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Honduranura centraliamericana gen. n. et sp. n. from Central America (Collembola, Neanuridae, Neanurinae)

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Abstract

Honduranura **gen. n.** and the type species *H. centraliamericana* **sp. n.** are described and illustrated. The new genus shows the characters of Sensillanurini Cassagnau, 1983 tribe and is distinguished by the fusion of cephalic and abdominal tubercles: clypeal with antennofrontal and dorsointernal with dorsoexternal on head; presence of fused tubercles on each side of abdominal segment V. Most of the tubercles bear strong subcuticular reticulation. A key for the genera of the tribe Sensillanurini is provided.

Keywords

Honduras, Costa Rica, morphology, Sensillanurini, taxonomy

Introduction

To date, the tribe Sensillanurini contains only four genera: *Americanura* Cassagnau, 1983, with a wide distribution in North America, México, Central America, and the north of South America; *Palmanura* Cassagnau, 1983, with a Neotropical distribution from Central México to north of South America; *Sensillanura* Deharveng, 1981, with Holarctic and Nearctic distribution and *Tabasconura*, Palacios-Vargas & Catalán, 2015, endemic of Mexico. The tribe Sensillanurini has a high diversity of species in the Neotropical Region (46 out of 49 named species), and is characterized by hypertrophy of the sensillum S7 on antennal segment IV (Deharveng 1981; Palacios-Vargas et al. 2009), development of cuticular tubercles and reduction of the chaetotaxy. The new genus seems to be wide distributed in Central America (from Honduras to Costa Rica). It is distinguished by the fusion of some tubercles and the elongation of the dorsolateral and lateral ones on tergites.

Materials and methods

Samples of leaf litter were collected at Camayagua, Honduras and processed by Berlese-Tullgren funnels. Specimens of Neanuridae were kept in 75 % alcohol and sent to the author. Members of the new genus were cleared and mounted in Hoyer's solution under slides. Observations and measurements were made using a Carl Zeiss Axiostar Plus phase contrast microscope with an adapted drawing tube. Dorsal chaetotaxy follows Deharveng and Weiner (1984) modified by Palacios-Vargas and Catalán (2010) and ventral chaetotaxy follows Smolis (2008) and Smolis and Deharveng (2006).

Abbreviations

Abd	abdominal segment	**M**	macrosetae
Af	cephalic antenno-frontal tubercle	**me**	mesosetae
asl	above sea level	**mi**	microseta
Ant	antennal segment	**m'**	ventral microsensillum of Ant III
Cl	clypeal tubercle	**Oc**	ocular tubercle
Cx	coxa	**Ocm**	ocular median seta
Di	dorso-internal tubercle	**Ocp**	ocular posterior seta
De	dorso-external tubercle	**or**	subapical organ of Ant. IV
DL	dorso-lateral tubercle	**S**	cylindrical sensillum on Ant IV
Fe	femur	**Scx2**	subcoxa 2
Fu	furcal vestige	**sgd**	dorsal guard sensillum
L	lateral tubercle	**sgv**	ventral guard sensillum
L'	ordinary lateral seta on Abd. V	**So**	sub-ocular tubercle

ss	sensorial setae on body	**Vel**	ventroexternolateral
T	tibiotarsus	**Vec**	ventroexternocentral
Th.	thoracic segment	**Vei**	ventroexternointernal
Tr	trochanter	**Vi**	ventrointernal
VT	ventral tube	**Vl**	ventrolateral.
Ve	ventroexternal		

Results

Taxonomy

***Honduranura* gen. n.**
http://zoobank.org/FC1B78AC-2830-40D6-861B-A532ED097BF2

Type species. *Honduranura centraliamericana* sp. n.

Diagnosis. Neanuridae with aspect of a yellow *Neanura*. 2+2 slightly pigmented big eyes. Body color yellow or orange when alive, without blue pigment, almost white in alcohol (Fig. 1). Mouthparts reduced, maxillae styliform. Sensilla S7 on Ant. IV hypertrophied, at least twice thicker than others. Clypeal and Antennofrontal tubercles fused altogether, cephalic setae A, B, E, F and G present (O, C and D absent) (Fig. 2). Two ocular setae: Ocm and Ocp. Posterior cephalic tubercles Di and De fused at each side, Di1, Di2, De1 and De2, not in crossed pattern. Dorsolateral tubercle (DL) separate, with two me and two M setae. Lateral tubercle with two M and two me, subocular tubercle with 5 setae. Thorax I with two M setae on De and one M seta on DL tubercle, without setae or tubercle on Di position. Di tubercle of Th. II and III with three setae, one M and two mi; Di tubercle on Abd. I–III with two setae, one M and one me. De tubercle with two setae one M and one me, plus ss from Th. II to Abd. III. Tubercle Di on Abd. IV with two setae M and mi, other tubercles with lateroexternal migration. Abd. V with tubercles Di, De and DL fused, with three setae and one sensorial seta ss. Four (2+2) macrosetae between the sensorial setae on Abd. IV, two (1+1) setae between sensorial setae of Abd. V. Head and body tubercles with strong subcuticular reticulation. Distal part of abdomen strongly bilobed.

Remarks. This is the only genus in the Sensillanurini tribe with clypeal and antennofrontal tubercles fused on head, dorso-internal and dorso-external tubercles fused on each side of the head, and tubercles of abdomen V fused on each side of the body. In addition, all tubercles exhibit a strong subcuticular reticulation, and dorsolateral and lateral tubercles slightly elongated.

Etymology. The name of genus is after the country where the author had seen specimens for the first time and it is the type locality of the type species. Gender of genus is feminine.

Key for the genera of Sensillanurini

1	Presence of Di tubercle and one seta on Th. I..... ***Sensillanura***
–	Lacking Di tubercle and seta on Th. I **2**
2	Cephalic tubercles Di and De; Cl and Ant fused..... ***Honduranura* gen. n.**
–	Cephalic tubercles clearly isolate **3**
3	Dorsal tubercles developed and "finger-like"; S2 hypertrophied and thickened similar to S7 on Ant. IV ..... ***Tabasconura***
–	Dorsal tubercles not elongated; S2 not hypertrophied, thin and short, similar to others except S7.....**4**
4	Cephalic tubercle De with 3−1 setae, two or one setae on tubercle Di of Abd. IV and V; most dorsal macrosetae smooth or barbulate.....***Americanura***
–	Cephalic tubercle De always with 1 seta; only one seta on tubercle Di of Abd. IV and V; most dorsal macrosetae palmate with serrate margins ....***Palmanura***

***Honduranura centraliamericana* sp. n.**
http://zoobank.org/DF4C2585-74C5-4A18-AC62-B65C24B1E6F0
Figs 1–12, Tables 1, 2

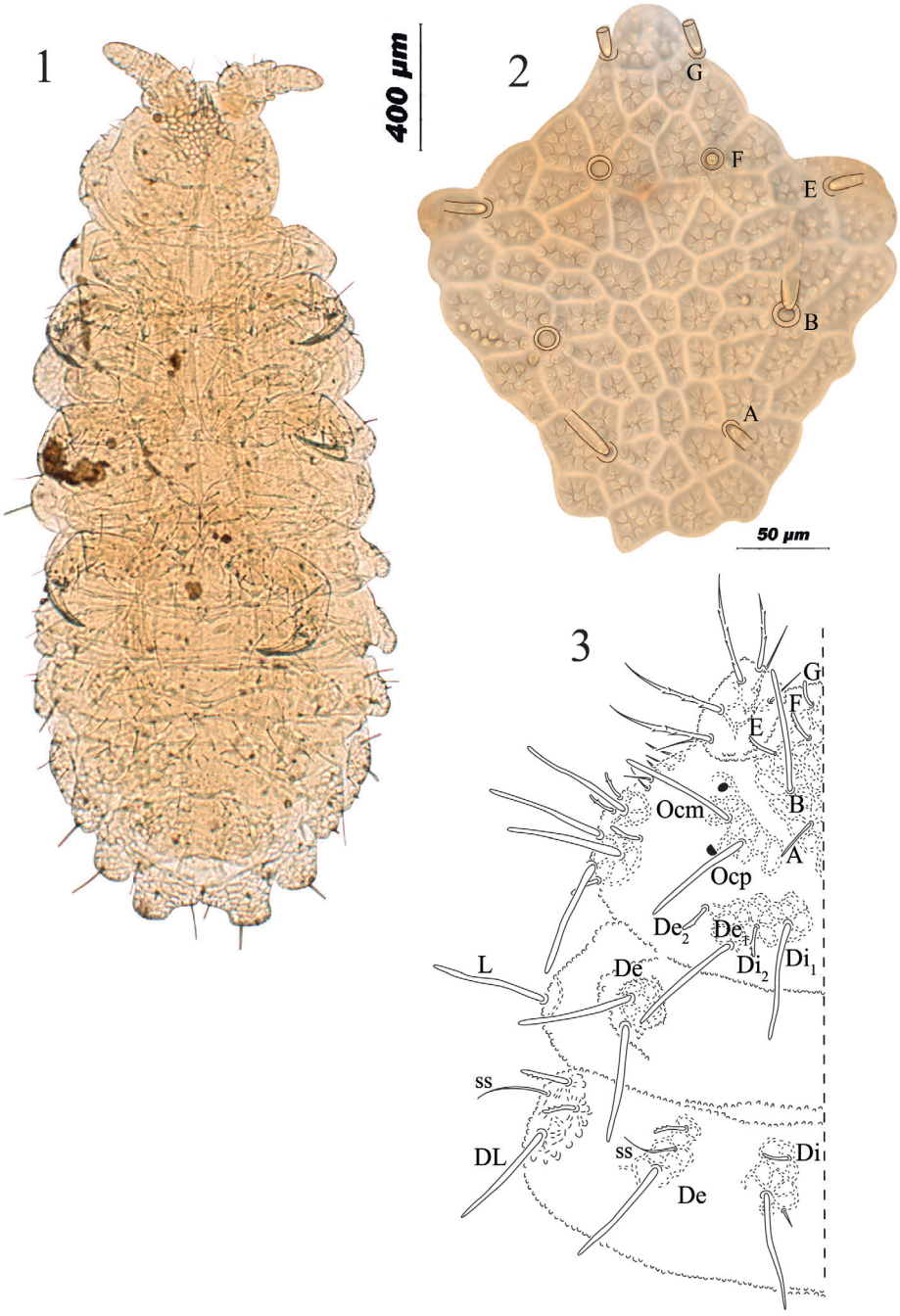
Type material. Holotype: adult female; Paratypes: three adult females, one adult male and one juvenile. All the type material kept at author's institution.

Type locality. Central America: Honduras: Camayagua (14°48'39"N; 87°53'22"W). 2140 m asl. FS2A LLAMA # Wa-C03-2-all, cloud forest, samples of leaf litter. 05.v.2010, F. Soto-Adames leg.

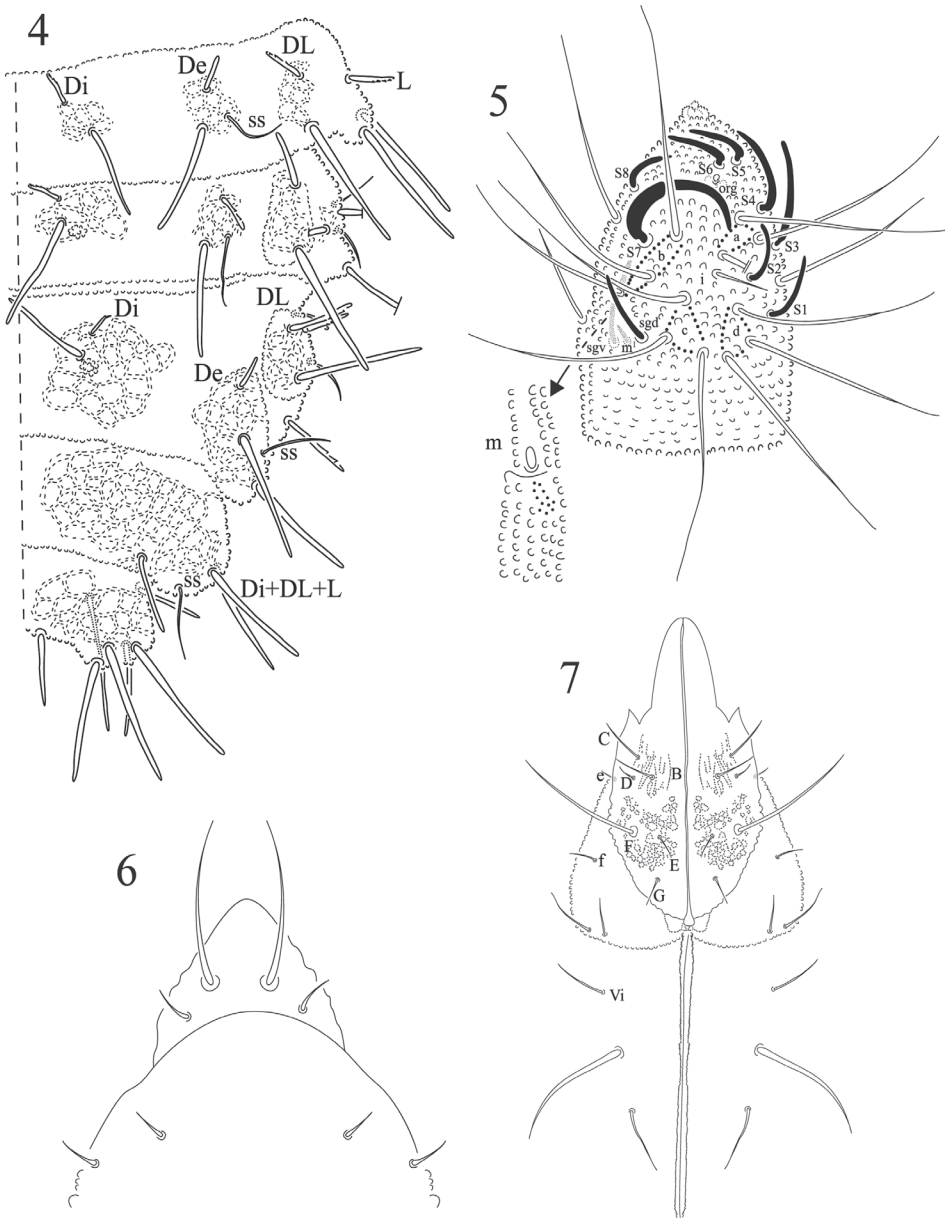
Other material. Central America: Costa Rica: Sierra de Talamanca. Parque Nacional Tapantí (9°46'14"N; 83°47'59"W). 1200 m asl, tropical rain forest, *ex* rotting trunk. 19.vii.2010, J. G. Palacios-Vargas col. One female and one juvenile.

