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1 **Opiine parasitoids (Hymenoptera: Braconidae) of tropical fruit flies (Diptera:**
2 **Tephritidae) of the Australian and South Pacific region**

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12

1 **Abstract** Opiine wasps are parasitoids of dacine fruit flies, the primary horticultural
2 pests of Australia and the South Pacific. A taxonomic synopsis and distribution and
3 host records (44% of which are new) for each of the 15 species of dacine-parasitising
4 opiine braconids found in the South Pacific is presented. Species dealt with are
5 *Diachasmimorpha hageni* (Fullaway), *D. kraussii* (Fullaway), *D. longicaudata*
6 (Ashmead), *D. tryoni* (Cameron), *Fopius arisanus* (Sonan), *F. deeralensis* (Fullaway),
7 *F. ferrari* Carmichael & Wharton **sp.n.**, *F. illusorius* (Fischer) **comb.n.**, *F. schlingeri*
8 Wharton, *Opius froggatti* Fullaway, *Psytalia fijiensis* (Fullaway), *P. muesebecki*
9 (Fischer), *P. novaguineensis* (Szépligeti) and *Utetes perkinsi* (Fullaway). A
10 potentially undescribed species, which may be a colour morph of *F. vandenboschi*
11 (Fullaway), is diagnosed but not formally described. *Fopius vandenboschi sensu*
12 *stricto*, *Diachasmimorpha fullawayi* Silvestri, *Psytalia concolor* Szépligeti and *P.*
13 *incisi* Silvestri have been liberated into the region but are not considered to have
14 established: a brief diagnosis of each is included. *Biosteres illusorius* Fischer is
15 formally transferred to the genus *Fopius*. A single opiine specimen reared from a
16 species of *Bactrocera* (*Bulladacus*) appears to be *Utetes albimanus* (Szépligeti), but
17 damage to this specimen and to the holotype (the only previously known specimen)
18 means that this species remains unconfirmed as a fruit fly parasite: a diagnosis of *U.*
19 *cf. albimanus* is provided. *Psytalia novaguineensis* could not be adequately separated
20 from *P. fijiensis* using previously published characterisations and further work to
21 resolve this complex is recommended. A key is provided to all taxa.

22

23 **Key words** *Bactrocera*, biological control, natural enemies, Australia, Papua New
24 Guinea

25

1 **Introduction**

2 Fruit flies (Diptera: Tephritidae) are among the most economically important pests of
3 edible fruits worldwide (White & Elson-Harris, 1992). Interest in the biological
4 control of fruit flies, utilising parasitic Hymenoptera, dates back to the early 1900s
5 (Silvestri, 1913; Silvestri, 1914; Lever, 1938) and has been a focus of fruit fly
6 research ever since (Knipling, 1992; Waterhouse, 1993). Among the most commonly
7 used biological control agents against fruit flies are members of the Opiinae
8 (Hymenoptera: Braconidae). Opiines are koinobiont endoparasites of the egg or
9 larval stages of Diptera and have been introduced and released as classical biological
10 control agents of fruit flies in many regions (Wharton & Gilstrap, 1983; Waterhouse,
11 1993; Ovruski, *et al.*, 2000). More recently, opiines have been used in manipulative
12 and inundative release programmes against fruit flies (Messing, *et al.*, 1993; Purcell,
13 *et al.*, 1998; Ramadan, 2004), with foreign exploration continuing (Wharton, *et al.*,
14 2000).

15

16 Despite their importance in applied entomology, the identification of opiine fruit fly
17 parasitoids remains difficult. A previously published key to opiine parasitoids of
18 dacine tephritid pests (Wharton & Gilstrap, 1983) is now taxonomically dated and
19 restricted in the taxa covered. Because the Opiinae is a large group with over 1500
20 described species, using primary taxonomic literature to identify these wasps is a
21 time-consuming and difficult task, especially if no host records are available. For
22 fruit fly workers of the South-Pacific region, problems of parasitoid identification are
23 exacerbated due to the fact that regional faunas are now mixed as a result of biological
24 control liberations, the geographic area covered is large and much of the primary

1 regional literature is in difficult to access foreign language journals (eg Fischer 1963a;
2 1967a; 1978; 1988).

3

4 Fruit fly parasitoids are best collected through the rearing of fruit flies from their host
5 fruit, rather than as collections of individual adults. Such host rearing work led, for
6 example, to the first comprehensive survey of opiine fruit fly parasitoids from
7 Thailand and Malaysia (Chinajariyawong, *et al.*, 2000). From the mid-1990s, a series
8 of fruit fly projects in the South Pacific region resulted in substantial, new parasitoid
9 collections being generated as the indirect result of host fruit studies. These projects
10 included the *Bactrocera papayae* Drew & Hancock eradication programme in far
11 north Queensland (Cantrell, *et al.*, 2001), the [Pacific] Regional Fruit Fly Project
12 (Ferrar, 1997) and the Papua New Guinea Fruit Fly Project (see Acknowledgements).
13 These new parasitoid collections provided an opportunity hitherto unavailable to
14 examine the taxonomy, distribution and host associations of the regional fruit fly
15 parasitoid fauna.

16

17 Based on an examination of nearly 4000 specimens, the greater percentage collected
18 in the last decade, we present a synopsis of the South Pacific tephritid-infesting opiine
19 fauna. Information provided includes a key to taxa and synopses of each species
20 (including illustrations, distributions and host records). The document is targeted at
21 fruit fly workers and inclusion of taxa is based on the parasitoids having been reared
22 from a dacine tephritid, as evidenced by label or previously published data. Opiines
23 reared from other dipterans (eg Belokobylskij, *et al.*, 2004) are not included in this
24 review.

25

1 **Materials and Methods**

2 Geographic scope

3 This paper covers the countries and territories of the South Pacific, including
4 Polynesia, Melanesia and Australia. It does not extend north of the equator, therefore
5 excludes Hawaii, the Federated States of Micronesia and the Marshall Islands.

7 Material examined

8 Material examined came from: the Australian National Insect Collection, Canberra,
9 Australia (ANIC); the Agricultural Scientific Collections Unit, NSW Dept of Primary
10 Industries, Orange, Australia (ASCU); the Bernice P. Bishop Museum, Honolulu,
11 Hawaii (BPBM); the Griffith University Fruit Fly Research Group, Nathan, Australia
12 (GU); the Queensland Department of Primary Industries and Fisheries Insect
13 Collection, Indooroopilly, Australia (QDPIF); the Secretariat of the Pacific
14 Community, Suva, Fiji (SPC); Texas A&M University Insect Collection (TAMU).
15 Holotype specimens from international collections were examined by R.A.W.
16 Collections were strongly biased towards Australian and PNG material, with the
17 number of specimens examined by country as follows: American Samoa 1, Australia
18 1297, Cook Islands (NZ) 123, Fiji 713, Papua New Guinea 1296, Samoa 36, Solomon
19 Islands 5, Tonga 373, Vanuatu 27. The holotype of the newly described species is
20 housed at the Queensland Museum, Brisbane, Australia (QM).

22 Terminology

23 The morphological terminology follows that of Sharkey & Wharton (1997) and is
24 illustrated in Fig. 1 and 2. The mesosoma is the thorax plus propodeum and the
25 metasoma is the petiole plus the gaster.

1 <<Insert Fig 1 near here>>

2 <<Insert Fig 2 near here>>

3

4 Distribution and host records

5 The distribution and host fly associations have been gathered from the literature or
6 from specimen label data. For each host association record, the source of the record is
7 given, in brackets, after the fly species using the following code: 1 (label data); 2
8 (Wharton & Gilstrap, 1983); 3 (Waterhouse, 1993); 4 (Quimio & Walter, 2001); 5
9 (Wharton, 1999); 6 (Fullaway, 1952); 7 (Fischer, 1963a). One important caveat has
10 been placed on the host association data to minimise error. When host fruit-rearing is
11 being carried out, multiple fly species may be reared from the one fruit sample. If
12 parasitoids also emerge from such samples, then ambiguity exists over the fly species
13 with which the parasitoid was associated (Clausen, *et al.*, 1965). Where label data for
14 an individual specimen showed that the parasitoid was associated with two or more
15 host fruit flies, then that label data has not been reported in this paper. Host data is
16 given individually for each species and as a comparative summary table (Table 1).

17

18 A number of the parasitoids dealt with in this paper are known to parasitise fruit fly
19 species which do not occur in the South Pacific region. These records are not
20 included here so as to avoid possible confusion over the geographical distribution of
21 those flies.

1 **Key to the Opiinae parasitising Tephritidae of the South Pacific region**

- 2 **1** Hind tibia dorso-posteriorly without basal carina....3
- 3 - Hind tibia dorso-posteriorly with distinct basal carina (Fig. 17)....2
- 4 **2** Body uniformly dark brown to black, tarsi white....*Utetes cf. albimanus*
- 5 - Head and at least apical metasomal terga dark brown to black, mesosoma yellow/orange, hind
- 6 tarsi dark....*Utetes perkinsi* (Fullaway)
- 7 **3** Notauli smooth (Fig. 4d) to absent or nearly so (Fig. 14d)....4
- 8 - Notauli crenulate (Fig. 7d)....13
- 9 **4** Labrum exposed, not concealed by clypeus (Fig. 14a)....5
- 10 - Labrum concealed by clypeus (Fig. 6a)....9
- 11 **5** Midpit of mesoscutum absent (Fig. 14d)....6
- 12 - Midpit of mesoscutum deep and circular (Fig. 13b)....*Opius froggatti* Fullaway
- 13 **6** Propodeal carina present (Fig. 14e)....7
- 14 - Propodeal carina absent... *Psytalia muesebecki* (Fischer)
- 15 **7** Forewing vein (RS+M)b present (Fig 1); vein 2RS narrow throughout, not thickened
- 16 medially.....8
- 17 - Forewing vein (RS+M)b absent; junction of 2RS and m-cu expanded into a large, irregular
- 18 thickening; 2RS also thickened medially in most specimens....*Psytalia fijiensis/novaguineensis*
- 19 **8** Forewing vein 2RS about twice the length of r....*Psytalia concolor* (Szépligeti)*
- 20 - Forewing vein 2RS about equal in length to r....*Psytalia incisi* (Silvestri)*
- 21 **9** Ventral margin of clypeus sinuate or evenly convex (Fig. 5a)....10
- 22 - Clypeus with two small teeth along midline at apex of clypeus*Diachasmimorpha fullawayi*
- 23 (Silvestri)*
- 24 **10** Metasomal tergum 2 smooth and polished (Fig 6f) (or occasionally with weak striae at
- 25 extreme base)....11
- 26 - Metasomal tergum 2 extensively longitudinally striate....*Diachasmimorpha longicaudata*
- 27 (Ashmead)
- 28 **11** Metasoma at least partly black....12
- 29 - Metasoma entirely yellow/orange....*Diachasmimorpha kraussii* (Fullaway)

- 1 **12** Occipital carina well developed, extending dorsally to level of mid-eye....*Diachasmimorpha*
2 *hageni* (Fullaway)
- 3 - Occipital carina nearly absent, or present ventrally only near base of
4 mandible....*Diachasmimorpha tryoni* (Cameron)
- 5 **13** Tergum 2 densely striate (Fig 7f)....14
- 6 - Tergum 2 either without striae (Fig. 10f) or with only a few weak striae basal-medially....17
- 7 **14** Frons and vertex rugose-punctate....16
- 8 - Frons densely punctate, vertex more sparsely punctate, neither frons nor vertex rugose-
9 punctate....15
- 10 **15** Metasomal terga 1-5 yellow to orange....*Fopius deeralensis* (Fullaway)
- 11 - At least metasomal terga 2+3 black....*Fopius cf. vandenboschi*
- 12 **16** Metasoma dark brown to black. Apex of ovipositor lacking dorsal ridges, distinctly constricted
13 subapically....*Fopius arisanus* (Sonan)
- 14 - Petiole dark brown, remainder of metasoma usually yellow/orange, at least in female. Apex of
15 ovipositor with weak dorsal ridge and without subapical constriction *Fopius vandenboschi*
16 (Fullaway)*
- 17 **17** Metasomal terga 1-4 entirely yellow/orange (apical metasomal terga sometimes black in
18 males)....18
- 19 - Metasomal terga entirely dark brown to black....19
- 20 **18** Clypeus with ventral margin very obtusely angulate (Fig. 8a)*Fopius deeralensis*
21 (Fullaway)
- 22 - Clypeus with rounded ventral margin (Fig. 11a) *Fopius schlingeri* Wharton
- 23 **19** Clypeus with ventral margin very obtusely angulate, body densely setose (Fig. 9a)...*Fopius*
24 *ferrari* sp. n
- 25 - Clypeus with rounded ventral margin (Fig. 10a) *Fopius illusorius* (Fischer)

26 * Indicates species which have been released but not yet recovered.

27

28 <<Insert Table 1 here>>

1 ***Diachasmimorpha hageni* (Fullaway, 1952)**

2 *Opius hageni* Fullaway, 1952: 412.

3 *Opius (Biosteres) hageni*: Fischer, 1963b: 231.

4 *Biosteres hageni*: Fischer, 1971a: 25.

5 *Biosteres (Chilotrichia) hageni*: Fischer, 1978: 386.

6 *Diachasmimorpha hageni*: Wharton, 1987: 62; Waterhouse, 1993: 38.

7 **Synopsis** (Fig. 3a-f)

8 Frons and vertex sparsely setose and punctate. Frons polished and weakly punctate,
 9 the punctures anterior to ocellar field sparse and shallow; ocellar triangle arranged to
 10 form an obtuse triangle with a slight depression anterior to the median ocellus. Occipital
 11 carina well developed; clypeus in profile slightly bulged medially; ventral margin of
 12 clypeus slightly thickened and sufficiently convex to completely conceal labrum when
 13 mandibles closed. Notauli deep, broad, unsculptured; propodeum rugose laterally,
 14 with a median longitudinal carina stemming a pentagonal areola, the base of which
 15 coincides with the posterior margin. Sternaulus broad, deep, crenulate. Wings strongly
 16 infumate. Forewing r vein arising slightly basal to midpoint of stigma, 2RS slightly
 17 longer than 3RSa, (RS+M)a weakly sinuate; (RS+M)b absent, m-cu arising distad
 18 2RS. Hindwing RS absent; m-cu well developed and pigmented to wing margin.
 19 Petiole with dorsal lateral carinae strongly elevated over basal half, weaker
 20 posteriorly, but extending to posterior margin. Metasomal tergum 2 smooth and
 21 polished. Ovipositor sheath about equal in length to body including head. Ovipositor
 22 subapically sinuate. Head, mesosoma and petiole yellow/orange, remainder of
 23 metasoma dark brown; legs yellow/orange.

24 **Distribution:** *Fiji* Viti Levu.

25 **Type Locality:** Ndeumba, Viti Levu, Fiji.

1 **Material Examined:** ANIC: 5♂, 4♀, 1, sex undetermined.

2 **Host Associations:** *Bactrocera passiflorae* (Froggatt) (2,3,6).

3 **Discussion**

4 Morphologically similar to *D. tryoni* and *D. kraussii*. Distinguished from *D. tryoni* by
5 paler colouration and *D. kraussii* by dark metasoma. This species is native to Fiji
6 (Wharton & Gilstrap, 1983; Waterhouse, 1993) and was described from specimens
7 collected by N.L.H. Krauss in May 1951.

