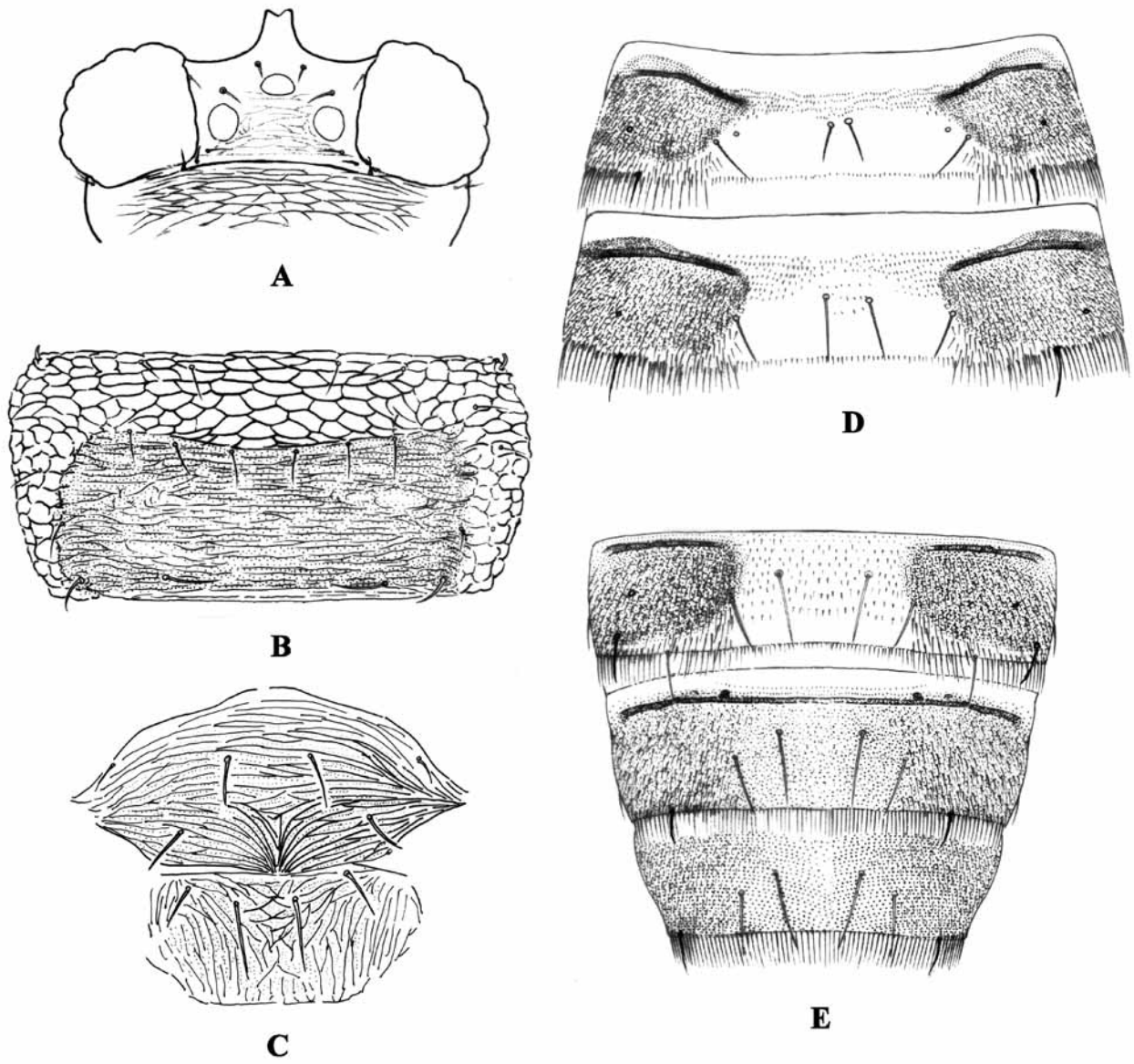

FIGURE 11. *Neohydatothrips tabulifer*: A. head; B. pronotum; C. meso- and metanotum; D. abdominal tergites II & III; E. tergites VI-VIII (with dots to show the brown color).

Specimens examined: **JAPAN, Iriomote**, 3 females, 2 males on *Glochidion lanceolatum*, 20-vii-1932, col. S. Minowa. **TAIWAN**, **Taipei**, Shih-ding, 1 female, 2 males on *Eucalyptus robusta*; 23-ix-1993; **Taichung**, Wufeng, 1 female, 1 male on wooden tree; 23-viii-1993; 1 male, **Taichung**, Kukuan, 1 male on *Morus* sp., 18-ix-1992.

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