Description. Length of holotype 2.5 mm; length range: 2.2–2.8 mm (n = 5). Color yellowish. Granulations strong, approximately 1/4 diameter of one eye. Tubercles well developed mainly on lateral and posterior part of body (Fig. 1), with strong subcuticular reticulation. Head with clypeal and antennofrontal tubercles fused with setae A, B, E, F, G present (O, C and D absent) (Fig. 2); posterior cephalic tubercles dorsointernal and dorsoexternal fused (Fig. 3). On Abd. V there is only one tubercle on each side (Fig. 4). Two kinds of dorsal body setae, macrosetae (M) 46 µm (38–60 µm) with blunt apex, mesosetae (me) with blunt apex, both slightly serrate in both sides, besides sensorial setae (ss) (30 µm). All ventral setae are smooth and acuminate; some are macrosetae and most are mesosetae.

Ant. I with 9 setae, 4 dorsal slightly barbulate macrosetae on a surface with subcuticular reticulation. Ant. II with 11 setae, one of them slightly serrate. Ant. III sensorial organ with two globular sensilla in a cuticular fold, and two guard sensilla; S.g.d slightly curved, one microsensillum ventro-external. Ant. IV with hypertrofied sensilla S7; S2 like other sensilla. One clear subapical organite. Apical bulb of Ant. IV trilobed (Fig. 5).



Figures 1–3. *Honduranura centraliamericana* sp. n. **1** habitus on slide **2** antennofrontal + clypeal tubercle **3** dorsal chaetotaxy of head and thoracic segments I–II.



Figures 4–7. *Honduranura centraliamericana* sp. n. **4** dorsal chaetotaxy of abdominals segments II–VI **5** dorsal antennal segments III and IV **6** chaetotaxy of pre-labrum/labrum **7** chaetotaxy of labium.

Labrum with 4 short prelabral setae, two short basal setae and two long apical setae (Fig. 6). Labium without tuberculate seta L, organite "x" or seta A (as cited by Deharveng, 1983 for the subfamily) Seta D short; seta F much longer than E and G (Fig. 7). Eyes 2+2, large, with dark pigment. Mandibles with three teeth. Maxillae styliform. Head with clypeal and antennofrontal tubercles fused, ocular seta Ocm and Ocp in one independent tubercle, Di and De tubercles fused, DL and L tubercles independent

Table 1. Head chaetotaxy of *Honduranura centraliamericana* sp. n.

Head setae group	Tubercles	Number of setae	Kind of setae	Setae
Cl+Af	1	5	1M, 4me	A, B, E, F, G
Oc	1	2	2M	Ocm, Ocp
Di + De	1	4	2M, 2me	Di1, Di2, De1, De2
DL	1	4	3M, 1 me	
L	1	4	1M, 3 me	
So	–	5	Mi	
Total number	5	24		

Table 2. Thorax and abdomen chaetotaxy of *Honduranura centraliamericana* sp. n. by half tergite.

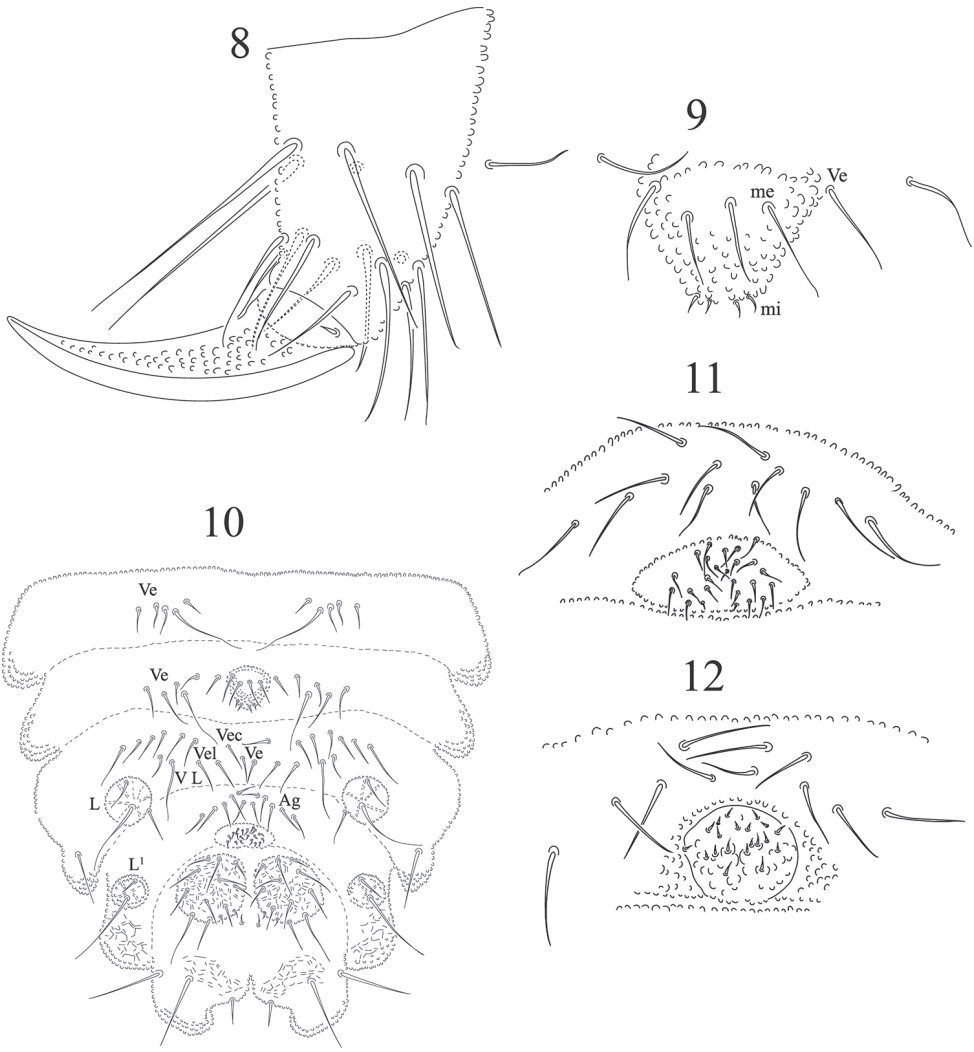
Thorax & Abdomen DORSAL					Legs				
	Di	**De**	**DL**	**L**	**Scx2**	**Cx**	**Tr**	**Fe**	**T**
Th. I	–	2M	M		0	3	6	13	19
Th. II	M, 2m	M, me+ss	M, 2me +ss	M	2	7	6	12	19
Th. III	M, 2m	M, me+ss	M, 2me +ss	M	2	8	6	11	18
					Abdomen VENTRAL				
Abd. I	M, me	M, me+ss	1M, 1me	2M, 2me	VT: 4				
Abd. II	M, me	M, me+ss	1M, 1me	2M, 2me	Ve: 6(5)	Vel 0			
Abd. III	M, me	M, me+ss	1M, 1me	2M, 2me	Vel: 6(7)	–	–	Fu: 4me	4mi
Abd. IV	M, me	(2M,	me +ss)	M, 5me	Vel: 9	Vec: 2	Vei: 1	VI: 3	
Abd. V	(M +	ss, 2M)	M, me	M, me	Ag: 6	–	–	VI: 2	L: 1
Abd. VI	7–				Ve:12	–	–	An: 2mi	

and well developed. Head chaetotaxy in figure 3 and in Table 1. Three pairs of postlabial setae, the second one much larger and thicker than others (Fig. 7).

Legs chaetotaxy from coxae to tibiotarsi (I, II and III), respectively, as 3,7,7; 5,5,5; 10,10,10; 18, 18, and 17 setae, without capitate tenent hairs, but with setae B4 and B5 long and acuminate (Fig. 8). One ventral seta of trochanter is small and very thin. Each femur with one long ventral seta. Ungues with strong granulation but without tooth. Thoracic and abdominal chaetotaxy in Figs 3 and 4. Body chaetotaxy by half tergite is shown in Table 2.

Ventral tube with 4 + 4 setae, the two distal setae subequal in size, basal setae are different, one is larger. Furcal vestige with four mesosetae and four apical microsetae in the apex of a small tubercle (Figs 9, 10). Female genital plate with 6 + 6 pregenital, 28 circumgenital and two eugenital setae (Fig. 11), genital plate of the only male studied with 6 + 6 pregenital, 16 circumgenital and 2 + 2 eugenital (Fig. 12), but it should be 6 + 6, 22, and 4 + 4 respectively. Each lateral anal valve with subcuticular reticulation, 11 setae and 2 microsetae. Ventro-internal tubercle of Abd. V well-developed and with strong subcuticular reticulation, one macroseta and three mesosetae.

Etymology. The new species is named *H. centraliamericana* sp. n. for its distribution in Central America (Honduras and Costa Rica), but it might be even more widely distributed, as the two localities are approximately 800 km from each other.



Figures 8–12. *Honduranura centraliamericana* sp. n. **8** lateral view of tibiotarsus III chaetotaxy **9** furcular vestige (midventral region of Abd. III) **10** ventral chaetotaxy of Abd. II–VI **11** female genital plate **12** male genital plate.

Discussion. This species has the unique characters of this new genus: the fusion of clypeal and antennofrontal tubercles and of dorsointernal and dorsoexternal tubercles on head. Additionally, the presence of only one tubercle on each side of the abdominal segment V is unique among Sensillanurini. The new species has more abundant head chaetotaxy than members of *Americanura* and *Palmanura*, including the antennofrontal, dorsolateral and lateral cephalic tubercles, and Th. I which has no Di seta, against one in all species of the genus *Sensillanura* (Palacios-Vargas and Catalán 2010). The presence of nine setae on Ant. I have been cited in other member of the Neanurinae (Deharveng 1981), here, there are five dorsal slightly barbulate macrosetae on a surface with subcuticular reticulation like in the *Neanura*, *Monobella* and *Neanurella* species

which exhibit this character, and which belong to different evolutionary lineages; the 6 + 6 pregenital setae is also a character unique in the tribe. The furcal vestige of the new species is like that of *Sensillanura*, but more developed, as a small tubercle similar to that of *Morulina* species, with mesosetae and microsetae.

Variation: The ag setae in females varies from 5-6 pairs, and circumgenital ones from 15 to 28 setae. One teratologic specimen lacks left tubercle of abdominal segment VI. Some of the mesosetae on Di tubercle of Th. II and III are very thin and smooth and can be overlooked. The juvenile paratype has ten setae on anal valve instead of eleven. The specimens from Costa Rica have the dorsal macrosetae and mesosetae acuminate.