8 <<Insert Fig 3 near here>>

9

10 ***Diachasmimorpha kraussii* (Fullaway, 1951)**

11 *Opius kraussii* Fullaway, 1951: 249.

12 *Opius (Biosteres) kraussii*: Fischer, 1963b: 233.

13 *Biosteres kraussi*: Fischer, 1971a: 26.

14 *Biosteres (Chilotrichia) kraussi*: Fischer, 1978: 386.

15 *Diachasmimorpha kraussii*: Wharton, 1987: 62; Waterhouse, 1993: 40.

16 **Synopsis** (Fig. 4a-f)

17 Frons and vertex punctate and setose. Ocellar triangle arranged to form an obtuse
18 triangle with a slight depression anterior to the median ocellus. Occipital carina well
19 developed; clypeus semicircular, ventral margin completely concealing labrum when
20 mandibles closed. Notauli deep, broad, unsculptured; propodeum rugose laterally,
21 with a median longitudinal carina stemming a pentagonal areola, the base of which
22 coincides with the posterior margin. Wings hyaline. Forewing r arising from midpoint
23 of stigma, 2RS slightly longer than 3RSa, (RS+M)a weakly sinuate; (RS+M)b absent,
24 m-cu arising distad 2RS. Hindwing RS absent; m-cu well developed and pigmented to
25 wing margin. Petiole weakly longitudinally striate, dorsal carinae strongly elevated

1 and weakly convergent to posterior margin. Metasomal tergum 2 smooth; Ovipositor
 2 sheath about equal in length to body, including head. Ovipositor apically sinuate.
 3 Entire body yellow orange.

4 **Distribution:** *Australia* Collected from Biogu Is., Darnley Is., Dauan Is., Sabai Is.
 5 and mainland Australia, from Cape Tribulation in the north to Sydney in the south.

6 *Papua New Guinea* Collected from both high and low altitude regions of the main
 7 island of New Guinea and the Gazelle Peninsular of East New Britain. *Solomon*
 8 *Islands* Visale. *Vanuatu* Efate.

9 **Type Locality:** Deeral, Australia.

10 **Material examined:** ANIC: 20♂, 32♀, 2, sex undetermined; ASCU: 4♂, 6♀, 1, sex
 11 undetermined; GU: 89♂, 107♀, 7, sex undetermined; QDPIF: 176♂, 159♀, 3, sex
 12 undetermined.

13 **Host Associations:**

14 *Bactrocera barringtoniae* (Tryon) (2), *B. bidentata* (May) (1), *B. cacuminata* (Hering)
 15 (2,3), *B. cucurbitae* (Coquillett) (1), *B. dissidens* Drew (1), *B. frauenfeldi* (Schiner)
 16 (1), *B. jarvisi* (Tryon) (1,2,3), *B. kraussi* (Hardy) (1,2,3), *B. murrayi* (Perkins) (2), *B.*
 17 *neohumeralis* (Hardy) (1,3), *B. pallida* (Perkins & May) (2), *B. penefurva* Drew (1),
 18 *B. tryoni* (Froggatt) (1), and *B. umbrosa* (Fabricius) (1).

19 **Discussion**

20 Morphologically similar to *D. longicaudata* and *D. hageni*, but can be readily
 21 distinguished from these species by its pale colouration and smooth metasomal
 22 tergum 2. *Diachasmimorpha kraussii* is considered native to Australia (Wharton &
 23 Gilstrap 1983, Waterhouse 1993) and Solomon Islands (Waterhouse 1993); PNG is
 24 also likely to be part of its native range.

25 <<Insert Fig 4 near here>>

1

2 ***Diachasmimorpha longicaudata* (Ashmead, 1905)**3 *Biosteres longicaudatus* Ashmead, 1905: 970.4 *Diachasmimorpha comperei* Viereck, 1913: 641; syn. by Wharton & Gilstrap 1983:
5 733.6 *Biosteres compensans* Silvestri, 1916:168; Fischer, 1963b 234 as subsp.; Wharton &
7 Gilstrap, 1983: 733 as syn.8 *Biosteres formosanus* Fullaway, 1926: 283; syn. by Fischer, 1963b: 234.9 *Opius longicaudatus*: Fullaway, 1951: 243.10 *Opius longicaudatus* var. *chocki* Fullaway, 1953: 310.11 *Opius longicaudatus* var. *novocaledonicus* Fullaway, 1953: 311.12 *Opius longicaudatus* var. *malaiaensis* Fullaway, 1953: 312.13 *Opius longicaudatus* var. *taiensis* Fullaway, 1953: 313.14 *Opius (Biosteres) longicaudatus taiensis*: Fischer, 1963b: 234.15 *Opius (Biosteres) longicaudatus longicaudatus*: Fischer, 1963b: 234.16 *Biosteres longicaudatus*: Fischer, 1971a: 27.17 *Biosteres (Chilotrichia) longicaudatus*: Fischer, 1978: 386.18 *Diachasmimorpha longicaudata*: Wharton, 1987: 62.19 **Synopsis** (Fig. 5a-f)20 Frons and vertex sparsely punctate and setose. Ocellar triangle arranged to form an
21 obtuse triangle with a slight depression anterior to the median ocellus. Occipital carina
22 well developed; ventral margin of clypeus completely concealing labrum when
23 mandibles closed. Notauli deep, broad, unsculptured; propodeum irregularly areolate
24 with a median longitudinal carina extending from anterior margin to areola. Wings
25 hyaline. Forewing r arising slightly basad midpoint of stigma, 2RS slightly longer

1 than 3RSa, (RS+M)a weakly sinuate; (RS+M)b absent, m-cu arising distad 2RS.
 2 Hindwing RS absent; m-cu well developed and pigmented to wing margin. Petiole
 3 longitudinally striate, with dorsal lateral carinae strongly elevated and slightly
 4 divergent to posterior margin. Metasomal tergum 2 longitudinally striate; Ovipositor
 5 sheath about equal in length to body, including head. Body entirely yellow orange, or
 6 with black transverse stripe(s) subapically on metasomal terga.

7 **Distribution:** *Australia* Collected from the Bloomfield River, far North Queensland
 8 and Lord Howe Island. *Fiji* Collected from many sites on Viti Levu and Vanua Levu,
 9 also collected on islands of the Lau and Yasawa groups. *Papua New Guinea* Lae and
 10 Sonoma. *Vanuatu* Efate.

11 **Type Locality:** Manila, Philippines

12 **Material examined:** ASCU: 1♂, 2♀; GU: 8♂, 16♀, 1, sex undetermined; QDPIF:
 13 70♂, 86♀; SPC: 1♂, 3♀.

14 **Host Associations:** *B. caryeae* Kapoor (2), *B. cucurbitae* (1,2), *B. curvipennis*
 15 (Froggatt) (2,3), *B. dorsalis* (Hendel) (2,3), *B. frauenfeldi* (1,2), *B. latifrons* (Hendel)
 16 (2), *B. passiflorae* (1), *B. pedestris* (Bezzi) (2), *B. psidii* (Froggatt) (2), *B. tryoni* (2),
 17 *B. umbrosa* (1), *B. xanthodes* (Broun) (1), *B. zonata* (Saunders) (2), *Dacus ciliatus*
 18 Loew (2), and *Ceratitis capitata* (Wiedemann) (2).

19 **Discussion**

20 Morphologically similar to *D. kraussii* and *D. hageni*. Distinguished by pale
 21 colouration and having striae on metasomal tergum 2. *Diachasmimorpha*
 22 *longicaudata* is not considered native to the South Pacific region, but was introduced
 23 to Australia and elsewhere around the Pacific from Hawaii for the biological control
 24 of pest *Bactrocera* species during the 1950s. Multiple releases were made under a
 25 number of different varietal names, the biological status of which was, and is still,

1 unclear (O'Connor 1960, Wharton & Gilstrap 1983, Waterhouse 1993). There are a
 2 range of colour variants of *D. longicaudata* on several of the Pacific islands and since
 3 this species, and those related to it, have traditionally been separated only by colour
 4 and the presence or absence of striae on tergum 2, this creates a taxonomic problem.
 5 All of the variations have been listed here as *D. longicaudata*, however, further study
 6 is required to accurately differentiate these populations and determine their true
 7 biological status.

8 <<Insert Fig 5 near here>>

9

10 ***Diachasmimorpha tryoni* (Cameron, 1911)**

11 *Opius tryoni* Cameron, 1911: 343.

12 *Diachasma tryoni*: Silvestri, 1913: 116.

13 *Opius (Biosteres) tryoni*: Fischer, 1959: 29.

14 *Biosteres (Parasteres) acidusae* Fischer, 1967b: 3; syn. by Wharton & Marsh, 1978:
 15 157.

16 *Biosteres tryoni*: Fischer, 1971a: 31.

17 *Parasteres tryoni*: Fischer, 1978: 394.

18 *Diachasmimorpha tryoni*: Wharton, 1987: 62.

19 **Synopsis** (Fig. 6a-f)

20 Frons and vertex setose and punctate. Frons polished and weakly punctate, the
 21 punctures anterior to the ocellar field sparse and shallow; ocellar triangle arranged to
 22 form an obtuse triangle with a slight depression anterior to the median ocellus. Occipital
 23 carina weakly developed to almost absent; clypeus in profile slightly bulged medially;
 24 ventral margin of clypeus sinuate, ventral margin sufficiently convex to completely
 25 conceal labrum when mandibles closed. Notauli deep, unsculptured; propodeum

1 weakly rugose laterally, with a median longitudinal carina stemming from a weakly
 2 developed pentagonal areola, the base of which coincides with the posterior margin.
 3 Sternaulus broad, shallow, crenulate. Wings strongly infumate. Forewing r arising
 4 slightly basad midpoint of stigma, 2RS about equal in length to 3RSa, (RS+M)a
 5 weakly sinuate; (RS+M)b absent, m-cu arising distad 2RS. Hindwing RS absent; m-
 6 cu well developed and pigmented to wing margin. Petiole with dorsal lateral carinae
 7 strongly elevated over basal half, weaker posteriorly but reaching the posterior
 8 margin. Metasomal tergum 2 smooth and polished. Ovipositor sheath about equal in
 9 length to body including head. Ovipositor subapically sinuate. Head and mesosoma
 10 yellow/orange, petiole and tergum 2 black medially, pale to almost white laterally,
 11 remainder of metasoma black dorsally; fore and mid legs yellow/orange except tarsal
 12 segments 4-5 brown, hind leg basal half of coxa yellow orange, remainder of leg dark
 13 brown.

14 **Distribution:** *Australia* Collected along the eastern coast of Australia, from
 15 Mossman in the north to Sydney in the south.

16 **Type Locality:** Narara, Australia.

17 **Material examined:** ANIC: 20♂, 23♀, 1, sex undetermined; ASCU: 15♂, 3♀;
 18 QDPIF: 5♂, 11♀.

19 **Host Associations:** *B. dorsalis* (2), *B. halfordiae* (Tryon) (1), *B. passiflorae* (2), *B.*
 20 *tryoni* (1,2,3,7), *B. xanthodes* (2), and *C. capitata* (2,7).

21 Discussion

22 Morphologically similar to *D. hageni*, *D. kraussi* and *D. longicaudata* in having an
 23 apically sinuate ovipositor and notauli deep and unsculptured to midpit. Distinguished
 24 by dark metasomal colouration, metasomal tergum 2 smooth and polished and having
 25 a weakly developed occipital carina. *Diachasmimorpha tryoni* is native to eastern

1 Australia (Silvestri 1914, Wharton & Gilstrap 1983) and was released, but did not
 2 become established, in Fiji, French Polynesia and Western Australia (Waterhouse
 3 1993).

4 <<Insert Fig 6 near here>>

5 ***Fopius arisanus* (Sonan, 1932)**

6 *Opius arisanus* Sonan, 1932: 67-68.

7 *Opius oophilus* Fullaway, 1951: 248; syn. by Wharton & Gilstrap, 1983: 730.

8 *Diachasma arisanum*: Fischer, 1967a: 68; Fischer, 1988: 250.

9 *Biosteres arisanus*: Wharton & Gilstrap, 1983: 730.

10 *Fopius arisanus*: Waterhouse, 1993: 41.

11 **Synopsis** (Fig. 7a-f)

12 Frons and vertex densely setose and rugose-punctate. Occipital carina well developed;
 13 clypeus in profile not bulging medially, ventral margin almost completely concealing
 14 labrum when mandibles closed. Notauli deep and foveolate/crenulate to midpit;
 15 propodeum rugose, the sculpture largely without obvious pattern. Sternaulus rugose.
 16 Wings weakly infumate. Forewing r arising distad midpoint of stigma, 2RS longer
 17 than 3RSa, (RS+M)a weakly sinuate; (RS+M)b sinuate, m-cu arising basad or directly
 18 in line with 2RS. Hindwing RS virtually absent, m-cu well developed and at least
 19 weakly pigmented to wing margin. Petiole longitudinally striate, dorsal carinae
 20 elevated over basal half and reaching posterior margin. Metasomal tergum 2
 21 longitudinally striate. Ovipositor sheath equal to or greater than length of metasoma.
 22 Ovipositor narrowed apically, with distinct subapical constriction. Head almost
 23 entirely orange-brown, antennae dark; mesosoma varying from orange brown
 24 anteriorly, darker brown posteriorly to entirely brown (males often darker than
 25 females); metasoma dark brown to black. Legs pale yellow, except tarsi brown.

1 **Distribution:** *Australia* Collected along the eastern coast of Australia, from Cape
 2 Tribulation in the north to Sydney in the south, and Lord Howe Island. *Cook Islands*
 3 (NZ) Rarotonga. *Fiji* Collected from many sites on Viti Levu and Vanua Levu, also
 4 collected on Mana Island and the islands of the Lau and Yasawa groups. *Tonga*
 5 Havelotu and Tongatapu. *Western Samoa* Savoli and Upolu.

6 **Type Locality:** Funkiko, Arisan, 1400m, Formosa [Taiwan]

7 **Material examined:** ANIC: 86♂, 105♀, 18, sex undetermined; ASCU: 3♂, 4♀;
 8 QDPIF: 416♂, 711♀, 34, sex undetermined; SPC: 2♂, 3♀.

9 **Host Associations:** *B. aberrans* (Hardy) (1), *B. barringtoniae* (1,4), *B. cacuminata*
 10 (1,2,4), *B. distincta* (Malloch) (1), *B. dorsalis* (2,3,4), *B. endiandrae* (Perkins & May)
 11 (1), *B. facialis* (Coquillett) (1), *B. jarvisi* (1,4), *B. kirki* (Froggatt) (1), *B. kraussi* (1,4),
 12 *B. latifrons* (2,4), *B. manskii* (Perkins & May) (1), *B. melanotus* (Coquillett) (1), *B.*
 13 *neohumeralis* (1,4), *B. passiflorae* (1,2,4), *B. tryoni* (1), *B. xanthodes* (1), and *C.*
 14 *capitata* (2).

15 **Discussion**

16 Morphologically similar to *F. illusorius* in its dark colouration and sculpture of the
 17 notauli, however, it can be readily distinguished in having dense longitudinal
 18 striations on tergum 2. *Fopius arisanus* (as *Opius oophilus*) was introduced to
 19 Australia from Hawaii, for the control of *B. tryoni*, in 1956-57 and again in 1958-59,
 20 with the first liberation not thought to have established (Waterhouse 1993). *Fopius*
 21 *arisanus* has also been introduced to Fiji (1951 and 1954). Although there is no record
 22 of its introduction there, *F. arisanus* has been recovered on Cook Is (Waterhouse
 23 1993).