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RESEARCH ARTICLE

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New species and records of terrestrial slugs from East Africa (Gastropoda, Urocyclidae, Veronicellidae, Agriolimacidae)

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Abstract

New and little-known terrestrial slugs are dealt with based on extensive collections made in East Africa (Kenya, Tanzania, and Uganda) 1993–2007. This account deals primarily with larger species from forests in the Eastern Arc Mountains of Tanzania. In Veronicellidae, *Pseudoveronicella* Germain, 1908 is extended to Tanzania by *P.* (*Hoffmannia*) *zootoca tanzaniensis* **subsp. n.** in the Udzungwa Mts. In Urocyclidae, *Dendrolimax parensis* **sp. n.** is described from the Pare Mts. and *Leptichnoides avisexcrementis* **sp. n.** is described from the Uluguru Mts. In Urocyclinae, *Tanzalimax tattersfieldi* **gen. & sp. n.** is described from the Usambara Mts., *Tanzalimax seddonae* **gen. & sp. n.** from the Uluguru Mts., and *Udzungwalimax suminis* **gen. & sp. n.** from the Udzungwa Mts. In addition, the ill-defined genus *Atrichotoxon* Simroth, 1910 is discussed and the little-known *Dendrolimax leprosus* Pollonera, 1906 is reported from Uganda. In Agriolimacidae, a species of *Deroceras* Rafinesque, 1820 is reported for the first time from southern Tanzania. The taxonomic attribution and significance of each discovery is discussed.

Keywords

endemism, forests, Helicarionoidea, introductions, land-snails, Mollusca, taxonomy

Introduction

Terrestrial slugs are often encountered in tropical Africa, but are less frequently collected than snails and in many ways more demanding to study. The native slug fauna of tropical Africa is dominated by genera of the helicarionoid Urocyclidae Simroth, 1888 (Urocyclinae sensu Van Goethem 1977), an apparently purely African group. Also native are the apparently far less diverse systellommatophoran slugs of the Veronicellidae Gray, 1840 (= Vaginulidae von Martens, 1866). Slugs of the limacoid Agriolimacidae Wagner, 1935 are represented in tropical Africa by several Ethiopian endemics, but otherwise only by a few records of introduced European species. Since the revisions of African Urocyclinae by Van Goethem (1977), African Veronicellidae by Forcart (1953), and the monograph of the Agriolimacidae by Wiktor (2000), studies on African slugs have been few. They have included revisionary and faunistic work (Herbert 1997, Verdcourt 2006, Rowson 2007, Muratov 2010) and species descriptions (Rowson et al. 2010, Rowson and Van Goethem 2012), mainly concerning the eastern half of Africa. DNA data support the relationship between urocyclid slugs and shelled Urocyclidae and their placement in the Helicarionoidea Bourguignat, 1877 (Herbert & Mitchell 2009). This paper reports on further new taxa and noteworthy slug records from East Africa, based on collections made in East African forests between 1993–2007 by, among others, P. Tattersfield, M. B. Seddon, C. F. Ngereza, C. N. Lange and B. Rowson and held at the National Museum of Wales, Cardiff, Wales, UK (NMW).

Many East African Urocyclidae are extraordinarily variable in colour and markings, and dissection is generally required to identify the tribe or genus. Spermatophores, when present, often help identify and (presumably) delimit species. Variation in internal morphology and spermatophores across the NMW collection often hints at East African species or subspecies complexes in some of the genera. This interpretation falls between that of Verdcourt (1960a, b, 1962, 1965) and Verdcourt and Polhill (1961) who described many species and subspecies, and Van Goethem (1977) who synonymised many of them under a few names. Both workers examined material from the volcanic Kenyan and Tanzanian highlands, and the forests of Uganda, from which earlier collecting had been more extensive (e.g. by Pollonera 1906, 1909, 1911). They saw relatively little from the forests of the Eastern Arc Mountains of Tanzania and Kenya, except for that collected by Verdcourt and co-workers in the 1950s and 1960s. Species endemism in the Eastern Arc is especially likely to be high, as it is amongst shelled molluscs (e.g. Rowson and Tattersfield 2013). Species complexes require much more detailed revision for which this material may be useful in future.

Despite this complexity it is also clear that additional species, some very distinct, remain undescribed especially in Tanzania. The generic placement of these is often difficult, with new Tanzanian species recently attributed to the tribes Dendrolimacini Van Goethem, 1977 and Upembellini Van Goethem, 1977 only with some circumspection (Rowson et al. 2010, Rowson and Van Goethem 2012). Such enigmatic taxa indicate that some of the deeper evolutionary relationships among East African slugs are yet to be resolved.

Materials and methods

All animals were drowned in water and are preserved in 80% ethanol, sometimes methylated and/or with 2% propylene glycol; dimensions given are for material in preservation. The slug collection was reviewed and around 100 animals dissected in 2013 and 2014. Only material that could not be attributed to known, widespread species (following Van Goethem 1977) is listed here, unless the records extend ranges substantially. Grid references are in decimal degrees.

Paratypes have been deposited at the National Museums of Tanzania, Dar es Salaam, Tanzania (NMT) and Royal Belgian Institute of Natural Sciences, Brussels, Belgium (RBINS). Suprageneric classification agrees with Van Goethem (1977) and Bouchet and Rocroi (2005). Van Goethem (1977) is indispensible for redescriptions, details of previous citations and type material of Urocyclidae; note that most of Simroth's types could not be found by Van Goethem, and have still not been found (e.g. in the collections at Berlin; Glaubrecht 2010, Glaubrecht and Zorn 2012).

Abbreviations

ad. = adult slug; ag = albumen gland; am = ampulla of spermatophore; AK = A. Kisondella; AR = A. Robert; at = atrium; bc = bursa copulatrix; bd = bursa copulatrix duct; BHW = B. H. Warren; BR = B. Rowson; CFN = C. F. Ngereza; CNL = C. N. Lange; dg = digitiform glands; ec = epiphallic caecum; ep1 = epiphallus 1 (i.e. part between the calc sac or flagellum and the epiphallic caecum; ep1 is usually wound around the penis); ep2 = epiphallus 2 (i.e. part between epiphallic caecum and penis); cs = calc sac; FE = F. Ebonga; fl = flagellum; FR = Forest Reserve; juv. = juvenile or subadult slug; MBS = M. B. Seddon; mo = muscular organ between atrium and oviduct; NMT = National Museums of Tanzania, Dar es Salaam, Tanzania; NMW = National Museum of Wales, Cardiff, UK; NO = N. Otieno; NP = National Park; og = oviductal gland; ov = (free) oviduct; ot = ovotestis; pe = (free) penis; pr = penial retractor muscle; ps = penial sheath; PT = P. Tattersfield; RBINS = Royal Belgian Institute of Natural Sciences, Brussels, Belgium; vd = vas deferens; vg = vagina; vm = muscular part of vagina.

Systematic part

Clade Systellommatophora Pilsbry, 1948
Superfamily Veronicelloidea Gray, 1840
Family Veronicellidae Gray, 1840
Genus *Pseudoveronicella* Germain, 1908
Subgenus *Hoffmannia* Forcart, 1953

Pseudoveronicella (*Hoffmannia*) *zootoca* (Hoffmann, 1927)

Pseudoveronicella (*Hoffmannia*) *zootoca tanzaniensis* subsp. n.

http://zoobank.org/1AFD402A-BC98-4D86-B9A3-15971B789B21
Figs 1–2, 21, 27–29, 45–49

Material. TANZANIA: Holotype NMW.Z.2003.001.00030: 1 ad., Mt. Mwanihana FR (7.82°S, 36.83°E), Udzungwa Mts. NP, Kilombero District, forest at 1050 m alt., leg. BR, PT, MBS & CFN, 29 Jan. 2003 (sample 1050 misc). Paratype 1 NMW.Z.2003.001.00031: 1 ad., data as previous but 1200 m alt. (sample 1200P). Paratype 2 NMW.Z.2003.001.00032: 1 ad., data as previous but 1695 m alt. (sample 1695S).

Comparative material of *P.* (*Pseudoveronicella*) *liberiana* (Gould, 1850): UGANDA: 17 ads., Jubiya FR (0.27°S, 31.97°E), Masaka District, forest at 1180 m alt., leg. PT, BR, & FE, 3 Feb. 2007.

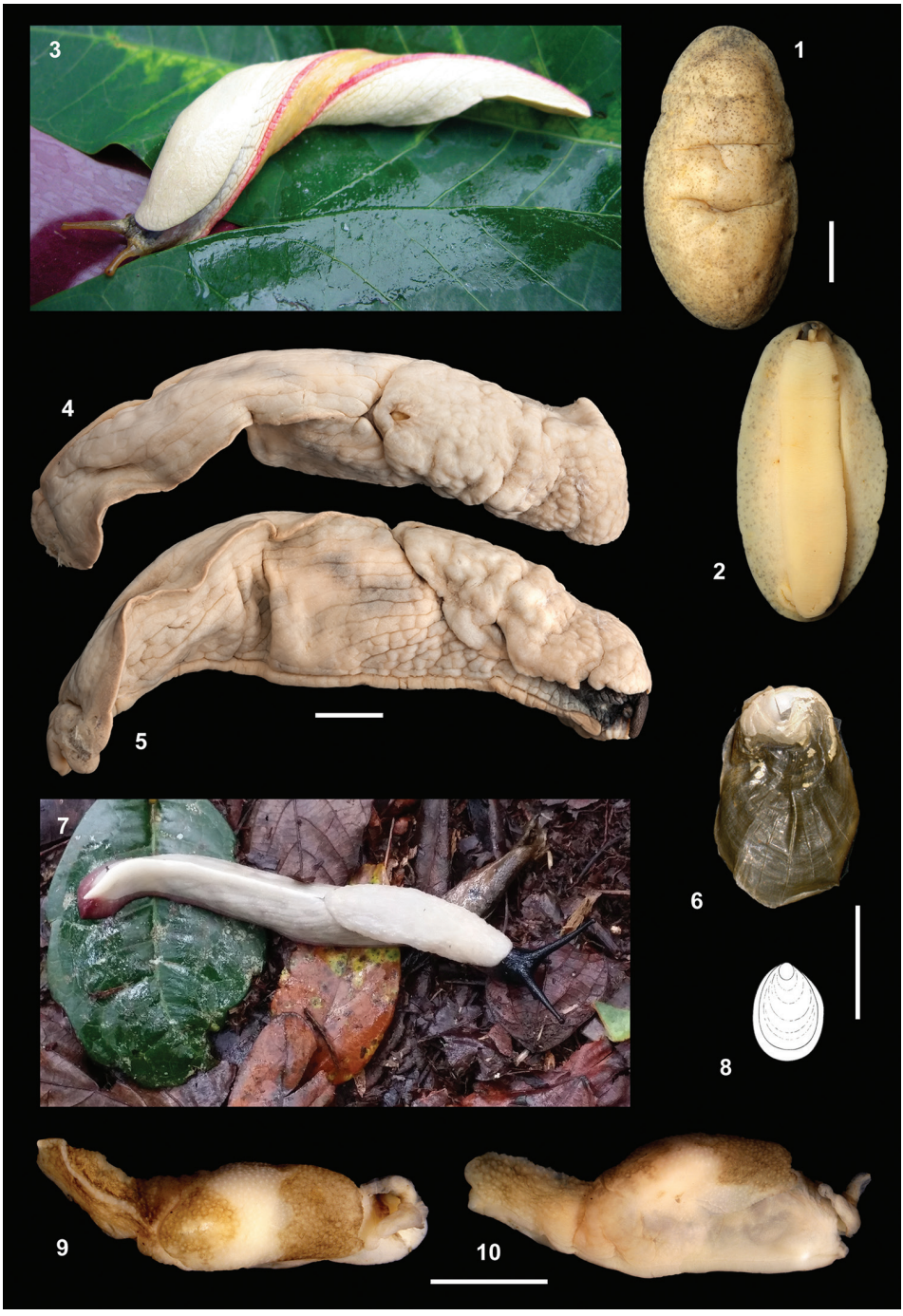
Description. External appearance (Figs 1–2, 45). Medium-sized slugs (notum length 33–39 mm), notum weakly mottled grey-brown or grey-green, evenly speckled with small dark grey speckles, which continue onto the lighter-coloured hyponotum. Tentacles dark grey. Conspicuous anus in the form of a crescent-shaped slit with strongly flaring lips. Female genital opening just anterior to the mid-point of the right hyponotum. Juveniles not known.

Jaw and radula (Figs 21, 27–29). Similar to other African Veronicellidae: jaw of overlapping plates, accompanied by chitinous (?) bristles forming rows along the upper lip and two patches at the margins of the lower lips. Radula with central tooth and 47 teeth in a half-row. Central tooth small, rounded, stump-like; laterals simple, unicuspid and triangular; marginals subtriangular, becoming increasingly elongate and irregular in outline.

Genitalia (Figs 46–49). Penial sheath thin-walled, smooth, incorporating a verge and the conical tip of the "penial gland" of Forcart (1953). Verge small, lacking thorns or spines, basally swollen and with a single rim around the glandular, glans-like tip, which is symmetrical and lacks a fringe around its opening. Penial gland in the form of a smooth cone with an opening at its pointed tip. Five long, tangled digitiform glands enter the penial sheath near one another at the muscular base of the cone. Embryos not found; a single soft spheroidal mass (perhaps an egg) present in the uterus of one individual.

Etymology. From Tanzania.

Distribution and habitat. Apparently endemic to forest in the Udzungwa Mts. *Pseudoveronicella* is a West and Central African genus previously known in eastern Africa only from western Uganda and a single occurrence in Ethiopia (Forcart 1953, Verdcourt 2006, Wronski and Hausdorf 2010). It is easily recognised by the slit-like anus. Using Forcart (1953), all other Tanzanian Veronicellidae examined key to *Laevicaulis* Simroth, 1913, a genus widespread in eastern Africa (Forcart 1953, Herbert 1997, Verdcourt 2006), while the Ugandan material keys to *P. liberiana*. The Udzungwa specimens thus extend the range of the genus *Pseudoveronicella* far to the southeast, providing further evidence of western affinities among the endemic and other molluscs of these mountains (Rowson and Van Goethem 2012).



Figures 1–10. Living animals, habitus and shells. **1–2** *Pseudoveronicella* (*Hoffmannia*) *zootoca tanzaniensis* subsp. n., holotype **3** *Dendrolimax leprosus* Pollonera, 1906 at Jubiya **4–7** *Dendrolimax parensis* sp. n.: **4–5, 6** holotype **7** living animal at Kindoroko, not collected but probably this species **8–10** *Leptichnoides avisexcrementis* sp. n., holotype. Scale bars: 10 mm (**1–5**), 5 mm (**6–10**).

Remarks. In Forcart (1953) the Udzungwa specimens key to *Pseudoveronicella* subgenus *Hoffmannia*. This differs from *Pseudoveronicella s. str.* (examined from Uganda) in having a verge that is glandiform rather than utricular, with an opening that is not surrounded by fringes. It then keys to *P.* (*H.*) *zootoca*, whose verge lacks thorns and has a glans-like tip. The shape of the tip differs between the two subspecies recognised by Forcart: *P.* (*H.*) *z. zootoca*, widespread in West Africa from Tamassadou to Leopoldville, and *P.* (*H.*) *z. aethiopica* Forcart, 1953 described from Sidamo, southern Ethiopia, at 2500 m. The Udzungwa slugs resemble *P.* (*H.*) *z. aethiopica* more closely than *P.* (*H.*) *z. zootoca* in their larger body size, and in not containing embryos (Forcart, 1953). However they do not confirm exactly to either: the verge has a much more strongly swollen base than either subspecies, while the glans is not hoof-like as in *P.* (*H.*) *z. aethiopica*. In light of the morphological differences and the greatly disjunct distributions, we follow Forcart (1953) in ascribing the material to a new subspecies of *P.* (*H.*) *zootoca*.

Clade Stylommatophora Schmidt, 1855
Superfamily Helicarionoidea Bourguignat, 1877
Family Urocyclidae Simroth, 1888
Subfamily Urocyclinae Simroth, 1888
Tribe Dendrolimacini Van Goethem, 1977
Genus *Dendrolimax* Heynemann, 1868

***Dendrolimax leprosus* Pollonera, 1906**
Fig. 3

Material. UGANDA: 9 ads., Jubiya FR (0.27°S, 31.97°E), Masaka District, forest at 1180 m alt., leg. PT, BR, & FE, 3 Feb. 2007.

Remarks. This species keys unambiguously to *Dendrolimax* in Van Goethem (1977), who noted that all *Dendrolimax* other than *D. osborni* Pilsbry, 1919 were poorly-known. One such species is *D. leprosus*, previously known only from the type locality of "between Kijemula and Madudu". According to Van Goethem (1977) this locality is at 0°41'N, 31°28'E (i.e. 0.68°N, 31.47°E). This is in Uganda approximately 100 km NE of Jubiya at a similar elevation (1300 m). Until now *D. leprosus* was known only from the types (which Van Goethem could not locate) and Pollonera's (1906, 1909) description and figures. The Jubiya material corresponds well to these: individuals range from white to olive-coloured with large pale lesion-like blotches; the genitalia, jaw and shell are similar; and perhaps most distinctively, the radula has the majority of laterals bicuspid rather than tricuspid as in *D. osborni* (Van Goethem 1977).

The live animals were strikingly coloured in having a violet-pink foot-fringe. When handled, they secreted mucus of the same colour onto the hands, as if in defence. It appeared as though the mucus came from the foot-fringe itself rather than the supraperipodial grooves, which are conspicuous in *Dendrolimax* species (Van Goethem 1977).

***Dendrolimax parensis* sp. n.**
http://zoobank.org/9CF1B989-D277-4219-8DCD-532EA483E7A9
Figs 4–7, 22, 30–32, 50–54

Material. TANZANIA: Holotype NMW.Z.1998.003.00002: 1 ad., Chome FR (4.30°S, 37.96°E), South Pare Mts., Same District, forest at 1875 m alt., leg. CFN & CNL, 15 Jan. 1998 (sample IC). Paratype 1 NMW.Z.1998.003.00003: 1 ad., data as previous. Paratype 2 NMW.Z.1998.003.00004: 1 ad., Kindoroko FR (3.75°S, 37.64°E), North Pare Mts., Mwanga District, forest at 1620 m alt., leg. MBS & CFN, 19 Jan. 1998 (sample IC). Paratype 3 NMT: 1 ad., data as previous but leg. PT & CNL (sample IIC). Excluded from type series: 3 ad. (dried out), data as previous but 1820 m alt.

Description. External appearance (Figs 4–5). (In preservation; living appearance not recorded other than "reddish", and "*Limax*-like"; but see Fig. 7). Very large (to 105 mm long), heavily-built slug, plain pale cream with black head and tentacles, lacking markings of any sort. Sole coloured as body, tripartite. Very strong, smooth, acute dorsal keel along whole length of tail, terminating in a short, blunt caudal appendage. Evident supraperipodial groove running parallel to strong peripodial groove as far as tail. Tail and flanks with large, smooth and fairly flat, tubercules. Mantle large (approx. 45% of body length) with cauliflower-like surface, with moderately-sized shell pore, attached at rear. Juveniles not known.

Shell (Fig. 6). Fingernail-shaped, symmetrical, to 9 mm long, thin and weakly mineralised around the nucleus only.

Jaw and radula (Figs 22, 30–32). Jaw with strong median projection. Radula with central tooth and up to 193 lateral and marginal teeth in a half-row, in about 150 rows. All teeth tricuspid but with mesocones pointed and by far the largest, other cusps tiny. No serrated outer edges to the outermost marginals.

Genitalia (Figs 50–51). Visceral cavity does not quite reach tail (posterior 15-20% of body solid). No stimulator, no calc sac. Atrium very short, with internal folds. Penial complex consisting of: stout free penis; moderately long flagellum (axial thread not found); short epiphallus 1 and epiphallus 2, approximately equal in length; moderately long epiphallic caecum. Penial retractor muscle arising from diaphragm. Penial papilla with a double wall, and a smaller papilla inside; free penis also with a penial sheath. Vagina present, rather-thick walled, with weak internal folds. Bursa copulatrix duct robust, long, not pigmented or ornamented, internally with weak longitudinal pilasters; bursa voluminous, thin-walled, rounded apically. Oviductal gland large, quite thick-walled. Ovotestis sited anterior to albumen gland, albumen gland extending to near tail.

Spermatophore (Figs 52–54). Three spermatophores from bursa of holotype, up to 30 mm long when coiled. Single short spur present near apical bend at junction between ampulla and tail. Ampulla smooth, slender, with 1.5–2 volutions, up to 25 mm long uncoiled. Tail thread-like, up to 35 mm long uncoiled, with a single keel of saw-like spines throughout.

Etymology. From the Pare Mts.

Distribution and habitat. Recorded from remnant forest above 1600 m in the North and South Pare Mts., to which it is likely to be endemic. Both Pare blocks are geologically part of the Eastern Arc chain, lying adjacent to the West Usambara Mts. (which are part of the chain) and Mt. Kilimanjaro (which is not). Verdcourt (2004) considered the Pares malacologically understudied despite their proximity to better-known areas, and there are no previous slug records from the area.

Remarks. There are few Tanzanian species with which this large species can be confused. It keys to Upembellini or Dendrolimacini using Van Goethem's (1977) key, based on the presence of a flagellum, the viscera almost reaching the tail, and the large size of the adult animal. The form of the jaw and radular teeth favour Dendrolimacini since there are more than Van Goethem's maximum for Upembellini (120 teeth in a half-row). The vagina, large oviductal gland, and interior of the penis recall both *Dendrolimax* Heynemann, 1868 and the two species currently attributed to *Upembella*: *U. adami* Van Goethem, 1969 from south-eastern DR Congo and *U. nonae* Rowson & Van Goethem, 2012 from the Udzungwa Mts. The Pare species differs from both *Upembella* species in the much shorter flagellum, and from *U. nonae* in the simpler spermatophore. The most similar spermatophore figured by Van Goethem (1977) is that of the central African *Dendrolimax osborni* Pilsbry, 1919, although this apparently often lacks the apical spur on the spermatophore.

A photograph taken of a very large living slug in 2016 at Kindoroko FR (Fig. 7) may well show an example of *D. parensis*. Notably, the photograph indicates a violet mucus exuded from the tail (cf. *D. leprosus* above).

This slug may have a role in traditional medicine. MBS, PT & CFN (pers. comm.) were told while collecting that members of the Pare (Wapare) ethnic group sometimes apply the mucus from slugs to human skin as a treatment for burns. We do not know which species are preferred, but this very large species seems a likely candidate.

Tribe Upembellini Van Goethem, 1977
Genus *Leptichnoides* Van Goethem, 1975

Leptichnoides avisexcrementis sp. n.

http://zoobank.org/D8B7480E-B5ED-414B-8755-237474DDAF7A
Figs 8–10, 23, 33–35, 55–58

Material. TANZANIA: Holotype NMW.Z.1996.148.00032: 1 ad., Uluguru North FR (6.93°S, 37.7°E), Uluguru Mts., Morogoro District, forest above Tegetero village, approx. 1300 m alt., leg. PT, 22 Jan. 1996 (sample IC). Paratype 1 NMW.Z.1996.148.00033: 1 juv., data as previous but sample IIF. Paratype 2 NMW.Z.1996.148.00034: 1 juv., Kimboza FR (7.01°S, 37.78°E), Uluguru Mts., Morogoro District, lowland forest on dolomitic limestone, approx. 350 m alt., leg. PT, 19 Jan. 1996 (sample IB). Paratype 3 NMW.Z.1996.148.00040: 1 ad., data as previous but 20 Jan. 1996 sample IB. Paratype 4 RBINS.I.G. 33548/MT.3608: 1 ad., data as previous but sample IA.

Description. External appearance (Figs 9–10). Small slug (to 23 mm long) with unusual colour pattern, imparting a resemblance to a bird dropping: pale cream with two thick grey-brown bands orientated across the dorsum (rather than parallel to it as is so common in slugs), leaving a pale saddle-like band across the mantle. Head and tentacles dark grey-brown, keel and sole pale. Strong dorsal keel along whole length of tail, terminating in a moderately long caudal appendage. Tail and flanks made granulose by raised tubercles. Mantle very large (approx. 50% of body length), with granulose surface, with large shell pore, attached at rear. Juveniles similarly coloured and proportioned.

Shell (Fig. 8). Fingernail-shaped, symmetrical, to 4.1 mm long, consisting of an extremely thin sheet of periostracum, weakly mineralised around the nucleus, adhering to the tissue below and easily torn during extraction.

Jaw and radula (Figs 23, 33–35). Jaw with weak median projection. Radula with central tooth and up to 55 lateral and marginal teeth in a half-row. All teeth strongly tricuspid, mesocones largest, ectocones larger than endocones. Weakly serrated outer edges to the outermost marginals.

Genitalia (Figs 55–56). Visceral cavity does not quite reach tail (posterior 10% of body solid). No stimulator, no calc sac. Atrium very short. Penial complex consisting of: stout free penis: moderately long flagellum; short epiphallus 1 and epiphallus 2, approximately equal in length; moderately long epiphallic caecum. The flagellum and caecum are loosely tangled together like a ball of wool until spread out during dissection. Penial retractor muscle short, arising from diaphragm. Free penis double-walled near the atrium, with a small conical papilla at the first bend of the penis. Vagina absent. Bursa copulatrix duct long, reaching albumen gland. Bursa spherical, thin-walled. A long, straight, muscular organ (characteristic of *Leptichnoides*) between atrium and oviduct, with a thick-walled sheath, entering atrium through a coarse papilla. Hermaphroditic duct extremely short, barely perceptible between spermoviduct and large ovotestis, which lies near rear of mantle. Albumen gland small.

Spermatophore (Figs 57–58). Single, partly-digested spermatophore from bursa. Apical bend at junction between ampulla and tail broken during manipulation. Ampulla smooth, thin-walled, 2.5 mm long, little coiled (less than 1 volution). Tail at least 1.6 mm long, of at least 1 volution, apically swollen then tapering. Strongly ornamented with a double keel of large, curved, apparently unforked spines.