24 <<Insert Fig 7 near here>>

25 *Fopius deeraleensis* (Fullaway, 1950)

1 *Opius deeralensis* Fullaway, 1950: 65.

2 *Opius (Biosteres) deeralensis*: Fischer, 1963b: 230.

3 *Biosteres deeralensis*: Fischer, 1971a: 23.

4 *Biosteres (Chilotrichia) deeralensis*: Fischer, 1978: 386.

5 *Fopius deeralensis*: Waterhouse, 1993: 41.

6 **Synopsis** (Fig. 8a-f)

7 Frons and vertex densely setose; frons densely punctate, vertex more sparsely and
 8 weakly punctate. Frons with polished, weakly elevated projection extending from the
 9 median ocellus at least half the distance to torulus. Ocellar triangle arranged to form
 10 an obtuse triangle with a slight depression anterior to the median ocellus. Occipital
 11 carina well developed; clypeus with anterior margin very obtusely angulate, forming
 12 an indistinct median tooth. Notauli foveolate/crenulate to midpit; propodeum
 13 irregularly areolate with coarse rugose sculpture; median carina distinct on basal 0.3-
 14 0.4. Sternaulus broad, deep, crenulate. Wings infumate. Forewing r arising from or
 15 slightly distad midpoint of stigma, 2RS longer than 3RSa, (RS+M)a weakly sinuate;
 16 (RS+M)b varying from short to absent, m-cu arising basad or directly in line with
 17 2RS. Hindwing RS absent; m-cu well developed and pigmented to wing margin.
 18 Petiole longitudinally striate, dorsal lateral carinae strongly elevated over basal two-
 19 thirds, converging posteriorly and extending to posterior margin. Metasomal tergum 2
 20 sometimes smooth and laterally setose, frequently with weak longitudinal striae
 21 especially anteromedially. Ovipositor sheath equal to or longer than length of body
 22 including head. Whole body yellow/orange except hind tibiae and tarsi dark brown.
 23 **Distribution:** *Australia* Collected in north eastern Australia, from Stephen Island in
 24 the north to Brisbane in the south. *Papua New Guinea* New Britain (but see
 25 discussion).

1 **Type Locality:** Deeral, Australia

2 **Material examined:** ANIC: 17♂, 13♀, 3, sex undetermined; ASCU: 1♂, 1♀;

3 QDPIF: 30♂, 60♀.

4 **Host Associations:** *B. aglaiae* (Hardy) (1), *B. barringtoniae* (1,2), *B. endiandrae*
5 (1,2), *B. fagraea* (Tryon) (2), *B. frauenfeldi* (1,2,3), *B. jarvisi* (2), *B. kraussi* (2), *B.*
6 *laticaudus* (Hardy) (2), *B. musae* (Tryon) (2,3), *B. pallida* (1,2), and *B. tryoni* (1,2,3).

7 **Discussion**

8 Morphologically similar to *F. schlingeri* in colouration and notauli sculpture,
9 however, *F. deeralensis* has a distinctly angulate clypeus and frequently has weak
10 striae on metasomal tergum 2. *Fopius deeralensis* was recorded from Australia
11 (Queensland) and Papua New Guinea (New Britain Island) by Wharton & Gilstrap
12 (1983), however, this publication predates the description of *F. schlingeri* by Wharton
13 (1999). No PNG material examined by us fit the description of *F. deeralensis* and its
14 presence in that country must now be reassessed.

15 <<Insert Fig 8 near here>>

16 ***Fopius ferrari* Carmichael & Wharton, sp. n**

17 **(Fig. 9 a-f)**

18 **Etymology:** Named after Dr Paul Ferrar, recently retired as Crop Sciences II
19 Programme Manager at the Australian Centre for International Agricultural Research.
20 Paul's long-term support for regional fruit fly research lead directly to several projects
21 which helped generate the parasitoid collections upon which this paper is based.

22 **Synopsis** (Fig. 9a-f)

23 Frons and vertex densely covered with white, decumbent setae; densely but finely
24 punctate. Frons with polished, elevated projection extending from median ocellus
25 almost to torulus; ocellar triangle otherwise margined by an impressed line. Occipital

1 carina well developed, in lateral view extending dorsally nearly level with top of eye.
2 Clypeus smooth, polished, very sparsely covered with long, erect setae, ventral
3 margin obtusely angulate, forming a distinct median tooth; clypeus bulging along
4 midline in profile. Notauli deep and foveolate-crenulate to midpit; midpit extending
5 narrowly to posterior margin of scutum; propodeum exceptionally densely setose and
6 rugose, the sculpture largely without obvious pattern except for median carina on
7 basal 0.3; postpectral carina present. Sternaulus broad, crenulate/rugose throughout.
8 Wings hyaline to weakly infumate. Forewing r arising slightly distad midpoint of
9 stigma, 2RS longer than 3RSa, (RS+M)a weakly sinuate; (RS+M)b absent, m-cu
10 arising directly in line with 2RS. Hindwing RS absent; m-cu developed and
11 pigmented, but not reaching wing margin. Petiole weakly bicarinate longitudinally,
12 otherwise polished, setose and weakly striate. Metasomal tergum 2 smooth
13 (occasionally weakly striate) and densely setose; tergum 3 densely setose at least
14 laterally. Ovipositor sheath almost twice length of metasoma; ovipositor not narrowed
15 apically. Entire body dark brown to black. Fore and mid legs brown, hind legs dark
16 brown to black.

17 **Diagnosis:** This species is similar to the Philippines species *F. skinneri* (Fullaway) in
18 coloration, but differs from *F. skinneri* and darker specimens of *F. arisanus* by the
19 absence of striae on metasomal tergum 2. The pattern of metasomal color and
20 sculpture thus closely resembles that of *F. illusorius*. The clypeus, however, differs
21 from that of *F. illusorius* and is similar to that of *F. deeraleensis*. *Fopius deeraleensis* is
22 variable in T2 sculpture but is readily differentiated from the new species because of
23 its yellow to orange coloration.

24 **Distribution:** *Papua New Guinea* Collected from low altitude regions of the main
25 island of New Guinea.

1 **Types:**

2 **Holotype** ♀; 3 labels, Label 1: Morobe Province, Lae: Bundun Conf Centre,

3 1.vi.2000, Label 2: Bred from: *Persea americana* Lauraceae N1516, Label 3: In

4 association with [*Bactrocera*] *frauenfeldi* (QM).

5 **Paratypes;**

6 1♀ (ANIC): 3 labels, Label 1: PNG Morobe Province, Lae, Wampit village area,

7 16.ii.2000, Label 2: Bred from *Musa* ?, Musaceae, N 1263, Label 3: In association

8 with [*Bactrocera*] *musae*.

9 1♀ (ANIC): Label 1: PNG Morobe Province Lae, Bukawa Tikeling 2 forest 27.v.1999

10 Label 2: Bred from ? N557 Label 3: In association with [*Bactrocera*] *redunca*;

11 3♂(ANIC): 3 labels, Label 1: PNG Morobe Province, Lae, Wampit village area,

12 16.ii.2000, Label 2: Bred from *Musa* ?, Musaceae, N 1263, Label 3: In association

13 with [*Bactrocera*] *musae*. 2♀, 2♂ (QM): 3 labels, Label 1: PNG Morobe Province,

14 Lae: FRI forest botanical garden, 16.v.2000, Label 2: Bred from: ? N 1462, Label 3:

15 In association with [*Bactrocera*] *frauenfeldi* and [*Bactrocera*] *trivialis*. 3♀ (QM): 3

16 labels, Label 1: PNG Morobe Province, Lae, Gabensis Village, 6.iv.2000, Label 2:

17 Bred from: *Psidium guajava*, Myrtaceae, N1384, Label 3: In association with

18 [*Bactrocera*] *frauenfeldi*. 2♀, 1♂ (QM), 1♀ (ANIC): 3 labels, Label 1: PNG Morobe

19 Province, Lae, Omsis forest, 11.vii.2000, Label 2: Bred from: ?, N1562, Label 3 In

20 association with [*Bactrocera*] *vulagaris* [sic]. 1♀ (QM): 2 labels, Label 1: PNG

21 Central Province, Bereina Station, Joe Aisa residence, 17.v.1999, Label 2: Bred from

22 *Averrhoa carambola* Oxalidaceae, L 2552.

23 **Other Material examined:**

24 PAPUA NEW GUINEA: Madang Province, Baitabag, 16.viii.2000, ex *Neisosperma*

25 *oppositifolia*, M 220, 10 sex undetermined (specimens damaged); Morobe Province,

1 Lae: Bukawa, Tikeling 2 forest, 27.v.1999, in association with *Bactrocera redunca*, N
 2 557, 1; Morobe Province, Lae: Omsis forest, 1.vi.2000, in association with *Bactrocera*
 3 *trivialis?*, N 1513(A), 1♂; Morobe Province, Lae, Gabensis Village, 6.iv.2000, ex
 4 *Psidium guajava*, Myrtaceae, in association with [*Bactrocera*] *frauenfeldi* N1384, 1♂,
 5 1 sex undetermined (specimen damaged).

6 **Discussion**

7 Although this species appears at first glance to be just a somewhat darker, more
 8 densely setose variety of *F. illusorius*, the ovipositor and clypeus are sufficiently
 9 different to warrant description as a separate species. The tip of the ovipositor is not
 10 narrowed as it is in *F. illusorius* and *F. arisanus*.

11 <<Insert Fig 9 near here>>

12 ***Fopius illusorius* (Fischer, 1971) NEW COMBINATION**

13 *Biosteres illusorius* Fischer, 1971b: 487.

14 *Biosteres (Chilotrichia) illusorius*: Fischer, 1978: 386.

15 **Synopsis** (Fig. 10a-f)

16 Frons and vertex densely setose; frons rugose-punctate, vertex densely punctate.
 17 Ocellar triangle arranged to form an obtuse triangle with a slight depression anteriorly
 18 the median ocellus. Occipital carina well developed; clypeus in profile bulging very
 19 slightly dorsomedially, ventral margin slightly thickened medially, without distinct
 20 medial projection. Notauli deep, foveolate/crenulate to midpit; propodeum rugose, the
 21 sculpture largely without obvious pattern except for median carina on basal 0.3;
 22 postpectral carina present. Sternaulus deep, broad, crenulate. Wings infumate.
 23 Forewing r arising slightly distad midpoint of stigma, 2RS longer than 3RSa,
 24 (RS+M)a weakly sinuate; (RS+M)b usually present, m-cu arising distad or directly in
 25 line with 2RS. Hindwing RS virtually absent basally, represented only by a faint

1 crease near the wing margin; m-cu well developed and at least weakly pigmented to
 2 wing margin. Petiole longitudinally striate, dorsal lateral carinae elevated over basal
 3 half and extending to posterior margin. Metasomal tergum 2 usually smooth, polished,
 4 and setose; occasionally with a few weak striae antero-medially. Ovipositor sheath
 5 equal in length to mesosoma plus metasoma; ovipositor tip narrower apically, with
 6 weak subapical constriction. Head orange-brown; mesosoma orange brown, with
 7 propodeum and usually metathorax dark brown to black; metasoma dark brown to
 8 black. Fore and mid legs yellow, except mid coxa dark brown dorsally; hind legs dark
 9 brown to black with apical tarsomeres lighter brown. Females tend to be slightly
 10 darker than males.

11 **Distribution:** *Australia* Nambour. *Papua New Guinea* Collected from low altitude
 12 regions of the main island of New Guinea, the Gazelle Peninsular of East New Britain
 13 and Duke of York Island. *Solomon Islands* Visale/Guadalcanal and Ysabel.

14 **Type Locality:** Original reference: Waris, Hollandia, Papua New Guinea . [Hollandia
 15 is actually a province of Indonesia, now officially known as ‘Irian Jaya’ or ‘West
 16 Papua’].

17 **Material examined:** BPBM: 1♂; GU: 227♂, 504♀, 65, sex undetermined; QDPIF:
 18 3♂, 2♀; TAMU: 15♂, 20♀.

19 **Host Associations:** *B. frauenfeldi* (1) and *B. musae* (1).

20 **Discussion**

21 This species is here transferred to the genus *Fopius* Wharton on the basis of
 22 mandibular morphology, wing venation and sculpture of the mesosoma. Additionally
 23 it has the long ovipositor typical of most *Fopius* species. This species is distinct from
 24 nearly all *Biosteres* species due to the absence of a strong basal tooth or lobe, a feature
 25 characteristic of all other *Biosteres* species except *B. blandus* (Wharton, 1997). Unlike

1 the type species of *Chilotrichia*, the hindwing RS is absent basally and only
 2 represented by a faint crease near the apex of the wing. The propleuron has the
 3 strongly developed oblique ridge typical of *Fopius* and the postpectal carina is also
 4 well developed. As noted above, *F. illusorius* is similar in colouration to *F. arisanus*,
 5 but the second metasomal tergum is smooth or nearly so.

6 *Fopius illusorius* was previously known only from the original description (Fischer,
 7 1971b) based on two males. The previously undescribed female has an ovipositor that
 8 is morphologically similar to that of *F. arisanus* and thus *F. illusorius* may oviposit in
 9 the eggs of its host as does *F. arisanus*. The hosts of *F. illusorius* were previously
 10 unknown as the males from the type series were collected with a sweep net.

11 <<Insert Fig 10 near here>>

12 ***Fopius schlingeri* Wharton, 1999**

13 *Fopius schlingeri* Wharton, 1999: 58.

14 **Synopsis** (Fig. 11a-f)

15 Frons and vertex densely setose; frons densely punctate, vertex more sparsely and
 16 weakly punctate. Frons with polished, weakly elevated projection extending from
 17 median ocellus at least half the distance to torulus. Ocellar triangle arranged to form
 18 an obtuse triangle with a slight depression anterior to the median ocellus. Occipital
 19 carina well developed; clypeus with rounded ventral margin. Notauli
 20 foveolate/crenulate to midpit; propodeum densely rugose, the sculpture without
 21 obvious pattern except for median carina basally. Sternaulus broad, deep, crenulate.
 22 Wings weakly infumate. Forewing r arising slightly distad midpoint of stigma, 2RS
 23 slightly longer than 3RSa, (RS+M)a sinuate; (RS+M)b present, m-cu arising basad
 24 2RS. Hindwing RS virtually absent, represented only by a faint crease near wing
 25 margin; m-cu well developed and pigmented to wing margin. Petiole longitudinally,

1 somewhat irregularly striate, dorsal lateral carinae well developed over basal two-
2 thirds, weaker posteriorly. Metasomal tergum 2 smooth and setose laterally.
3 Ovipositor sheath equal to or longer than length of body including head. Ovipositor
4 tip strongly narrowed subapically. Whole body yellow/orange except hind tarsi dark
5 brown.

6 **Distribution:** *Australia* Collected along the eastern coast of Australia, from Cape
7 Tribulation in the north, to Sydney in the south. *Papua New Guinea* Collected from
8 low altitude regions of the main island of New Guinea and the Gazelle Peninsula of
9 East New Britain.

10 **Type Locality:** Mt Glorious, Australia.

11 **Material examined:** ANIC: 6♂, 10♀; ASCU: 2♀; GU: 20♂, 65♀; QDPIF: 13♂,
12 34♀.