Etymology. From Latin *avis*, bird, and *excrementis*, faeces, in reference to the species' resemblance to a bird dropping.

Distribution and habitat. We initially suspected this species to be endemic to forest in the Uluguru Mts., where several such taxa occur (e.g. Verdcourt 2006, Tattersfield and Rowson 2011). However, apparently conspecific material has since been collected further south in Tanzania, in forest at approx. 80 m alt., Hippo Hole, 20 km west of Kirenjerange, Lindi Region (9.57°S, 39.28°E) (J. M. C. Hutchinson, pers. comm., 2017). The following additional material from the NMW collections is referred to *Leptichnoides verdcourti* (Forcart, 1967), suggesting that both species range from southern coastal Tanzania to the lower altitude forests of the Eastern Arc Mts.: TANZANIA: NMW.Z.1995.016.00013: 1 ad., Pindiro FR (9.53°S, 39.27°E), Kilwa District, coastal

forest at 350 m alt., leg. PT, 26 Feb. 1995 (sample II). NMW.Z.1995.016.00014: 3 juvs., Ngarama FR (9.33°S, 39.33°E), Kilwa District, coastal forest at 400 m alt., leg. PT, 25 Feb. 1995 (sample II). NMW.Z.1997.007.00009: 1 juv., Sali FR (8.95°S, 36.40°E), Mahenge Mts., Ulanga District, montane forest at 960 m alt., leg. AK, NO, CFN, MBS & PT, 5 Feb. 1997 (sample II). NMW.Z.1997.007.00010: 1 ad.?, Mzelezi FR (8.79°S, 36.72°E), Mahenge Mts., Ulanga District, forest on dolomitic limestone at 645 m alt., leg. AK, NO, CFN, MBS & PT, 6 Feb. 1997 (sample IC). NMW.Z.2003.001.00033: 1 juv., Mkungwe FR (6.90°S, 37.91°E), Uluguru Mts., Morogoro District, submontane forest, approx. 900 m alt., leg. BR & CFN, 7 Feb. 2003 (sample I misc).

Remarks. *Leptichnoides* has not previously been recorded from East Africa (Verdcourt 2006) and was until now known from a single species, *L. verdcourti* (Forcart, 1967) recorded from Mozambique, Zimbabwe, and (as an introduction) from Seychelles (Forcart 1967, Van Goethem 1977, Gerlach 2006). Van Goethem (1977) noted that an unnamed species from Comoros ("Species D") might also belong to *Leptichnoides*. The long, straight muscular organ between the atrium and the oviduct is characteristic of the genus. In the studied collections, material from several eastern Tanzanian lowland localities appears referable to *L. verdcourti* so the genus is clearly well established in Tanzania. Here we describe *L. avisexcrementis* on account of its small size and markedly distinct colouration which allows it to be readily separated from Tanzanian and other material of*L. verdcourti*, in which the body is more conventionally patterned with dark brown irregular longitudinal bands and spots (as figured in Forcart 1967 and Gerlach 2006).

The new species is also the only *Leptichnoides* from which a spermatophore has yet been reported. Although partially digested, it differs remarkably from that of all other East African slugs in the form and large spines. Although the spines are unforked, there is a resemblance to the spermatophores of the less fully-limacised, West African slugs of the "*Estria-Rhopalogonium* group" of Van Goethem (1977) and of urocyclid semi-slugs (Van Mol 1970). The spermatophore and animal show some resemblance to that of the Comoros slug genus *Comorina* Simroth, 1910, but the sole species *C. johannae* Simroth, 1910 was said to have a substantial dart sac not present in any other flagellum-bearing members of the Urocyclinae; whether the "dart sac" is homologous with the muscular organ in *Leptichnoides* is uncertain. Van Goethem (1977) had no material of *Comorina*, and ranked it as *incertae sedis*, wondering whether it belonged in Urocyclidae or even whether the genitalia were correctly described by Simroth (1910). New material of *Comorina* is needed to resolve this.

Tribe Urocyclini Simroth, 1888
Genus *Atrichotoxon* Simroth, 1910

The collections from different ranges of the Eastern Arc mountains include numerous large Urocyclini which lack darts. Using Van Goethem (1977), these features allow them to key to *Atrichotoxon* Simroth, 1910, although the species are evidently new. However, as explained below, *Atrichotoxon* is so problematic that we refer them to

other, better-defined genera. It is important to quote from Simroth's original text on *Atrichotoxon* because different interpretations of his descriptions have been made. The genus was introduced for a single species, *A. punctatum* Simroth, 1910, which he illustrated in colour (Simroth 1910: Taf. 26 Fig. 6; reproduced here as Fig. 11). It was said to be the 'smallest *Trichotoxon*' at 5 cm long, with a grey-brown background with dark mantle bands and grey to black spots.

Simroth's internal description of *Atrichotoxon* (from *A. punctatum*) was clear about the similarities and differences from *Diplotoxon* Simroth, 1897, namely its type species *Trichotoxon* (*D.*) *voeltzkowi* Simroth, 1910. That species, from Pemba I., is now considered a synonym of the widespread *T. heynemanni* (Van Goethem 1977). The diagnostic features of *Atrichotoxon* all relate to the dart sac, the only part of the internal anatomy Simroth figured (1910: Textfig. 13; reproduced here as Fig. 12). This was said to be externally like that of *Diplotoxon*, apart from the strong bundles of retractors attaching it to the floor of the body cavity ("Ausserlich unterscheidet er sich durch einen kräftigen, aus vielen Bündeln zusammengesetzten Retraktor, der ihn am Boden der Leibeshöhle festheftet;"). The interior of the (primary) dart sac further resembles that of *Diplotoxon* in consisting of two (secondary) dart sacs of longitudinal muscle ("Wir sehen die beiden starken, aus Längsmuskeln aufgebauten sekundären Pfeilsäcke"). However, there were no darts, nor broken stumps indicating that darts had once been present. Simroth discounted that the darts had been ejected during mating ("Da das Tier völlig unverletzt war und da die Pfeile von *Trichotoxon*, wie ihre von der behaarten Scheide auch an der Bruchfläche überzogenen Stümpfe beweisen, höchstens abgebrochen, niemals aber, wie bei *Helix*, ausgestossen und erneuert werden, so scheint es auch hier ausgeschlossen, dass sie bei der Copula entfernt wären."). Thus, *Atrichotoxon* was not simply a *Diplotoxon* which had lost or failed to develop its darts, but a species with a fully-formed, internally subdivided, yet empty dart sac with strong retractors.

Simroth's figure did not, however, make it clear to which end of the strongly asymmetrical dart sac the muscles are attached. In the text, Simroth described the dart sac retractors as "pointing in another direction" ("Auch deutet der Retraktor in anderer Richtung."). He explained this by suggesting that the entire dart sac was everted at mating into the body of the partner ("Hier hat offenbar das Rätsel, das ich oben beim *Tr. Voeltzkowi* berührte, wie der Penis zu dem oben in den Pfeilsack mündenden Bursagang gelangte, wie weit der Pfeilsack etwa ausgestülpt würde, seine radikale Lösung gefunden: Der ganze Pfeilsack wird ausgestülpt und wirkt nicht mehr als Reizorgan, sondern dient zur Vereinigung der Partner."). The term "another direction" unfortunately still allows for interpretation, given the uncertain orientation of Simroth's drawing. It is likely that he meant that the dart sac's retractors would withdraw it into the body after mating, and so must contract away from the genital orifice (as appears to be the pattern in other Urocyclidae). However this would mean that the atrium is at the right-hand side of his drawing, and that the narrow end with retractors is the basal (atrial) end of a dart sac that is swollen distally. Either this situation or its alternative would make *Atrichotoxon* unique (in addition to the lack of darts). None of the taxa in

Van Goethem's (1977) monograph have either a distally swollen dart sac, or a proximally swollen one with retractors confined to its distal end.

Unfortunately, Simroth gave no more internal details and no locality other than East Africa ("Aus Ostafrika, von Stuhlmann erbeutet"). As with many of Simroth's types, the types of *A. puncatum* are presumed lost (Van Goethem 1977, Glaubrecht 2010, Glaubrecht and Zorn 2012). Verdcourt's three-part biography of F. L. Stuhlmann (Verdcourt 1988, 1989a, b) included a list of taxa collected by Stuhlmann that were possibly present in the Berlin collections in 1959. However, in the list all the slug taxa described by Simroth were marked with a †, presumably indicating either that they were not seen in 1959, or that they were later discovered to be lost. Although some of the Stuhlmann–Simroth veronicellid slugs from this list have since been rediscovered in Berlin, none of the urocyclids have (Glaubrecht 2010). Stuhlmann collected widely in East Africa, but spent several years (1903–1907) in the nearby East Usambaras as the director of the research station at Amani (Verdcourt 1988, 1989a, b). Verdcourt himself later spent a year (1949–1950) at the Amani station and described the slugs of the area, yet did not find *A. punctatum*. Although he also worked in the West Usambaras he spent much less time in this area. Having failed to find the species, Verdcourt later (2006) suggested the true origin of *A. punctatum* might be in either Tanzania or Uganda. However, five of the six other East African urocyclids in Simroth's (1910) paper were from Tanzanian localities. The sixth, *Atoxon martensi* Simroth, 1910 was another single specimen collected by Stuhlmann from "East Africa" without further locality. Its description was even briefer than that of *A. punctatum*, and it was considered a species inquirendum by Van Goethem (1977). Verdcourt (2006) concluded that *A. martensi* was probably from Tanzania. Given also that all other records of the genus *Atrichotoxon* are from the Eastern Arc Mts. it thus seems more likely that *A. punctatum* was first collected in Tanzania than in Uganda.

Current usage is the second reason why *Atrichotoxon* is problematic. Verdcourt & Polhill (1961) and Verdcourt (1965) attributed material of a highly distinctive new species, *A. usambarense* (Verdcourt, 1961) to *Atrichotoxon*, which they then treated as a subgenus of *Trichotoxon* Simroth, 1888. A subsequent study (Van Goethem 1977) and the present material confirm the distinctness of *A. usambarense* and suggest it is restricted to the E. Usambara Mts. Verdcourt and Polhill (1961) and Verdcourt (1965) also discussed an *Atrichotoxon* "sp. ?n." from Vuria Peak in the Bura/Taita Hills, Kenya, also part of the Eastern Arc. The dart sac of this species differed from *A. usambarense* in containing "many small splinter-like crystals in the convolutions which seem to be arranged radially and not facing down the cavity like darts." They had no new material or localities for *A. punctatum*, but from Simroth's publication described the dart sac as being "narrow, swollen distally and with retractors at the proximal cylindrical end" (p. 30). By "proximal" they evidently meant "basal", i.e. near the atrium (p. 31). However, as they made clear (p. 30–31) neither of their *Atrichotoxon* species showed these retractors, and their figures show the dart sacs swollen basally, not distally. Despite this Verdcourt (1965) suggested the presence of atrial retractor muscles might diagnose *Atrichotoxon*. Van Goethem (1977) showed that such retractors also occur in some species of *Atoxon* Simroth, 1888 including the widespread *Atoxon pallens* Simroth,

1895, with which he synonymised another "*Atrichotoxon*" species, *T.* (*A.*) *impressum* Verdcourt, 1965 from Nairobi.

Although imperfect, this usage was followed by Van Goethem (1977) and subsequent works (e.g. Verdcourt 2006). Numerous specimens in the present collections, in several genera, have an external resemblance to *A. punctatum*, but we found none that match its characteristic internal anatomy (moreover, all *Trichotoxon* specimens investigated contain darts). We therefore propose to maintain the usage of Verdcourt (2006) of *Atrichotoxon* for *A. puncatum* and *A. usambarense* until authentic material of *A. punctatum* is found and properly studied. The following three species are therefore referred to other genera whose genital anatomy is fully described.

Genus *Tanzalimax* gen. n.
http://zoobank.org/B1F2D332-E12F-4E4F-9613-FBEA868441C5

Type species. *Tanzalimax tattersfieldi* sp. n.

Included species. *Tanzalimax tattersfieldi* sp. n. and *Tanzalimax seddonae* sp. n.

Diagnosis. Slug belonging to tribe Urocyclini. Genital apparatus without an accessory organ (atrial diverticulum, sarcobelum or dart sac); penis muscular; penial tube thick-walled with narrow lumen; penial sheath muscular over its whole length; very distinct transition between epiphallus 2 and penis. Vagina with a strong muscular bulb; oviductal gland present. Spermatophore with at least one toothed keel at the tail tip. Radula: median and lateral teeth tricuspid, outermost laterals and marginals bicuspid or serrated.

Etymology. From Tanzania and Latin *limax*, a slug (no relationship to *Limax* Linnaeus, 1758 is implied).

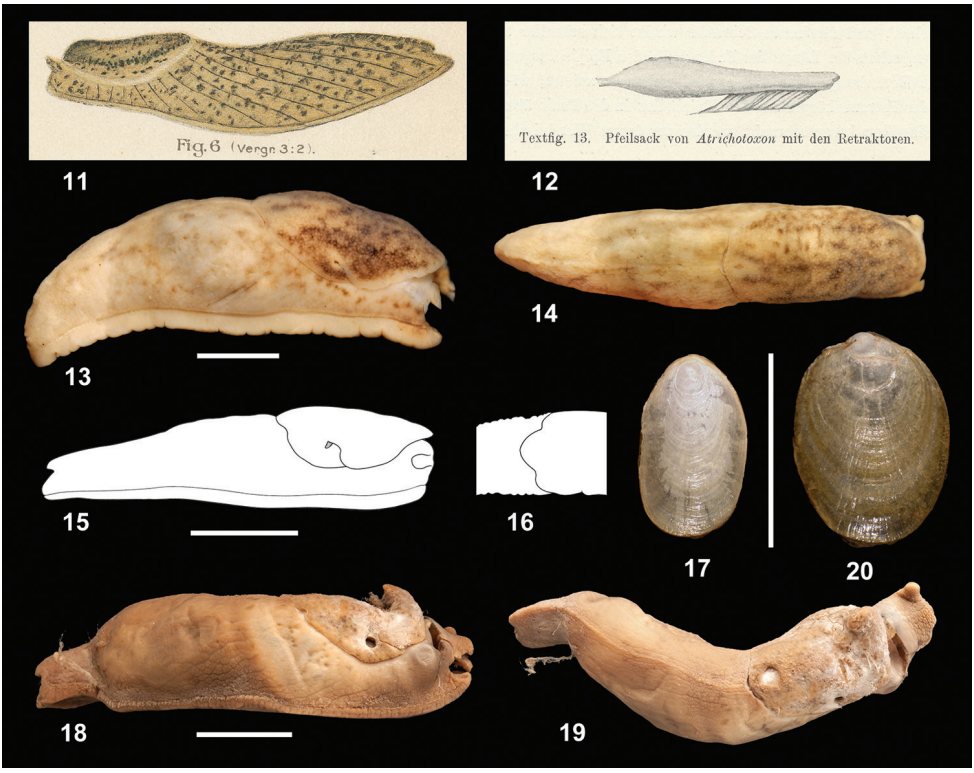
Known distribution. Forest in the East and West Usambara Mts. and the Uluguru Mts. of the Eastern Arc Mts., Tanzania.

Gender. Masculine.

Remarks. See also remarks on *Atrichotoxon* and *Udzungwalimax* gen. n. below. The schematic of the structure of the genitalia of this genus (Figs 61–62) can be contrasted with those in Van Goethem (1977: 28). The monotypic *Phaneroporus* Simroth, 1888 from the coasts of Lake Tanganyika (south-western Tanzania and northern Zambia) is similar to *Tanzalimax* gen. n. and *Udzungwalimax* gen. n. in some respects, but differs in its massively enlarged penis and penial stylet (Van Goethem 1977).

***Tanzalimax tattersfieldi* sp. n.**
http://zoobank.org/34B2EE14-347F-46E8-BB1C-CFDF75C9D47B
Figs 13–14, 17, 24, 36–38, 59–65

Material. TANZANIA: Holotype NMW.Z.1996.148.00035: 1 ad., Ambangulu FR (5.08°S, 38.43°E), West Usambara Mts., Lushoto District, montane forest at approx.

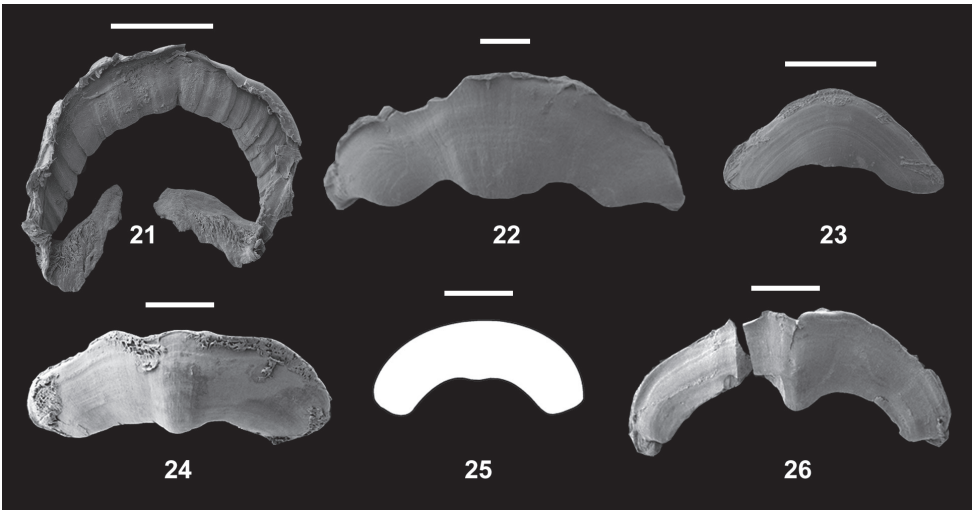


Figures 11–20. Habitus and shells, and dart sac. **11–12** *Atrichotoxon punctatum* Simroth, 1910: original figures of habitus and dart sac from Simroth (1910) **13–14 17** *Tanzalimax tattersfieldi* gen. & sp. n., holotype **15–16** *Tanzalimax seddonae*, gen. & sp. n., Paratype 1 **18–20** *Udzungwalimax suminis* gen. & sp. n., holotype. Scale bars: 10 mm (**13–16, 18–19**), 5 mm (**17, 20**).

1240 m alt., leg. PT, 29 Jan. 1996 (sample IIC). Paratype 1 RBINS.I.G. 33548/ MT.3609, 1 ad., Bomole FR (5.1°S, 38.62°E), East Usambara Mts., Muheza District, forest at 1240 m alt., leg. PT, 4 Mar 1995 (sample II). Paratype 2 NMW: 1 ad., Mtai FR (38.46°E, 4.51°S), East Usambara Mts., Muheza District, leg. Frontier Tanzania, 1996.

Description. External appearance (Figs 13–14). (In preservation; living appearance not recorded). Medium-sized (30–40 mm long) slug, body, head and tentacles pale buff, well-marked with scattered dark brown spots on back and flanks, coalescing to form diffuse bands on mantle. Sole coloured as body, tripartite. Moderate dorsal keel along whole length of tail, terminating in a very short, blunt caudal appendage. Supraperipodial groove not evident. Tail and flanks with moderately large, but smooth and very flat tubercules. Mantle moderately sized (approx. 40 % of body length) with finely granular surface and large shell pore, attached at rear.

Shell (Fig. 17). Fingernail-shaped, symmetrical, 5.0 mm long, thin and weakly mineralised, with periostracum just extending beyond the margins.



Figures 21–26. Jaws. **21** *Pseudoveronicella* (*Hoffmannia*) *zootoca tanzaniensis* subsp. n., Paratype 1., also showing patches of bristles **22** *Dendrolimax parensis* sp. n., holotype **23** *Leptichnoides avisexcrementis* sp. n., holotype **24** *Tanzalimax tattersfieldi* gen. & sp. n., holotype **25** *Tanzalimax seddonae*, gen. & sp. n., Paratype 1. **26** *Udzungwalimax suminis* gen. & sp. n., holotype. All scale bars: 1 mm.

Jaw and radula (Figs 24, 36–38). Jaw with strong median projection. Radula with central tooth and up to 80 lateral and marginal teeth in a half-row, in over 100 rows. Lateral teeth tricuspid, outermost laterals becoming bicuspid, but with mesocones pointed and largest. Serrated outer edges to some outermost marginals.

Genitalia (Figs 59–62, 64–65). Visceral cavity almost reaches tail (only the posterior 10% of body solid). No stimulator. Penial complex consisting of: strongly twisted free penis; epiphallus 1 long, epiphallus 2 very short; long epiphallic caecum; and pyriform calc sac. Penial retractor muscle arising from diaphragm. Internally, penis smooth. No penis verge. Moderately thick penial sheath present. Atrium long, with weak internal folds. Vagina with a strong muscular swelling at one side, internally with strong irregular folds and a sphincter near the swelling. Bursa copulatrix duct robust, long, not pigmented or ornamented, internally with weak longitudinal pilasters; bursa voluminous, thin-walled, pointed apically. Oviductal gland quite large, oviduct short and broad. Ovotestis sited posterior to albumen gland.

Spermatophores. Two fragmented spermatophore tails from bursa of holotype, toothed at the tail tip; three spermatophores from Paratype 2, up to 20 mm long.

Etymology. Named in honour of Peter Tattersfield, in recognition of his work, encouragement and support of others in the study of East African terrestrial molluscs, including collecting many of the slugs studied here.

Distribution and habitat. Forest in both the West and East Usambara Mts., where numerous endemic molluscs are known (e.g. Verdcourt 2006).

Remarks. See *T. seddonae* sp. n.

***Tanzalimax seddonae* sp. n.**
http://zoobank.org/28FCB609-3E33-42FA-B1A7-27693596AFD1
Figs 15–16, 25, 39–41, 66–70

Material. TANZANIA: Holotype RBINS.I.G. 33548/MT.3610, 1 ad., Uluguru North FR (6.93°S, 37.7°E), Uluguru Mts., Morogoro District, forest above Tegetero village, approx. 1300 m alt., leg. PT, 22 Jan. 1996 (sample IIG). Paratype 1 NMW.Z.1996.148.00041, 1 ad., data as previous but sample III.I. Paratype 2 NMW.Z.1996.148.00042, 1 juv., data as previous but sample ID.

Description. External appearance (Figs 15–16). (In preservation). Medium-sized slug (holotype 39 mm, paratype 30 mm), body unicolourous ivory. Sole coloured as body, tripartite. Supraperipodial groove distinct. Tail long and rounded, with a blunt keel only at the end, terminating in a very distinct caudal appendage. Tail and flanks with a warty appearance. Mantle moderately sized (40% of body length) with fine granular surface; no shell pore.

Shell. Fingernail-shaped, symmetrical, 4.3 mm long, very thin, not mineralised, except for the apex.

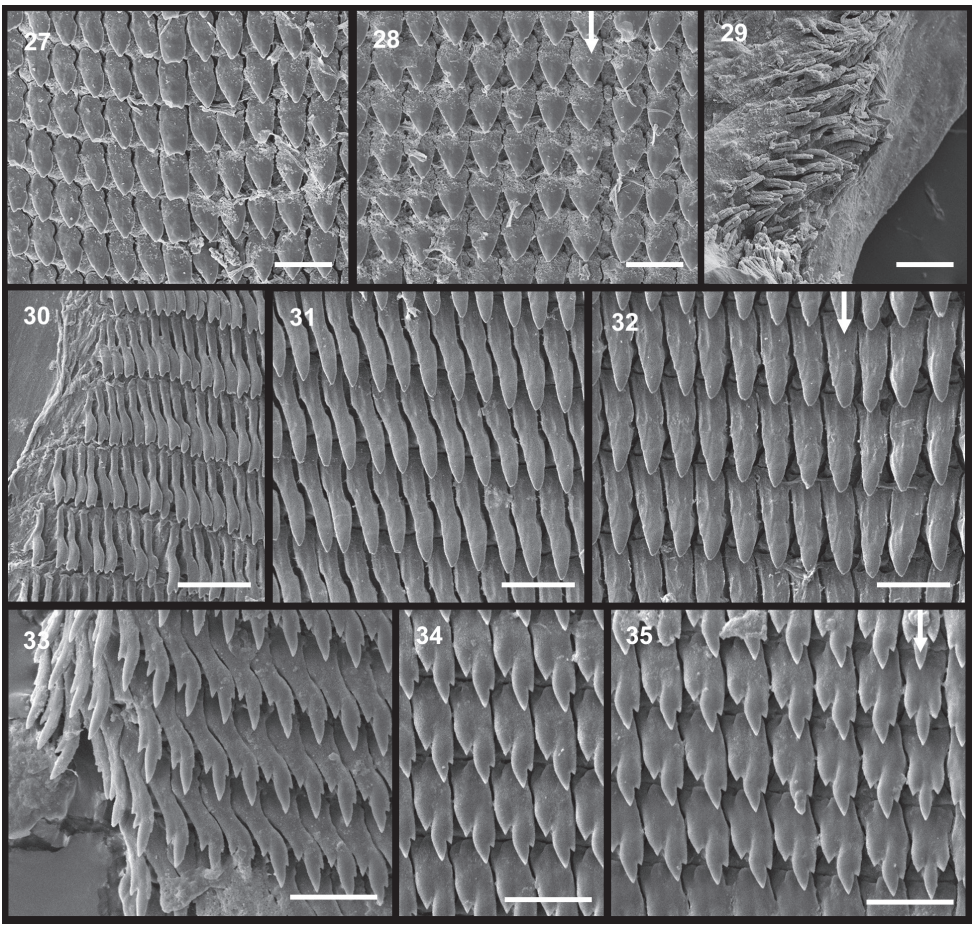
Jaw and radula (Figs 25, 39–41). Jaw with minor median projection, 1.9 mm wide. Radula with central tooth and up to 70 lateral and marginal teeth in a half-row, in over 100 rows. Lateral teeth tricuspid, with mesocones pointed and largest; many outermost marginals with serrated outer edges.