13 **Host Associations:** *B. frauenfeldi* (1), *B. halfordiae* (1,5), *B. kraussi* (1), *B. musae*
14 (1), *B. neohumeralis* (1,5), *B. penefurva* (1), *B. peninsularis* (Drew & Hardy) (5), *B.*
15 *rufofuscula* (Drew & Hancock) (5), *B. tinomiscii* Drew (1), *B. tryoni* (5), and *B.*
16 *(Bulladacus) sp.* (1).

17 **Discussion**

18 Morphologically similar to *F. deerlensis* in colouration and in sculpture of the frons,
19 vertex, and notauli. However, *F. schlingeri* has a rounded clypeus, without a distinct
20 medial projection. Originally described as occurring along the eastern coast of
21 Australia (Wharton, 1999), the native range is now extended to include Papua New
22 Guinea.

23 <<Insert Fig 11 near here>>

24

25 *Fopius cf. vandenboschi*

1 **Synopsis** (Fig. 12a-f)

2 Frons and vertex densely setose and punctate. Frons with polished, weakly depressed,
3 laterally carinate projection extending from median ocellus at least half the distance to
4 torulus; frons otherwise weakly punctate, the punctures anteriorad ocellar field dense,
5 with spacing between punctures slightly less than diameter of punctures; ocellar
6 triangle margined by an impressed line. Occipital carina well developed. Clypeus in
7 profile bulging dorsomedially; ventral margin of clypeus slightly thickened medially,
8 and sufficiently convex to completely conceal labrum when mandibles closed. Notauli
9 deep and foveolate/crenulate to midpit; propodeum rugose, the sculpture largely
10 without obvious pattern. Sternaulus broad, deep, crenulate/rugose throughout. Wings
11 weakly infumate. Forewing r arising slightly distad midpoint of stigma, second
12 submarginal cell short, 2RS slightly longer than 3RSa, (RS+M)a sinuate; (RS+M)b
13 short to absent, m-cu arising basad or directly in line with 2RS. Hind wing RS
14 virtually absent; m-cu well developed and at least weakly pigmented to wing margin.
15 Petiole longitudinally striate, dorsal lateral carina weakly developed to posterior
16 margin. Metasomal tergum 2 striate. Ovipositor sheath about equal in length to body
17 including head. Apex of ovipositor parallel sided with very weak dorsal node. Head
18 and mesosoma yellow/orange, metasoma yellow orange with terga 2+3 and often 4
19 black, sternites pale yellow/brown to almost white; petiole varying from orange to
20 dark brown.

21 **Distribution:** *Papua New Guinea* Kerevat.

22 **Material examined:** GU: 10♂, 25♀; TAMU: 1♀.

23 **Host Associations:** *B. frauenfeldi* (1).

24 **Discussion**

1 *Fopius vandenboschi* (Fullaway) appears to consist of a number of colour morphs and
 2 potentially cryptic species in the Indo-Pacific region. This colour form is potentially
 3 distinct from the true *F. vandenboschi*, having developed in isolation on the island of
 4 New Britain. Slight differences in clypeal morphology and punctuation of the vertex
 5 and frons provide support for considering this distinctive colour morph as a separate
 6 species, but further studies are needed. The second metasomal tergum is more
 7 extensively striate than shown in Fig. 12f both in typical *F. vandenboschi* and in the
 8 New Britain material.

9 <<Insert Fig 12 near here>>

10

11 ***Opius froggatti* (Fullaway, 1950)**

12 *Opius froggatti* Fullaway, 1950: 67.

13 *Opius (Opius) froggatti*: Fischer, 1963b: 203.

14 *Opius (Utetes) froggatti*: Fischer, 1987: 186.

15 *Opius froggatti*: Wharton, 1997: 29.

16 **Synopsis** (Fig. 13a-c)

17 Frons and vertex polished and sparsely setose. Ocelli arranged in an equilateral
 18 triangle margined by a depression. Occipital carina well developed. Clypeus in profile
 19 bulging dorsomedially; labrum visible in frontal view; gap between mandible and
 20 ventral margin of clypeus large and distinct. Notauli beginning as deep grooves,
 21 converging and becoming shallower posteriorly, meeting in a deep circular midpit.
 22 Propodeum reasonably smooth, usually with a complete medial longitudinal carina.
 23 Sternaulus shallow, minutely crenulate throughout. Wings weakly infumate. Forewing
 24 r arising slightly basad midpoint of stigma, 2RS notably shorter than 3RSa, (RS+M)a
 25 weakly sinuate; (RS+M)b absent, m-cu arising distinctly distad 2RS. Hind wing RS

1 and m-cu absent. Petiole with dorsal lateral carinae elevated, diverging posteriorly,
2 but extending to posterior margin. Metasomal tergum 2 smooth and polished.
3 Ovipositor sheath about two-thirds length of metasoma. Whole body yellow orange in
4 colouration.

5 **Distribution:** *Australia* Deeral.

6 **Type Locality:** Deeral, Australia

7 **Material examined:** ASCU: 1♂, 1♀, 2, sex undetermined.

8 **Host Associations:** *B. kraussi* (2), *B. laticaudus* (2), and *B. psidii* (2,3).

9 **Discussion**

10 *Opius froggatti* is morphologically similar to species in the genus *Utetes* (venation,
11 readily visible labrum, distinct median pit on mesoscutum), but can be easily
12 distinguished by the absence of a basal carina on the hind tibia. *Opius froggatti* is
13 similar to *Utetes perkinsi* in having weakly developed notauli, but in addition to the
14 presence of a tibial carina, the latter has a dark head.

15 <<Insert Fig 13 near here>>

16

17 ***Psyttalia fijiensis* (Fullaway, 1936)**

18 *Opius fijiensis* Fullaway, 1936: 179.

19 *Austroopius fijiensis*: Fischer, 1963a: 177.

20 *Psyttalia (Austroopius) fijiensis*: Wharton 1987: 64.

21 *Psyttalia fijiensis*: Waterhouse, 1993: 42.

22 **Synopsis**

23 See *P. novaguineensis*

1 **Distribution:** *Australia* Collected in north eastern Australia, from Yam Island in the
 2 north, south to Brisbane; *Fiji* Suva and surrounding area, Viti Levu. *Solomon Islands*
 3 Bougainville Island. *Tonga* Tongatapu and ‘Eua Islands.

4 **Type Locality:** Noainee, Fiji Islands

5 **Material examined:** ANIC: 24♂, 20♀, 5, sex undetermined; ASCU: 4♂, 7♀;
 6 QDPIF: 77♂, 81♀.

7 **Host Associations:** *B. aglaiae* (1), *B. bancrofti* (Tryon) (1), *B. barringtoniae* (2), *B.*
 8 *curvipennis* (2), *B. endiandrae* (1), *B. facialis* (1), *B. fagraea* (2), *B. frauenfeldi* (2,3),
 9 *B. jarvisi* (1,2), *B. kirki* (1), *B. kraussi* (1,2), *B. laticaudus* (2), *B. musae* (2,3), *B.*
 10 *pallida* (1,2), *B. passiflorae* (1,2,3), *B. psidii* (2), *B. tryoni* (1,2,3), *B. visenda* (Hardy)
 11 (1), and *B. xanthodes* (1,2,3).

12 **Discussion**

13 According to Fischer (1963a), *P. fijiensis* should be readily separated from *P.*
 14 *novaguineensis* on the basis of a broad, infuscated stripe running medially across the
 15 forewing. However, in almost all specimens examined from Australia (including
 16 some of those previously determined as *P. fijiensis* by Fischer) this stripe was not
 17 readily apparent. In the specimens examined, the forewing pattern varied from
 18 distinctly infumate on the basal half to completely hyaline. The variation appeared to
 19 be continuous rather than representing two or more discrete patterns. In the absence
 20 of this distinctive wing pattern, we were unable to separate *P. fijiensis* from *P.*
 21 *novaguineensis*. The distribution and host records listed above are based solely on
 22 museum specimens of *P. fijiensis* previously determined as that species. All
 23 previously undetermined material is listed below under *P. novaguineensis* for reasons
 24 discussed under that species.

25

1 ***Psyttalia muesebecki* (Fischer, 1963)**

2 *Austroopius muesebecki* Fischer, 1963a: 182.

3 *Psyttalia muesebecki*: Wharton 1987: 63.

4 **Synopsis**

5 Frons and vertex polished and sparsely setose. Clypeus in profile slightly bulged
6 medially; labrum visible in frontal view; gap between mandible and ventral margin of
7 clypeus distinct. Notauli deep at anterior margin, ending before level of tegula and
8 absent posteriorly. Midpit absent; propodeum smooth with median longitudinal carina
9 absent. Sternaulus impressed, short, with just a trace of sculpture. Wing with second
10 submarginal and discal cells infumate. Forewing 2RS shorter than 3RSa; (RS+M)b
11 absent, 2RS in line with m-cu; 2RS thickened medially, junction of 2RS and m-cu
12 thickened. Hindwing RS and m-cu absent. Petiole with dorsal lateral carinae elevated
13 on basal 0.3, diverging and less well developed posteriorly. Metasomal tergum 2
14 smooth and polished. Ovipositor sheath longer than metasoma. Entire body
15 yellow/orange in colouration.

16 **Distribution.** *New Caledonia*. Noumea.

17 **Type Locality:** Noumea, New Caledonia.

18 **Material examined.** None.

19 **Host Associations:** *Bactrocera psidii* (7).

20 **Discussion**

21 *Psyttalia muesebecki* can be readily distinguished from other species of *Psyttalia* by
22 the absence of a propodeal carina. No material was examined in this study.

23

24 ***Psyttalia novaguineensis* (Szépligeti, 1900)**

25 *Austroopius novaguineensis* Szépligeti 1900: 64.

1 *Austroopius novoguineensis*: Fischer 1963a: 184.

2 *Psytalia novaguineensis*: Wharton 1987: 63.

3 **Synopsis** (Fig. 14a-f)

4 Frons and vertex polished and sparsely setose. Posterior ocelli margined laterally with
 5 deep anteriorly diverging grooves. Occipital carina well developed; clypeus in profile
 6 slightly bulged medially; labrum visible in frontal view; gap between mandible and
 7 ventral margin of clypeus distinct. Notauli deep at anterior margin, ending before
 8 level of tegula and absent posteriorly. Midpit absent; propodeum smooth with a
 9 median longitudinal carina. Sternaulus shallow, finely crenulate. Wing colouration
 10 variable (see discussion). Forewing r arising slightly basad midpoint of stigma, 2RS
 11 shorter than 3RSa; (RS+M)b absent, 2RS in line with m-cu; 2RS thickened medially,
 12 junction of 2RS and m-cu thickened. Hindwing RS and m-cu absent. Petiole with
 13 dorsal lateral carinae elevated, diverging posteriorly, but extending to posterior
 14 margin. Metasomal tergum 2 smooth and polished. Ovipositor sheath 1.5 times longer
 15 than metasoma. Entire body yellow/orange in colouration.

16 **Distribution.** *Australia*. Far north eastern Queensland. *Papua New Guinea*.

17 Collected from low altitude regions of the main island of New Guinea, the Gazelle
 18 Peninsular of East New Britain and Duke of York Island.

19 **Type Locality:** Freidrich-Wilhelmshafen (now Madang), Papua New Guinea.

20 **Material examined.** GU: 38♂, 57♀, 3, sex undetermined; QDPIF: 25♂, 75♀.

21 **Host Associations:** *B. aglaiae* (1), *B. barringtoniae* (1), *B. calophylli* (Perkins &
 22 May) (1), *B. endiandrae* (1), *B. fagraea* (1), *B. frauenfeldi* (1), *B. kraussi* (1), *B.*
 23 *musae* (1), *B. neohumeralis* (1), *B. penefurva* (1), *B. tinomiscii* (1), *B. visenda* (1), *B.*
 24 *(Bulladacus) sp.* (1), and *B. (Gymnodacus) sp.* (1).

25 **Discussion**

1 *Psyttalia novaguineensis* is defined by Fischer (1963a) as having a uniformly hyaline
2 or yellowish wing. The wing of *P. fijiensis*, in contrast, was described by the same
3 author as having a broad infuscated band across the middle of the forewing. An
4 indistinct band matching this description was visible in only a very few previously
5 determined specimens of that species. However, several of the undetermined
6 specimens examined by us have infuscate mottling all across the basal half of the
7 wing. The infuscation appears to be more distinct in the males but there is also
8 variation across females. The colour pattern is different from the broad median band
9 described for *P. fijiensis*. A careful examination of material from northeastern
10 Queensland, including both reared and unreared material, indicates that at least five
11 species of *Psyttalia* occur in this area, four of which have an “*Austroopius*” wing vein
12 pattern (sensu Fischer 1963a: with a medially thickened 2RS). The most obvious
13 difference among these species is in the length of the ovipositor. The reared material
14 falls into three general categories: 1) ovipositor sheath about as long as mesosoma; 2)
15 ovipositor sheath nearly twice as long as mesosoma; and 3) ovipositor sheath more
16 than twice length of mesosoma. Previously undetermined material in which the
17 ovipositor sheath is nearly twice as long as the mesosoma is tentatively placed under
18 the name *P. novaguineensis*, since they most closely fit the redescription by Fischer
19 (1963a). Note, however, that Szépligeti (1900) originally described the ovipositor of
20 this species as very short. Further study is required in order to correctly place these
21 specimens.

22 <<Insert Fig 14 near here>>

23

24 *Utetes cf. albimanus*

25 **Synopsis** (Fig. 15)

1 Frons and vertex densely setose; and densely but finely punctate. Frons with median
 2 pit adjacent anterior ocellus, posterior ocelli margined laterally with weak, anteriorly
 3 diverging grooves. Occipital carina well developed. Clypeus in profile weakly
 4 protruding, overhanging base of labrum; clypeus in frontal view large and
 5 hemispherical, ventral margin thin, truncate to weakly convex; labrum visible in
 6 frontal view; gap between mandible and ventral margin of clypeus distinct but not
 7 large. Antennae 41 segmented. Notauli deep from anterior margin to level of tegula
 8 and absent or nearly so posteriorly. Midpit long, narrow, deep. Propodeum rugose
 9 throughout. Sternaulus broad, deep, crenulate throughout. Wings infumate. Forewing
 10 r arising from midpoint of stigma, 2RS slightly shorter than 3RSa, (RS+M)a weakly
 11 sinuate; (RS+M)b absent, m-cu entering second submarginal cell. Hind wing RS and
 12 m-cu absent. Basal carina on posterior side of hind tibia well developed (Fig.17).
 13 Petiole with dorsal lateral carinae strongly elevated over basal half, much weaker
 14 posteriorly, but extending to posterior margin. Metasomal tergum 2 smooth and
 15 polished. Head and mesosoma dark brown to black; metasoma dorsally black. Coxae
 16 and trochanters brown to dark brown, fore femur and tibia yellow brown, mid and
 17 hind femur and tibia brown to dark brown, tarsi 1-4 white, 5th tarsus brown.

18 **Distribution:** *Papua New Guinea*. Lae.

19 **Material examined:** GU: 1♂.