Genitalia (Figs 66–67). Visceral cavity almost reaches tail (only the posterior 10% of body solid). No stimulator. Penial complex consisting of: stout free penis, narrow in its straight proximal part, with one (holotype) and two (paratype) volutions; epiphallus 1 a little shorter than penis; epiphallus 2 extremely short; long epiphallic caecum; pyriform calc sac. Penial retractor muscle arising from diaphragm. Internally, penis tube thick walled. No penis verge. Penis sheath thick walled, free in its proximal half, fused with penial tube in its distal half. Atrium relatively wide, with internal longitudinal folds. Vagina short, with a thick muscular wall all around, with a narrow lumen. Duct of bursa copulatrix long; bursa elongated. Oviductal gland quite voluminous. Oviductus very short and broad. Vas deferens short. Ovotestis sited posterior to albumen gland.

Spermatophores (Figs 68–70). In paratype two empty spermatophores found in the bursa entangled with a third, even more corroded one. Length +/- 11 mm. Apex pointed. Outer side of ampulla with numerous, scattered very tiny pointed nodules; interior side and apical part smooth; very short tail with two rows of very tiny hooks, not exceeding 0.03 mm.

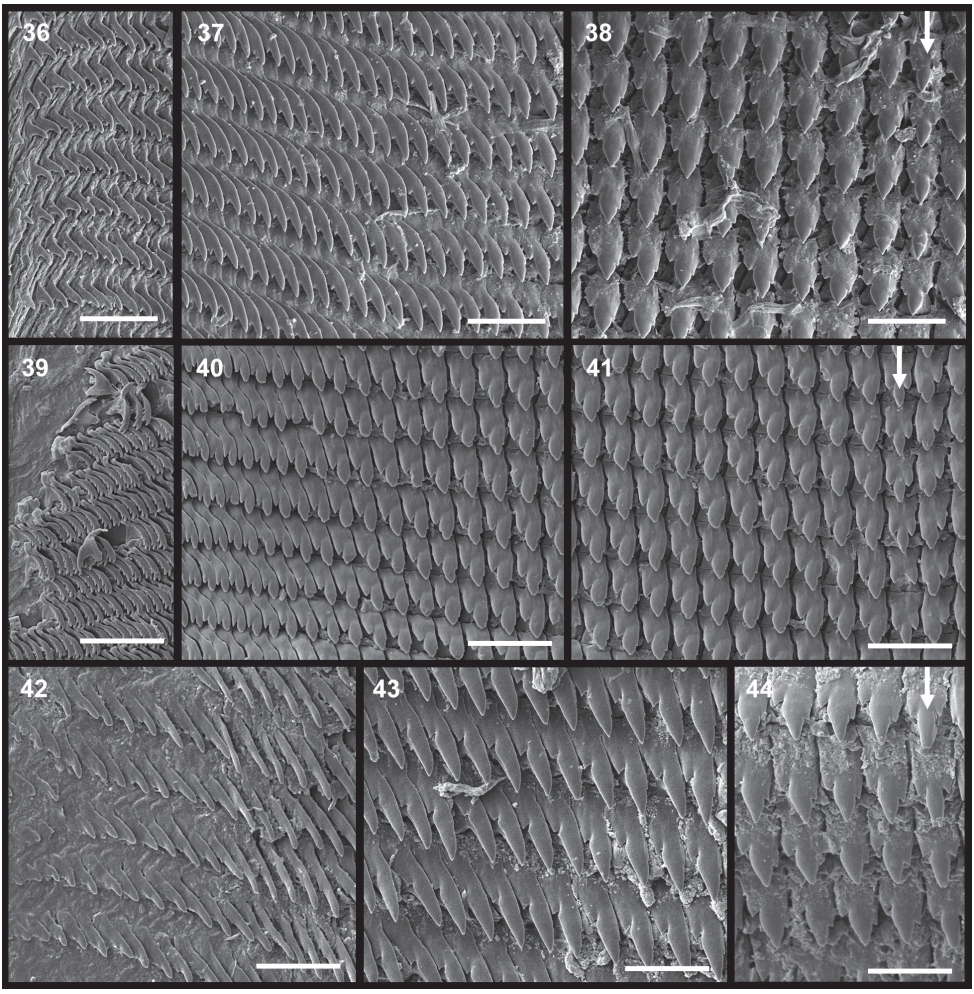
Etymology. Named in honour of Mary Seddon, in recognition of her work, encouragement and support of others in the study of East African terrestrial molluscs, and in mollusc conservation worldwide.

Distribution and habitat. Probably endemic to forest in the Uluguru Mts., where several other endemic forest molluscs occur (e.g. Verdcourt 2006; Tattersfield and Rowson 2011).



Figures 27–35. Radulae. From left to right, marginal, lateral and central teeth (arrow), each shown to the same scale. **27–28** *Pseudoveronicella* (*Hoffmannia*) *zootoca tanzaniensis* subsp. n., Paratype 1 **29** bristles from beneath jaw **30–32** *Dendrolimax parensis* sp. n., holotype **33–35** *Leptichnoides avisexcrementis* sp. n., holotype. All scale bars 50 μm except for **33–35**, 20 μm.

Remarks. *Tanzalimax seddonae* sp. n. resembles *T. tattersfieldi* sp. n. in the striking appearance of the penial complex, the penis being very muscular in both the penial tube and the penial sheath, and in the very short epiphallus 2. The vagina is also strikingly muscular. The species differs from *T. tattersfieldi* sp. n. by the much smaller genital system, despite both species having a similar body length. The penis has only 1–2 volutions instead of 5 in the latter. The vagina has a muscular ring, while in the latter species it is a muscular bulb at one side. The spermatophore looks smooth at first glance, but has numerous scattered very tiny pointed nodules at the outer side of the ampulla; the very short tail has two rows of very tiny hooks. In preservation the body looks warty and is uniformly ivory coloured, lacking markings.



Figures 36–44. Radulae. From left to right, marginal, lateral and central teeth (arrow), each shown to the same scale. **36–38** *Tanzalimax tattersfieldi* gen. & sp. n., holotype **39–41** *Tanzalimax seddonae*, gen. & sp. n., Paratype 1 **42–44** *Udzungwalimax suminis* gen. & sp. n., holotype. All scale bars 50 μm.

Genus *Udzungwalimax* gen. n.

http://zoobank.org/6D8C31D2-35FE-4D1F-9997-0FEBD39EC153

Type species. *Udzungwalimax suminis* sp. n.

Included species. *Udzungwalimax suminis* sp. n.

Diagnosis. Slug belonging to tribe Urocyclini. Genital apparatus without an accessory organ (atrial diverticulum, sarcobelum or dart sac); penis strong, with straight proximal part, narrowing towards the twisted distal part; penial tube thick-walled with broad lumen; penial sheath very thin. Vagina thick-walled with a distinct muscular part at one side; oviductal gland present, entering the vagina at a sharp angle. Sper-

matophore smooth. Radula: median and lateral teeth tricuspid, outermost laterals and marginals bicuspid.

Etymology. From the Udzungwa Mts. and Latin *limax*, a slug (no relationship to *Limax* Linnaeus, 1758 is implied).

Known distribution. Forest in the Udzungwa Mts. of the Eastern Arc, Tanzania.

Gender. Masculine.

Remarks. See also remarks on *Atrichotoxon*, *Tanzalimax* gen. n., and *Phaneroporus* above. The schematics of the structure of the genitalia (Figs 74–75) can be contrasted with those in Van Goethem (1977: 28).

***Udzungwalimax suminis* sp. n.**
http://zoobank.org/38EBC26E-69DB-44D0-A51E-2E266AE69B2F
Figs 18–20, 26, 42–44, 71–75

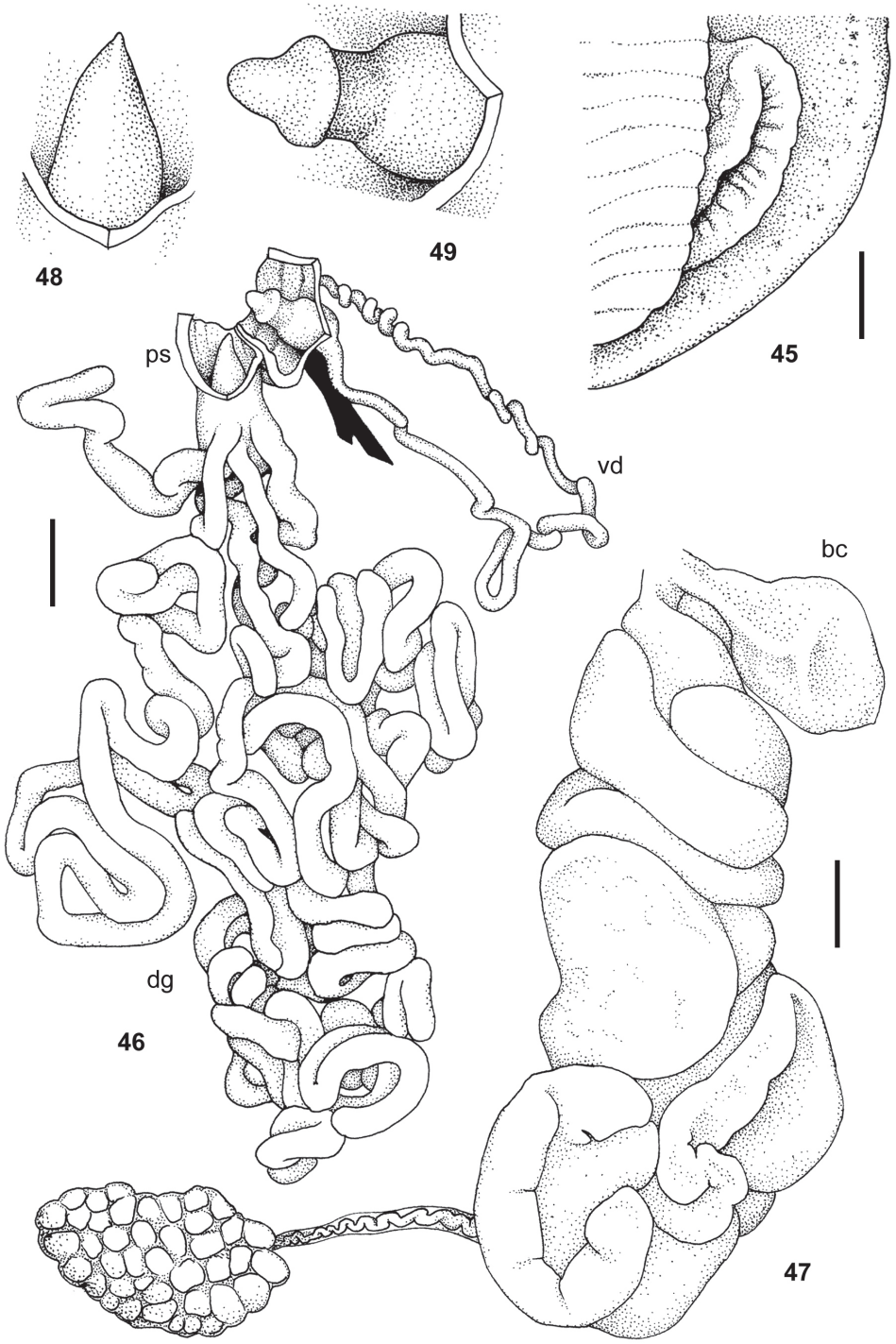
Material. TANZANIA: Holotype NMW.Z.1997.007.00011: 1 ad., Lulanda FR (8.62°S, 35.62°E), Mufindi District, montane forest at 1430 m alt., leg. AK, NO, CFN, MBS & PT, 12 Feb. 1997 (sample IG). Paratype 1 NMW.Z.1997.007.00013: 1 ad., data as previous but sample IH. Paratypes NMW.Z.1997.007.00014: 4 ads., 1 juv.?, data as previous. Paratype RBINS.I.G. 33548/MT.3611: 1 ad., data as previous. Paratype NMT: 1 ad., data as previous. Paratypes NMW.Z.1997.007.00012: 2 juvs., data as previous but sample IG.

Description. External appearance (Figs 18–19). (In preservation; living appearance not recorded). Medium-sized (46 mm long) slug, body, head and tentacles rich brown, lacking markings save for a few small scattered dark brown spots on and around the mantle. Sole coloured as body, tripartite. Moderate dorsal keel along whole length of tail, terminating in a short, blunt caudal appendage. Supraperipodial groove not evident. Tail and flanks with moderately large, but smooth and very flat tubercules. Mantle moderately sized (approx. 35% of body length) with finely granular surface and large shell pore, attached at rear. Two probable juveniles, collected with the holotype, have additional dark brown markings on and around the mantle.