20 **Label data:** Papua New Guinea: Morobe Province, Lae, Omsis Forest 16.ii.2000 ex
 21 *Gnetum gnemon* fruit containing *Bactrocera (Bulladacus) sp. n.* 1♂;

22 **Discussion**

23 Information based on a single male. The tibial carina and small, but distinct, gap
 24 between clypeus and mandibles clearly place this species in the genus *Utetes* Foerster
 25 as delimited by Wharton (1997). The holotype of *Utetes albimanus* (Szépligeti), in the

1 Hungarian Natural History Museum was examined by R.A.W. and appears to be
2 identical, but some slight uncertainty must remain because the holotype is damaged
3 and some features therefore cannot be compared. The second submarginal cell is
4 somewhat shorter than in many species of *Utetes*, but the general pattern of wing
5 venation is otherwise typical of *Utetes*.

6 <<Insert Fig 15 near here>>

7

8 ***Utetes perkinsi* (Fullaway, 1950)**

9 *Opius perkinsi* Fullaway 1950: 66.

10 *Opius (Opius) perkinsi*: Fischer 1963b: 210.

11 *Opius (Utetes) perkinsi*: Fischer 1987: 223.

12 *Utetes perkinsi*: Wharton 1997: 30.

13 **Synopsis** (Fig. 16a-d)

14 Frons and vertex polished and very sparsely setose and punctate. Frons with median
15 pit adjacent anterior ocellus, posterior ocelli margined laterally with weak, anteriorly
16 diverging grooves. Occipital carina well developed. Clypeus in profile weakly
17 protruding, overhanging base of labrum; clypeus in frontal view large and
18 hemispherical, ventral margin thin, truncate to weakly convex; labrum visible in
19 frontal view; gap between mandible and ventral margin of clypeus distinct but not
20 large. Notauli deep from anterior margin to level of tegula, continuing very weakly
21 posteriorly. Midpit long, narrow, deep; propodeum weakly rugulose to rugose, usually
22 with irregular transverse carina. Sternaulus broad, deep, weakly crenulate throughout.
23 Wings infumate. Forewing r arising basad midpoint of stigma, 2RS notably shorter
24 than 3RSa, (RS+M)a sinuate; (RS+M)b absent, m-cu entering second submarginal
25 cell. Hind wing RS and m-cu absent. Basal carina on the posterior side of the hind

1 tibia well developed (Fig. 17). Petiole with dorsal lateral carinae strongly elevated
2 over basal two-thirds, much weaker posteriorly, but extending to posterior margin.
3 Metasomal tergum 2 smooth and polished. Head dark red-brown to black; mesosoma
4 yellow-orange; apical metasomal terga black. Fore and mid legs yellow orange,
5 except tarsi 5 brown to dark brown. Hind coxa and trochanter brown, femur, tibiae
6 and tarsi dark brown.

7 **Distribution:** *Australia* Far north eastern Queensland.

8 **Type Locality:** Deeral, Australia

9 **Material examined:** ASCU: 1♂, 2♀; QDPIF: 1♂, 5♀.

10 **Host Associations:** *B. cacuminata* (2), *B. jarvisi* (2), *B. kraussi* (1,2), *B. laticaudus*
11 (2), *B. neohumeralis* (1), and *B. tryoni* (2,3).

12 **Discussion**

13 *Utetes perkinsi* is similar to *U. cf. albimanus* in having a basal carina on the posterior
14 side of the hind tibia. These species can be separated from each other on the basis of
15 colouration and notauli development.

16 <<Insert Fig 16 near here>>

17 <<Insert Fig 17 near here>>

18

19 **Species released in the region for biological control but not recovered**

20 *Diachasmimorpha fullawayi* Silvestri

21 This species can be readily distinguished from other species of *Diachasmimorpha* in
22 the presence of two small teeth along the midline at the apex of the clypeus.

23 Additionally, the first flagellomere is slightly shorter than the second, the notauli are
24 often weakly sculptured basally, the forewing 1cu-a is not widely separated from 1M
25 and the lateral margin between the notaulus and tegula is more distinctly carinate.

1 African species in the genus *Diachasmimorpha*, such as *D. fullawayi*, lack the
2 subapical sinuation of the ovipositor found in the species native to the South Pacific
3 Region. Small numbers of *D. fullawayi* were released in Australia (New South
4 Wales) in 1932-33 from Hawaii, but did not establish (Waterhouse 1993).

5

6 ***Fopius vandenboschi* Fullaway**

7 *Fopius vandenboschi* can be readily distinguished from other species of *Fopius* in
8 having metasomal tergum 2 longitudinally striate and setose, and petiole dark brown,
9 remainder of abdomen yellow orange. See also *F. cf. vandenboschi* discussion. This
10 species was released in Australia in 1958-59 to control *B. tryoni*, but failed to
11 establish (Waterhouse 1993). Some specimens examined in this study are likely to be
12 from this release as the label data gives the dates of collection between August 1958
13 and February 1959. There have been no recorded collections of *F. vandenboschi* in
14 the region since 1959.

15

16 ***Psytalia concolor* Szépligeti and *Psytalia humilis* Silvestri**

17 These species, which are virtually identical to one another, can be readily
18 distinguished from the species of *Psytalia* native to the South Pacific region by the
19 relatively short forewing r (2RS about twice length to r) in combination with
20 (RS+M)b present and more distinctly thickened basally than apically. *Psytalia*
21 *humilis* was introduced to Cook Islands (1927 from Hawaii), Australia (1932 & 1933
22 from Hawaii), and Fiji (1935 from Hawaii). *Psytalia concolor* was introduced to
23 New Caledonia (1966 from France). None of these introductions was successful
24 (Waterhouse 1993).

25

1 ***Psytalia incisi* Silvestri**

2 This species can be readily distinguished from other species of *Psytalia* in having
3 (RS+M)b long and somewhat uniformly thickened throughout its length and forewing
4 vein 2RS about twice as long as r. *Psytalia incisi* was introduced to Fiji (1951 and
5 1954 from Hawaii) and Australia (1958-1959 from Hawaii) but establishment was not
6 successful.

7

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1

2

1 **Figure 1.** Opiine wing venation and terminology (following Sharkey & Wharton
 2 1997). *Forewing*: **m-cu** = cross vein between the media and cubitus veins, also known
 3 as the recurrent vein; **r** = small cross vein which connects RS and the stigma; **RS** =
 4 first branch of the radial vein; **(RS+M)** = RS and M (media) fuse to form a composite
 5 vein, RS+M and when the anterior end of m-cu is basad 2RS, RS+M is subdivided in
 6 to (RS+M)a and (RS+M)b; **2RS** = the second branch of the radial vein; **3RSa** = the
 7 third branch of the radial vein; **S** = Stigma. *Hindwing*: **RS** = Radial Sector; **m-cu** =
 8 cross vein between the media and cubitus veins, also known as the postnervellus.

9

10 **Figure 2.** Opiine body morphology and terminology (following Sharkey & Wharton
 11 1997).

12

13 **Figure 3.** *Diachasmimorpha hageni*. **a**, head, anterior view; **b**, head, lateral view; **c**,
 14 mesosoma, lateral view; **d**, mesonotum, dorsal view; **e**, propodeum, dorsal view; **f**,
 15 metasoma, dorsal view.

16

17 **Figure 4.** *Diachasmimorpha kraussii*. **a**, head, anterior view; **b**, head, lateral view; **c**,
 18 mesosoma, lateral view; **d**, mesonotum, dorsal view; **e**, propodeum, dorsal view; **f**,
 19 metasoma, dorsal view.

20

21 **Figure 5.** *Diachasmimorpha longicaudata*. **a**, head, anterior view; **b**, head, lateral
 22 view; **c**, mesosoma, lateral view; **d**, mesonotum, dorsal view; **e**, propodeum, dorsal
 23 view; **f**, metasoma, dorsal view.

24

1 **Figure 6.** *Diachasmimorpha tryoni*. **a**, head, anterior view; **b**, head, lateral view; **c**,
2 mesosoma, lateral view; **d**, mesonotum, dorsal view; **e**, propodeum, dorsal view; **f**,
3 metasoma, dorsal view.

4

5 **Figure 7.** *Fopius arisanus*. **a**, head, anterior view; **b**, head, lateral view; **c**, mesosoma,
6 lateral view; **d**, mesonotum, dorsal view; **e**, propodeum, dorsal view; **f**, metasoma,
7 dorsal view.

8

9 **Figure 8.** *Fopius deeraleensis*. **a**, head, anterior view; **b**, head, lateral view; **c**,
10 mesosoma, lateral view; **d**, mesonotum, dorsal view; **e**, propodeum, dorsal view; **f**,
11 metasoma, dorsal view.

12

13 **Figure 9.** *Fopius illusorius*. **a**, head, anterior view; **b**, head, lateral view; **c**,
14 mesosoma, lateral view; **d**, mesonotum, dorsal view; **e**, propodeum, dorsal view; **f**,
15 metasoma, dorsal view.

16

17 **Figure 10.** *Fopius schlingeri*. **a**, head, anterior view; **b**, head, lateral view; **c**,
18 mesosoma, lateral view; **d**, mesonotum, dorsal view; **e**, propodeum, dorsal view; **f**,
19 metasoma, dorsal view.

20

21 **Figure 11.** *Fopius ferrari* Carmichael & Wharton, new species. **a**, head, anterior
22 view; **b**, head, lateral view; **c**, mesosoma, lateral view; **d**, mesonotum, dorsal view; **e**,
23 propodeum, dorsal view; **f**, metasoma, dorsal view.

24

1 **Figure 12.** *Fopius cf. vandenboschi*. **a**, head, anterior view; **b**, head, lateral view; **c**,
2 mesosoma, lateral view; **d**, mesonotum, dorsal view; **e**, propodeum, dorsal view; **f**,
3 metasoma, dorsal view.

4

5 **Figure 13.** *Opius froggatti*. **a**, head, anterior view; **b**, mesonotum, dorsal view; **c**,
6 wing.

7

8 **Figure 14.** *Psytalia novaguineensis*. **a**, head, anterior view; **b**, head, lateral view; **c**,
9 mesosoma, lateral view; **d**, mesonotum, dorsal view; **e**, propodeum, dorsal view; **f**,
10 metasoma, dorsal view.

11

12 **Figure 15.** *Utetes cf. albimanus*. habitus.

13

14 **Figure 16.** *Utetes perkinsi*. **a**, head, anterior view; **b**, head, lateral view; **c**, mesosoma,
15 lateral view; **d**, mesonotum, dorsal view.

16

17 **Figure 17.** Hind femur and tibia showing tibial carina (arrow) typical of *Utetes*.

18

1 **Table 1.**

2 For each host association record, the source of the record is given in the table using
3 the following code: 1 (label data); 2 (Wharton & Gilstrap, 1983); 3 (Waterhouse,
4 1993); 4 (Quimio & Walter, 2001); 5 (Wharton, 1999); 6 (Fullaway, 1952); 7
5 (Fischer, 1963a).

6

7



Figure 1.

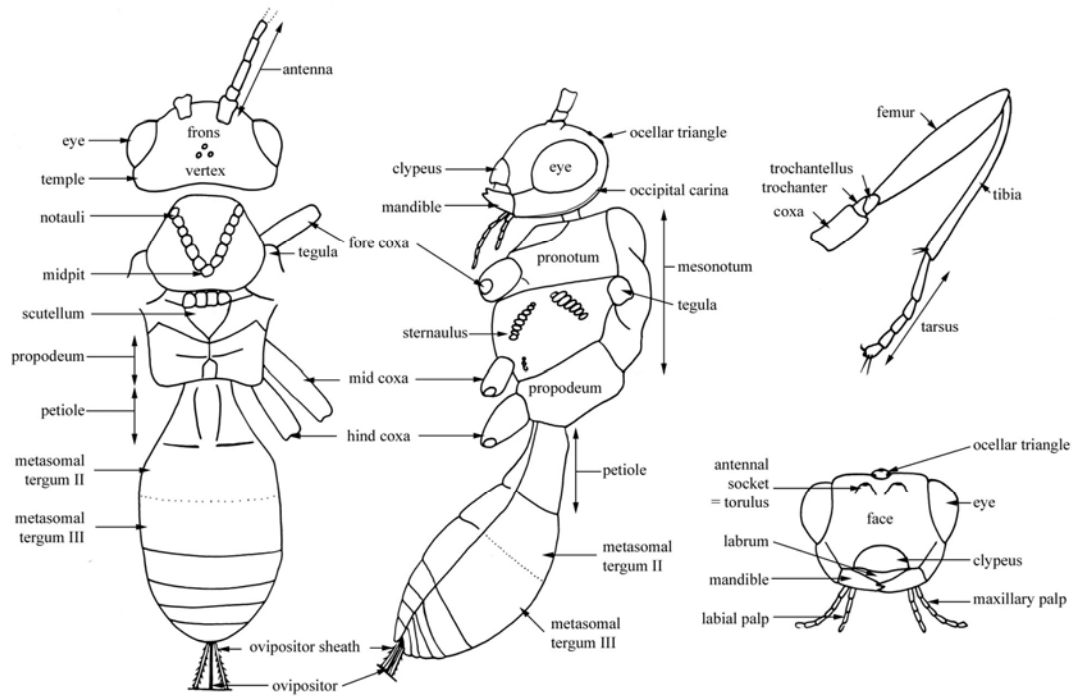


Figure 2.



Figure 3. *Diachasmimorpha hageni*. **a**, Head, anterior view; **b**, Head, lateral view; **c**, Mesosoma, lateral view; **d**, Mesonotum, dorsal view; **e**, Propodeum, dorsal view; **f**, Metasoma, dorsal view.

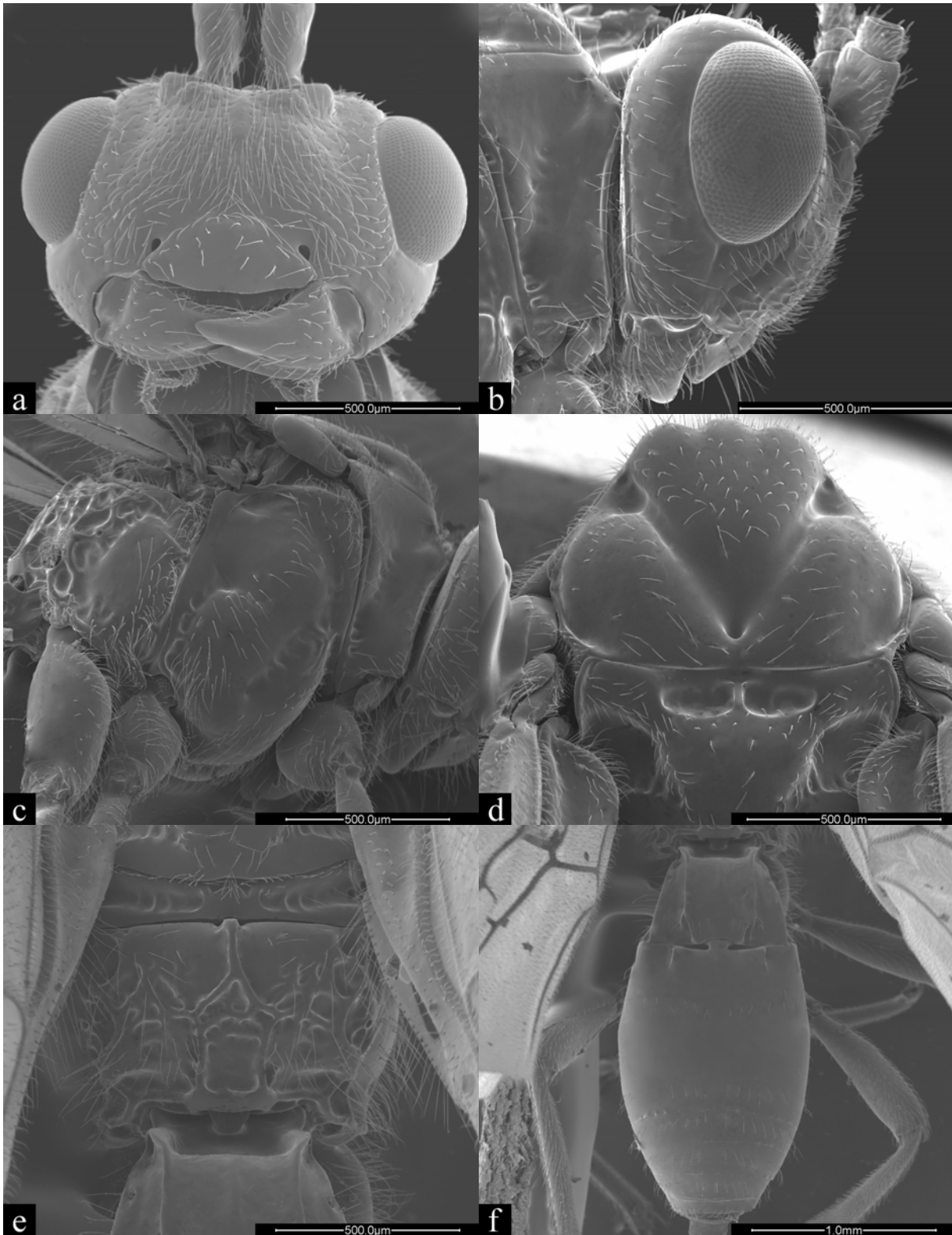


Figure 4. *Diachasmimorpha kraussii*. **a**, Head, anterior view; **b**, Head, lateral view; **c**, Mesosoma, lateral view; **d**, Mesonotum, dorsal view; **e**, Propodeum, dorsal view; **f**, Metasoma, dorsal view.

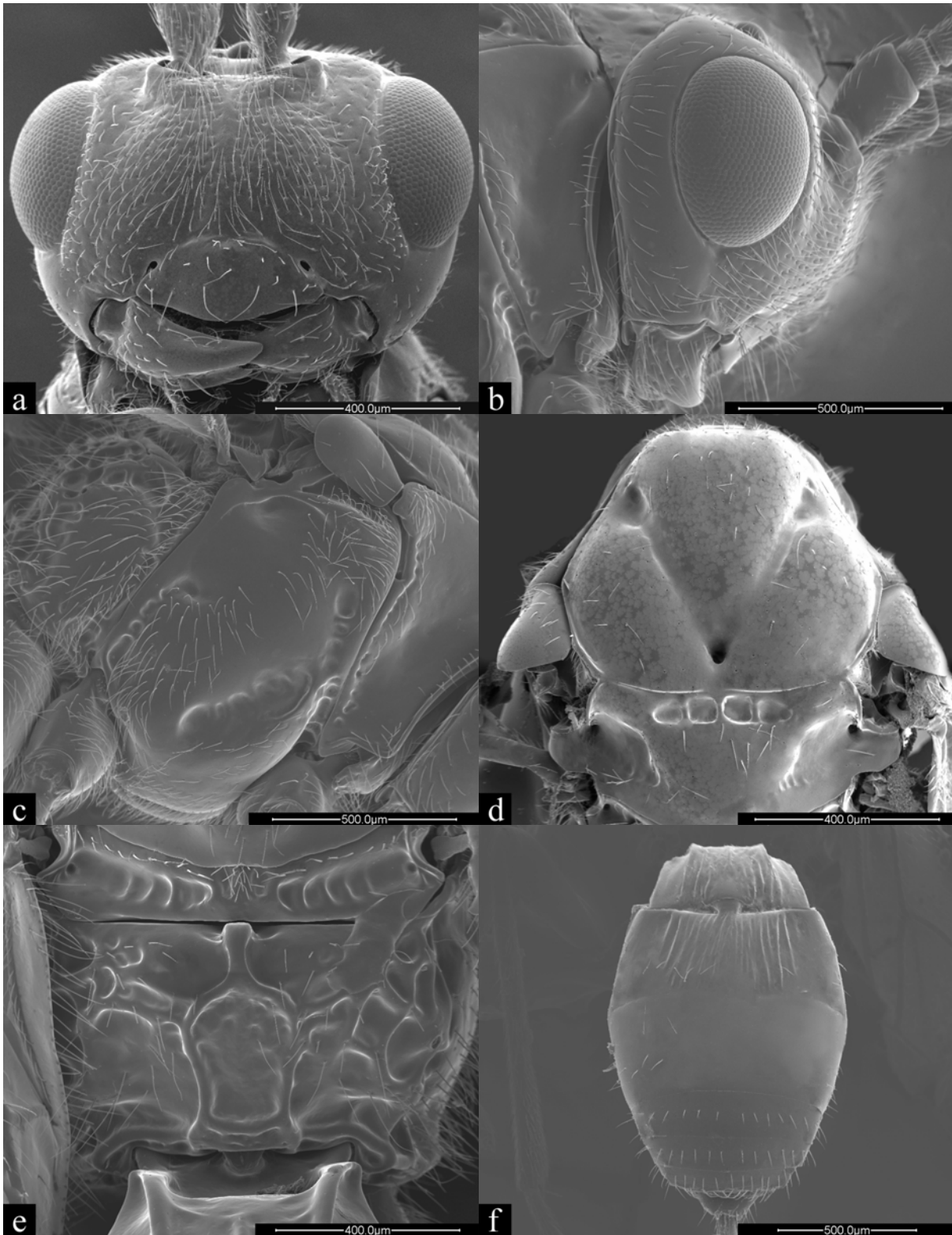


Figure 5. *Diachasmimorpha longicaudata*. **a**, Head, anterior view; **b**, Head, lateral view; **c**, Mesosoma, lateral view; **d**, Mesonotum, dorsal view; **e**, Propodeum, dorsal view; **f**, Metasoma, dorsal view.

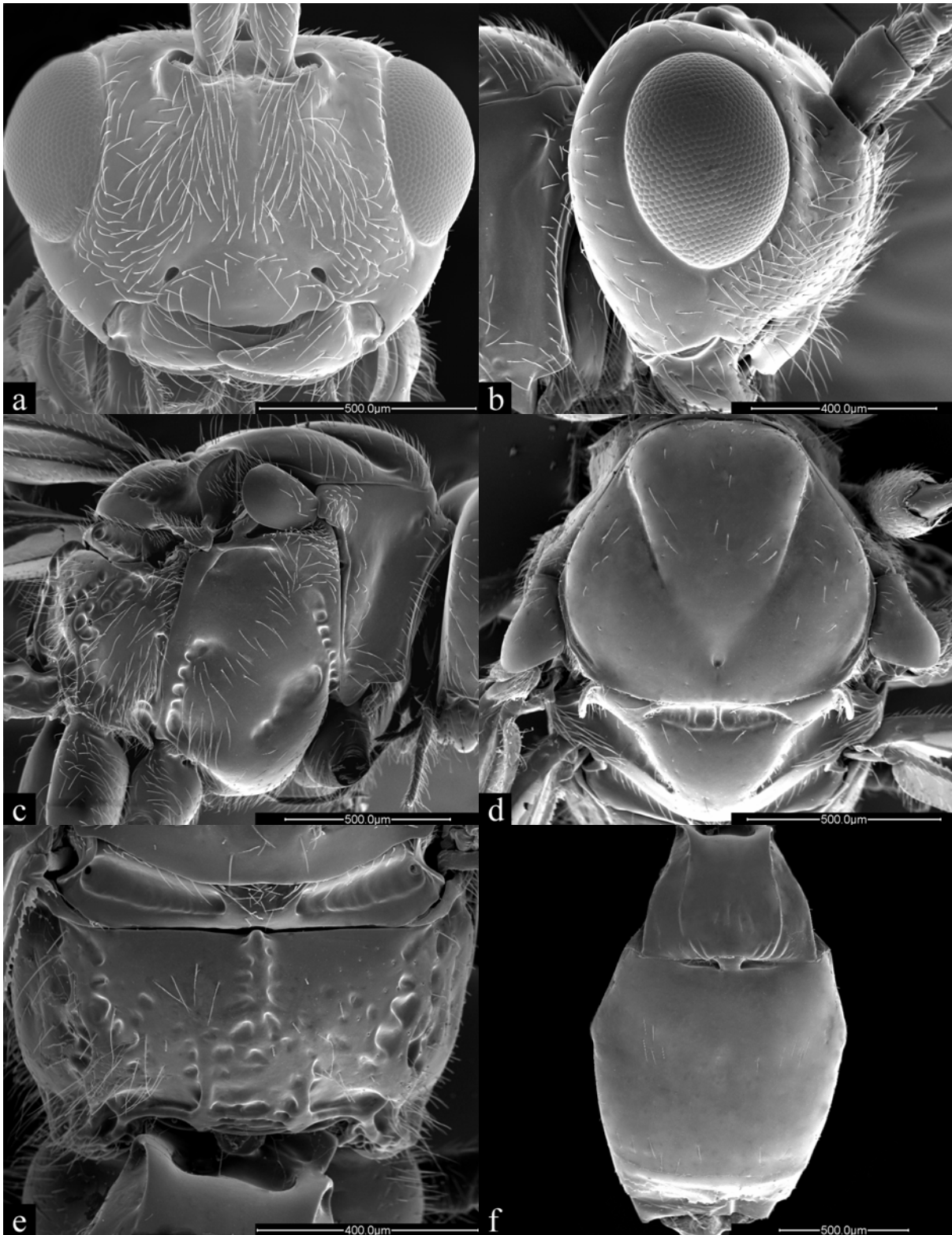


Figure 6. *Diachasmimorpha tryoni*. **a**, Head, anterior view; **b**, Head, lateral view; **c**, Mesosoma, lateral view; **d**, Mesonotum, dorsal view; **e**, Propodeum, dorsal view; **f**, Metasoma, dorsal view.

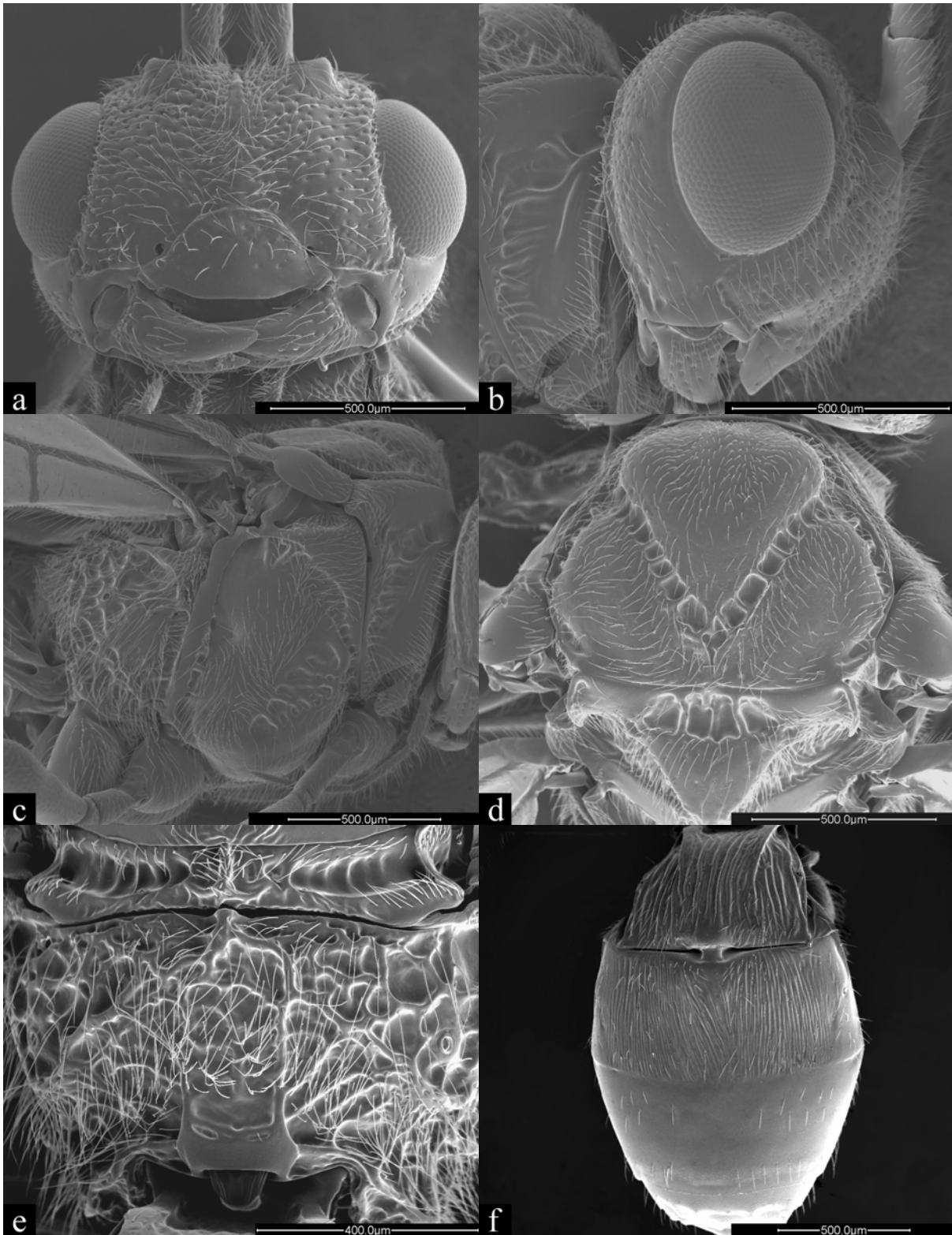


Figure 7. *Fopius arisanus*. **a**, Head, anterior view; **b**, Head, lateral view; **c**, Mesosoma, lateral view; **d**, Mesonotum, dorsal view; **e**, Propodeum, dorsal view; **f**, Metasoma, dorsal view.

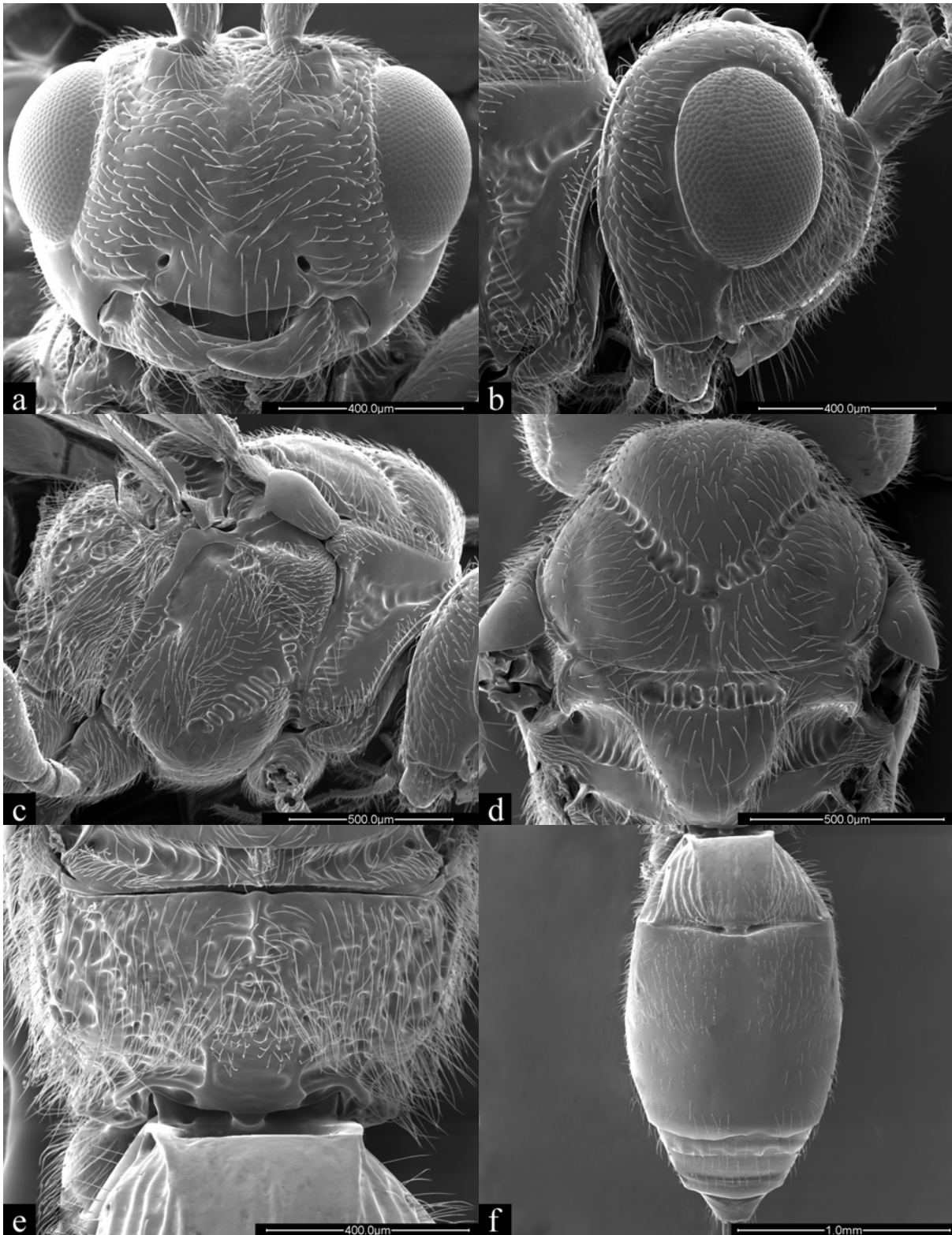


Figure 8. *Fopius deeralensis*. **a**, Head, anterior view; **b**, Head, lateral view; **c**, Mesosoma, lateral view; **d**, Mesonotum, dorsal view; **e**, Propodeum, dorsal view; **f**, Metasoma, dorsal view.

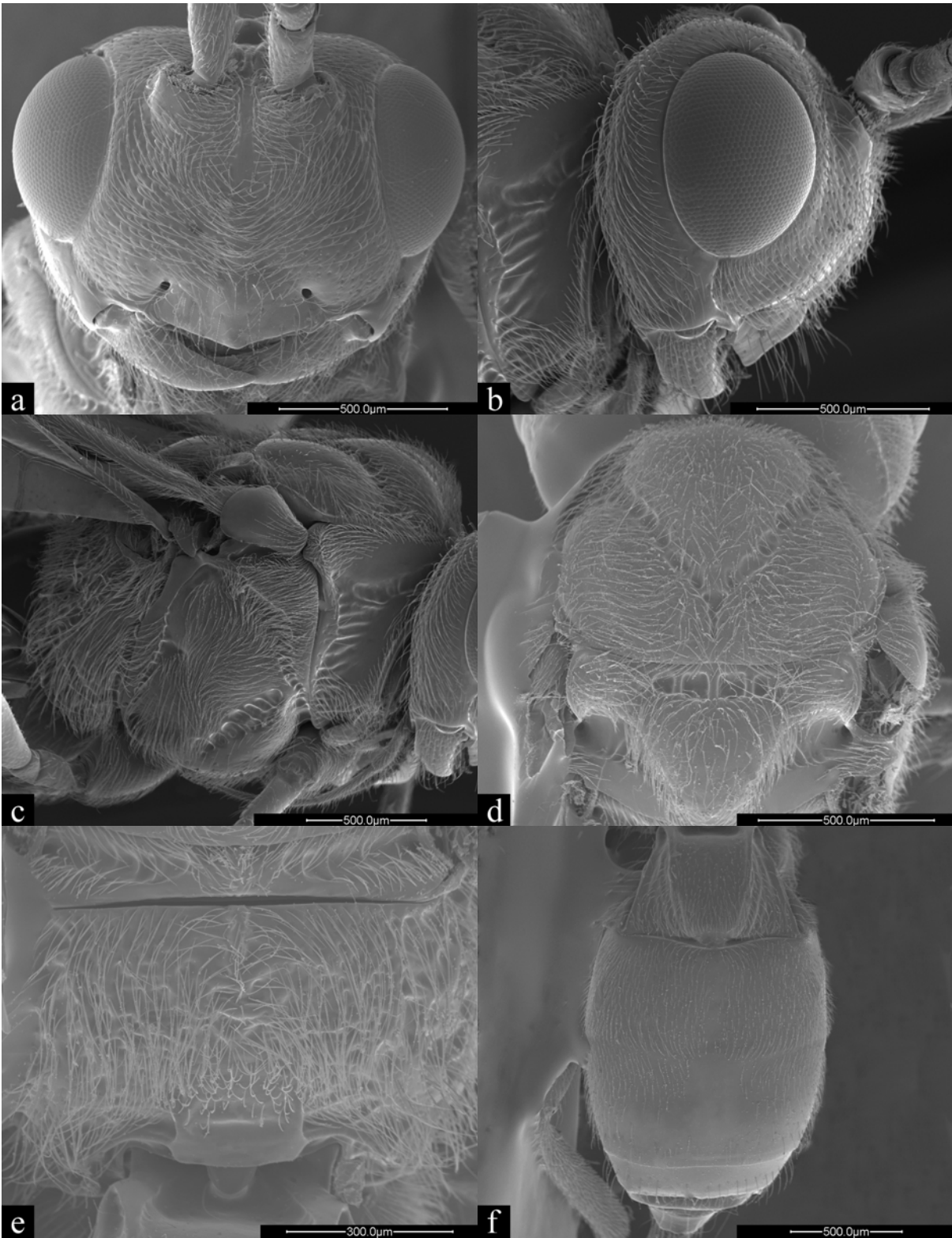


Figure 9. *Fopius ferrari* Carmichael & Wharton, new species. **a**, Head, anterior view; **b**, Head, lateral view; **c**, Mesosoma, lateral view; **d**, Mesonotum, dorsal view; **e**, Propodeum, dorsal view; **f**, Metasoma, dorsal view.

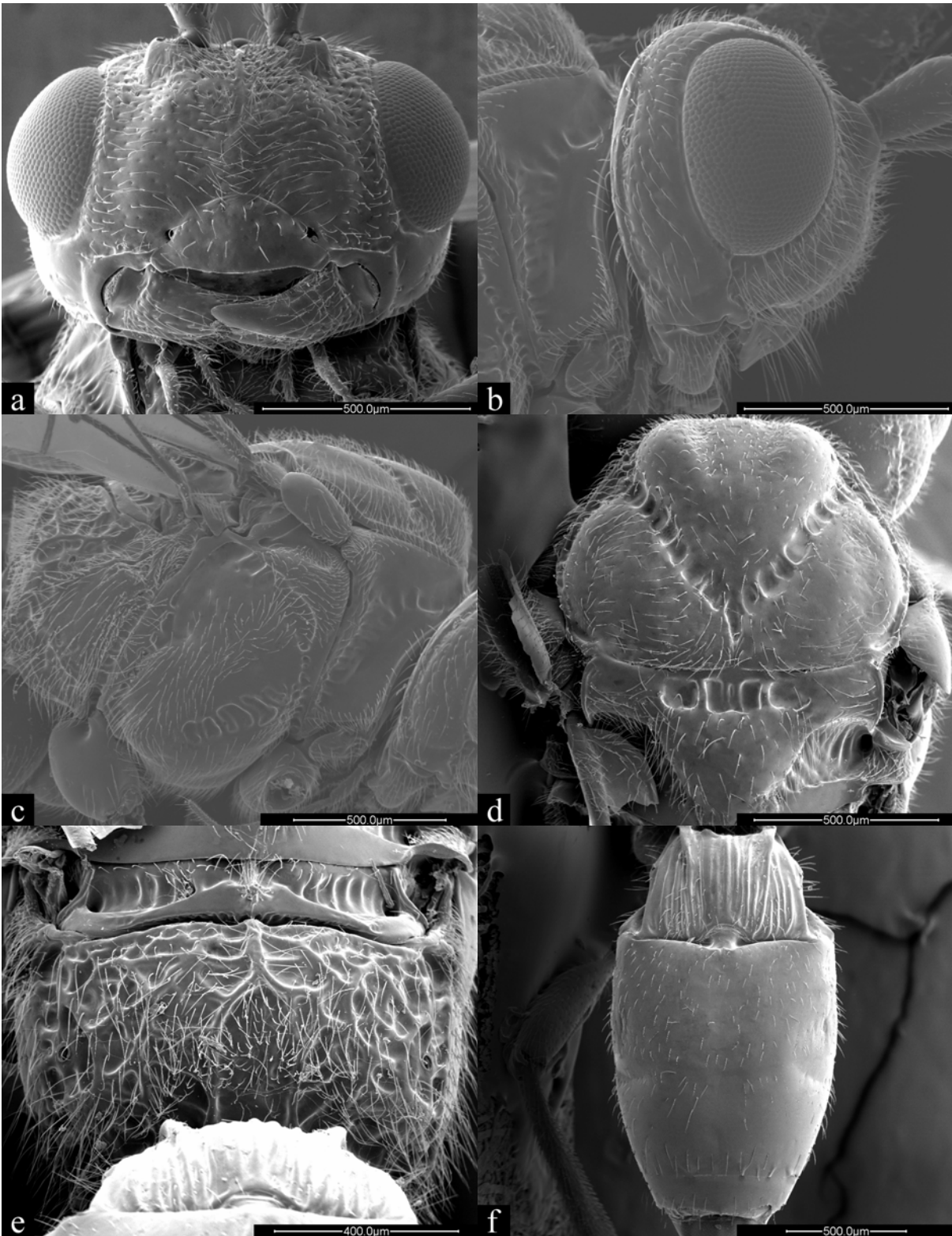


Figure 10. *Fopius illusorius*. **a**, Head, anterior view; **b**, Head, lateral view; **c**, Mesosoma, lateral view; **d**, Mesonotum, dorsal view; **e**, Propodeum, dorsal view; **f**, Metasoma, dorsal view.

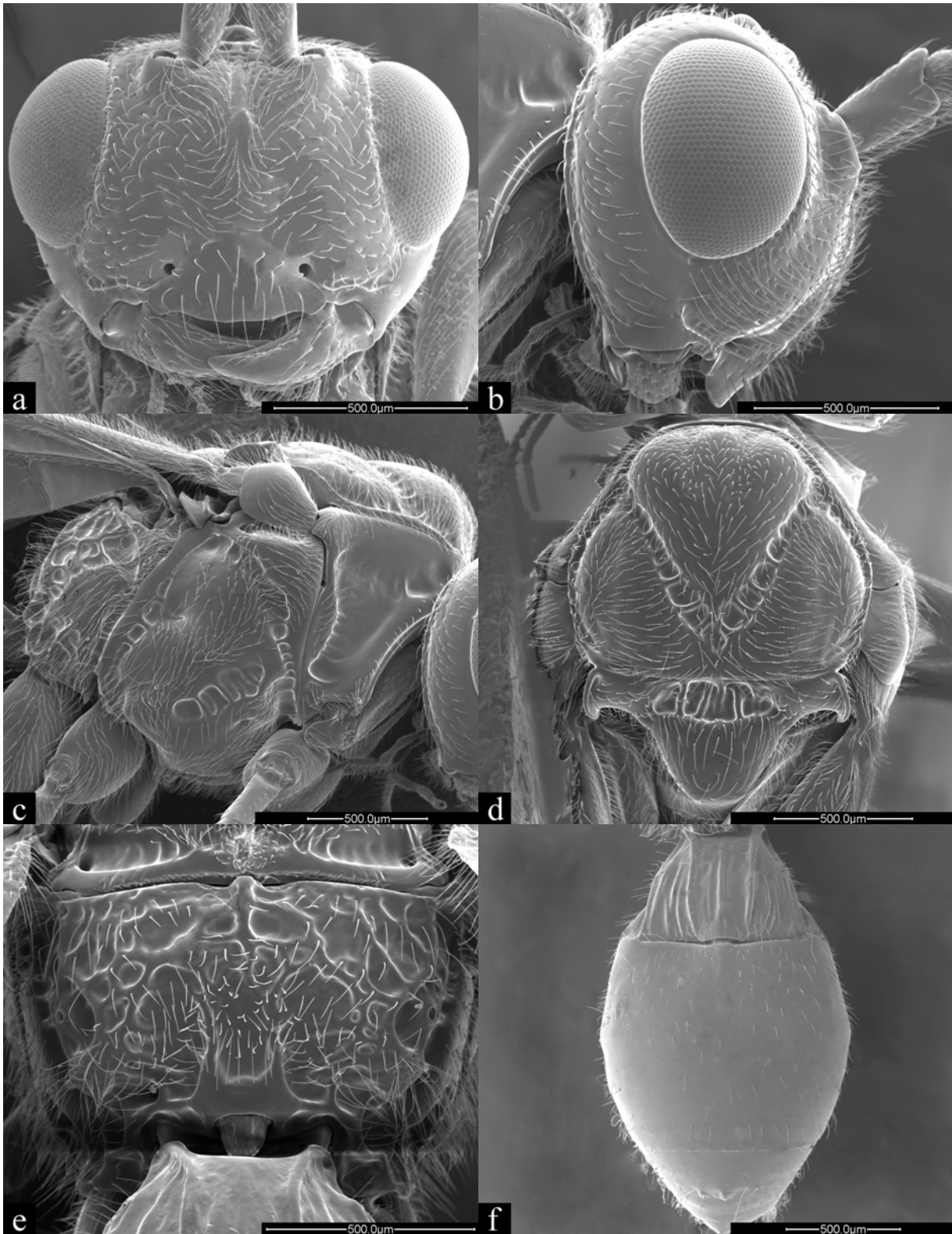


Figure 11. *Fopius schlingeri*. **a**, Head, anterior view; **b**, Head, lateral view; **c**, Mesosoma, lateral view; **d**, Mesonotum, dorsal view; **e**, Propodeum, dorsal view; **f**, Metasoma, dorsal view.

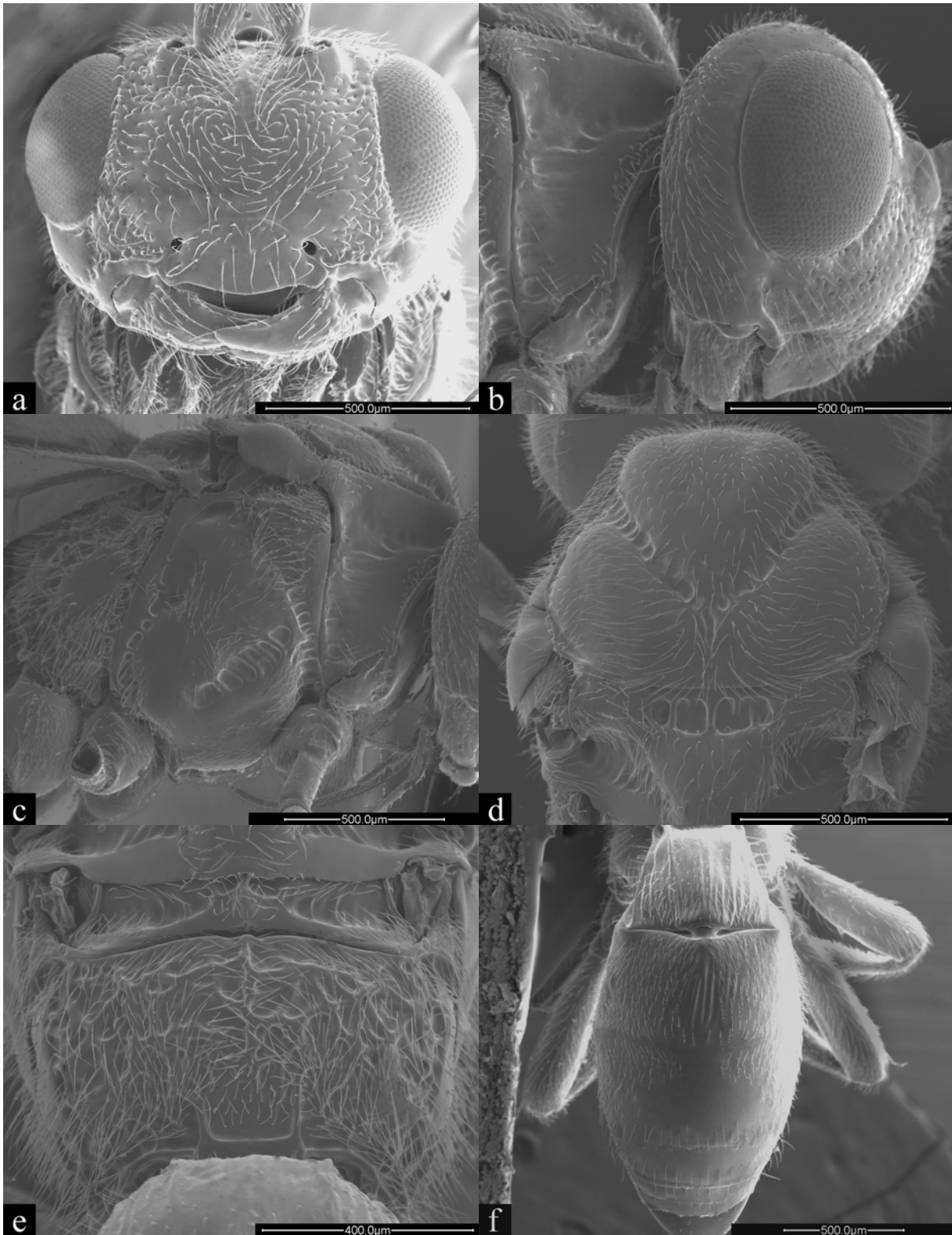
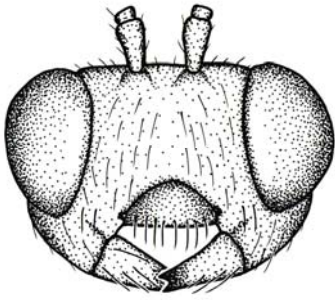
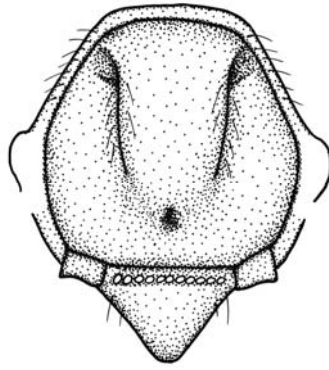


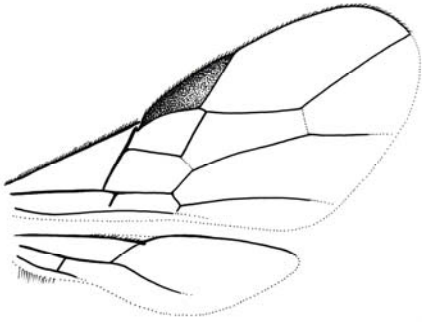
Figure 12. *Fopius cf. vandenboschi*. **a**, Head, anterior view; **b**, Head, lateral view; **c**, Mesosoma, lateral view; **d**, Mesonotum, dorsal view; **e**, Propodeum, dorsal view; **f**, Metasoma, dorsal view.



a



b



c

Figure 13. *Opius froggatti*.

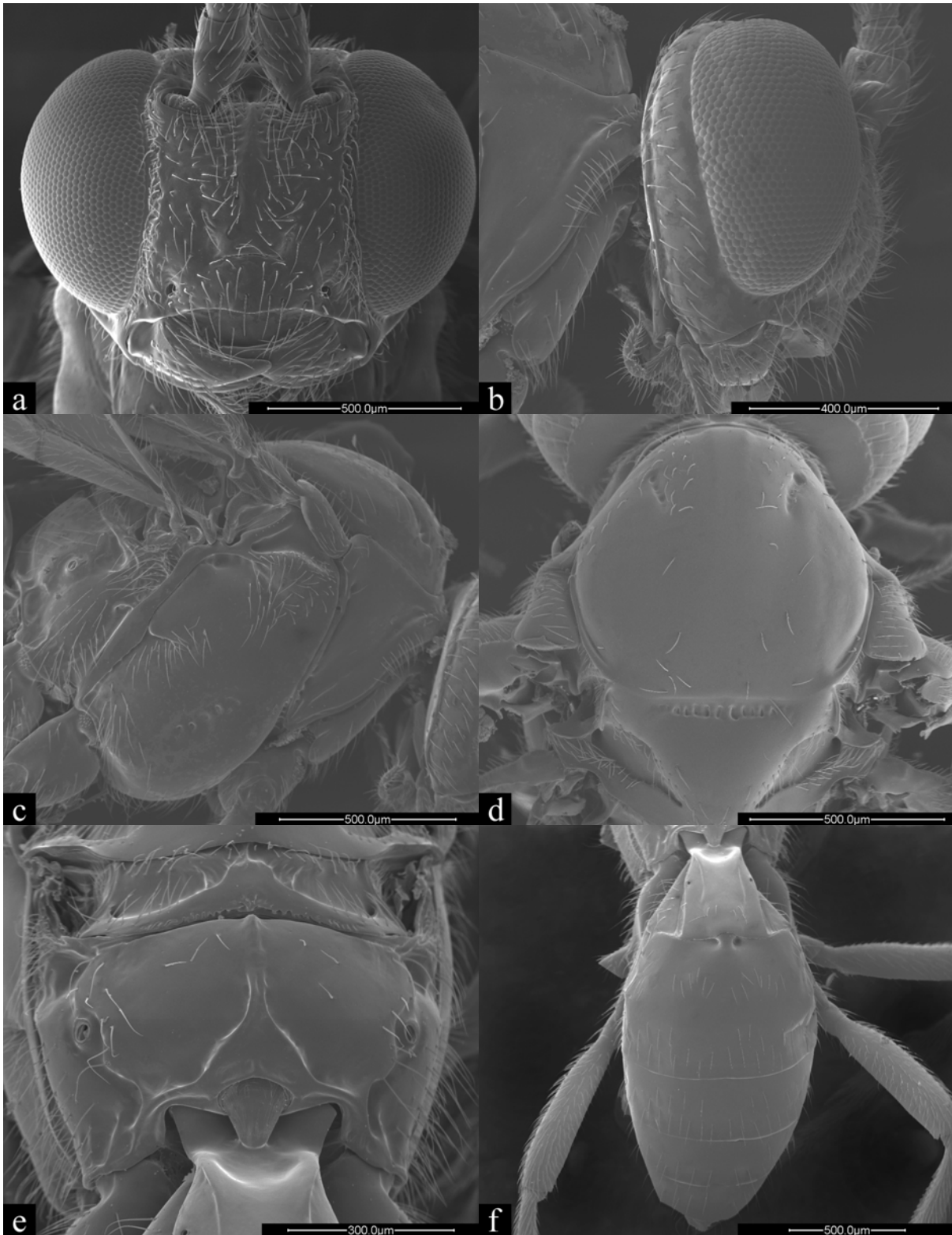


Figure 14. *Psyttalia novaguineensis*. **a**, Head, anterior view; **b**, Head, lateral view; **c**, Mesosoma, lateral view; **d**, Mesonotum, dorsal view; **e**, Propodeum, dorsal view; **f**, Metasoma, dorsal view.

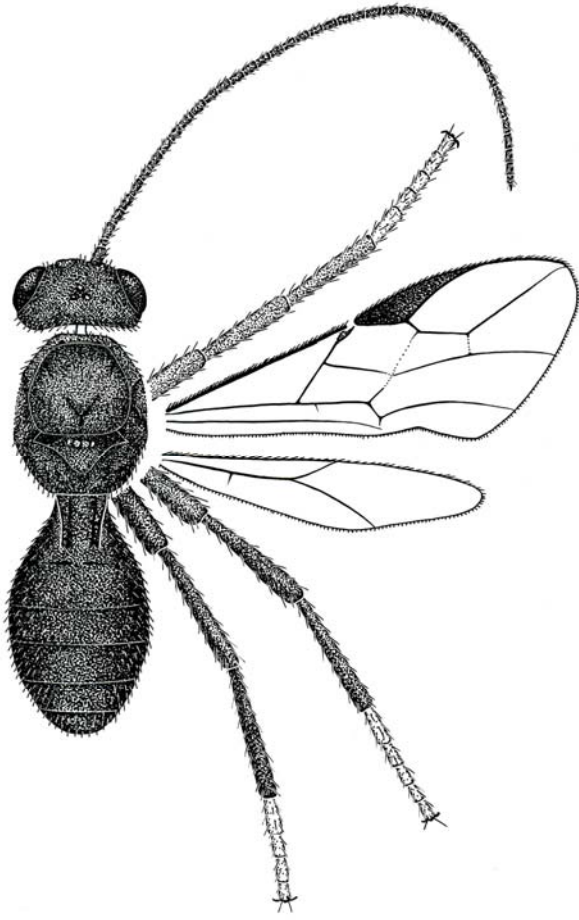


Figure 15. *Utetes cf. albimanus*.

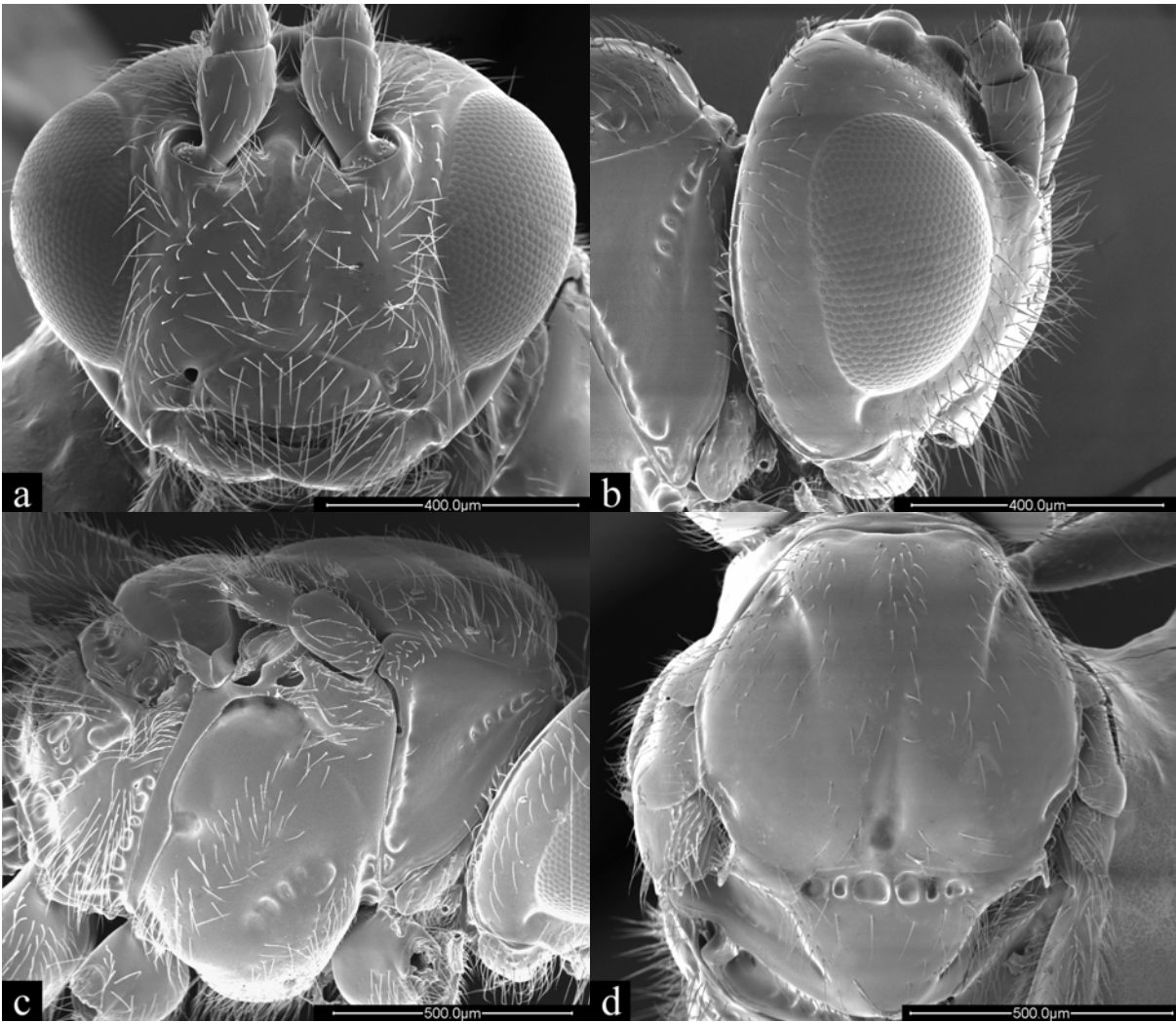


Figure 16. *Utetes perkinsi*. **a**, Head, anterior view; **b**, Head, lateral view; **c**, Mesosoma, lateral view; **d**, Mesonotum, dorsal view.

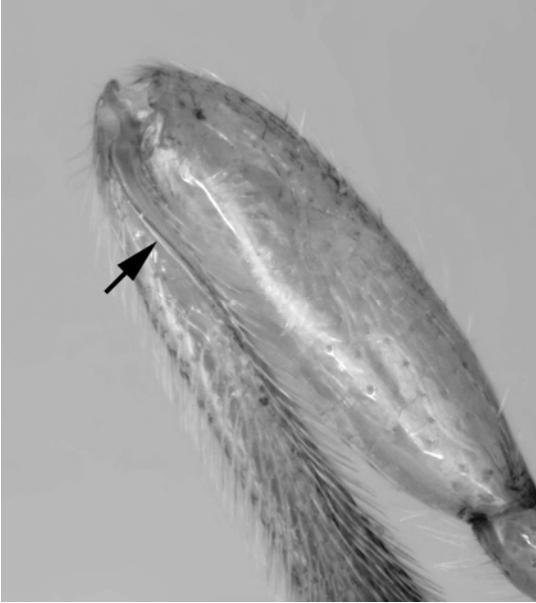


Figure 17. Hind tibial carina typical of *Utetes*.