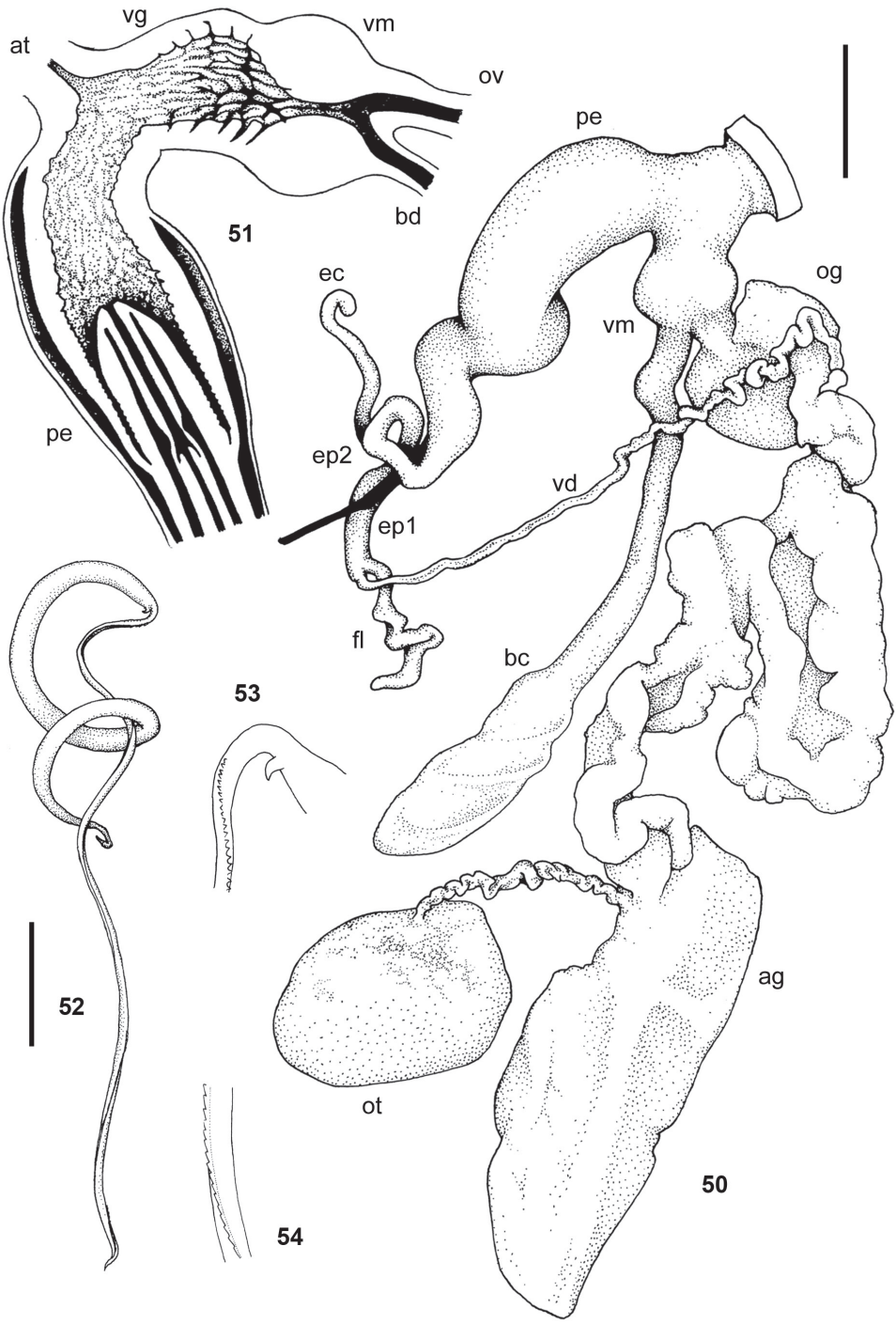
Shell (Fig. 20). Fingernail-shaped, nearly symmetrical, 7.3 mm long, thin and weakly mineralised, with periostracum just extending beyond the margins.

Jaw and radula (Figs 26, 42–44). Jaw with strong median projection. Radula with central tooth and up to 66 lateral and marginal teeth in a half-row, in over 100 rows. Lateral teeth tricuspid, outermost laterals becoming bicuspid, but with mesocones pointed and largest. No serrated outer edges to the outermost marginals.

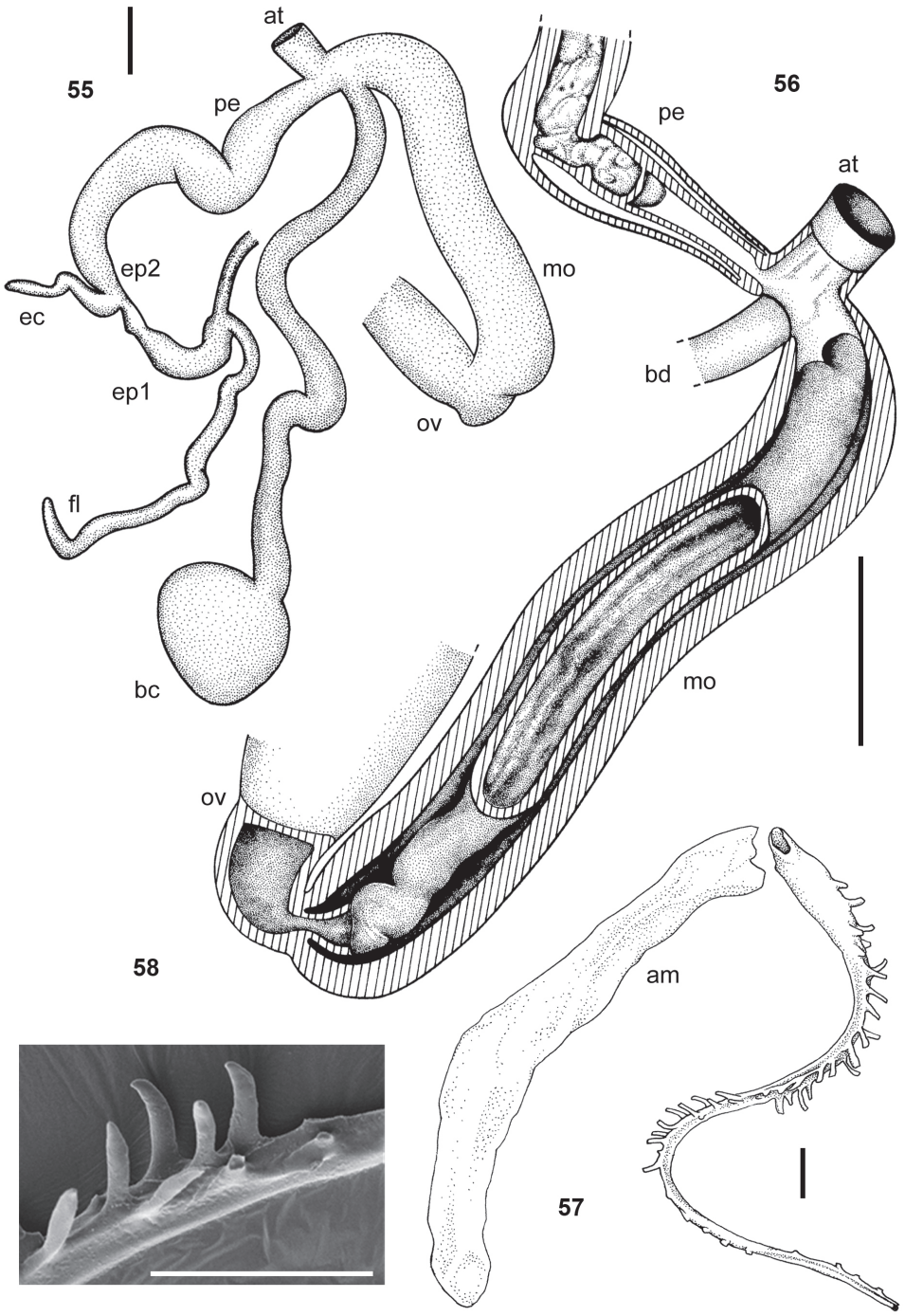
Genitalia (Figs 71–74). Visceral cavity almost reaches tail (only the posterior 10% of body solid). No stimulator. Penial complex consisting of: stout free penis, broad in its proximal part then rapidly narrowing; epiphallus 1 a little shorter than penis, epiphallus 2 short; long epiphallic caecum; pyriform calc sac. Penial retractor muscle arising from diaphragm. Internally, penis covered with many rounded, mamillate papillae with hard tips, arranged in irregular rows, some on a tongue-like flap. Papillae replaced by



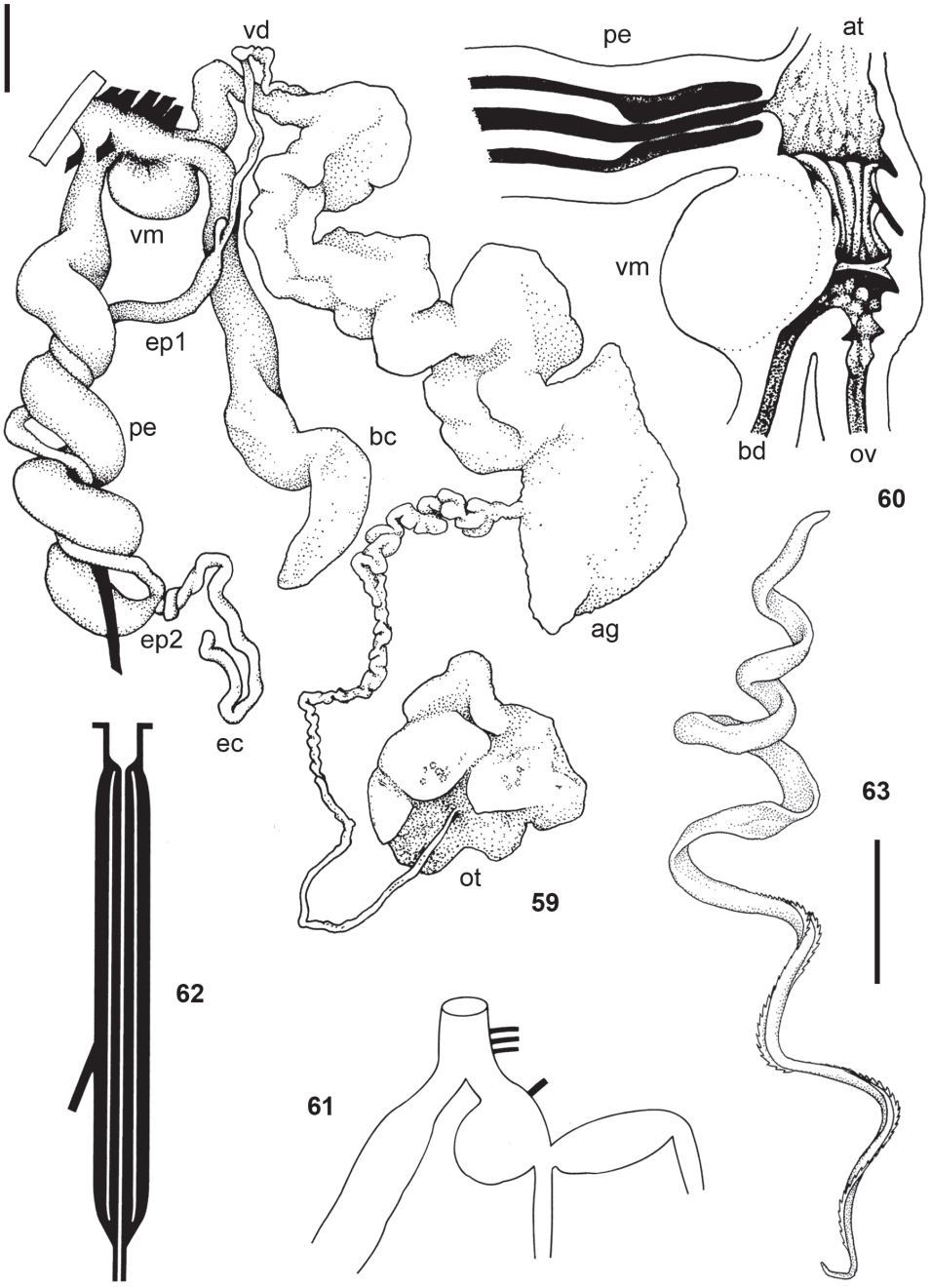
Figures 45–49. *Pseudoveronicella* (*Hoffmannia*) *zootoca tanzaniensis* subsp. n., holotype. **45** anus **46** male genitalia **47** female genitalia **48** tip of penial gland **49** penial verge. All scale bars 2 mm.



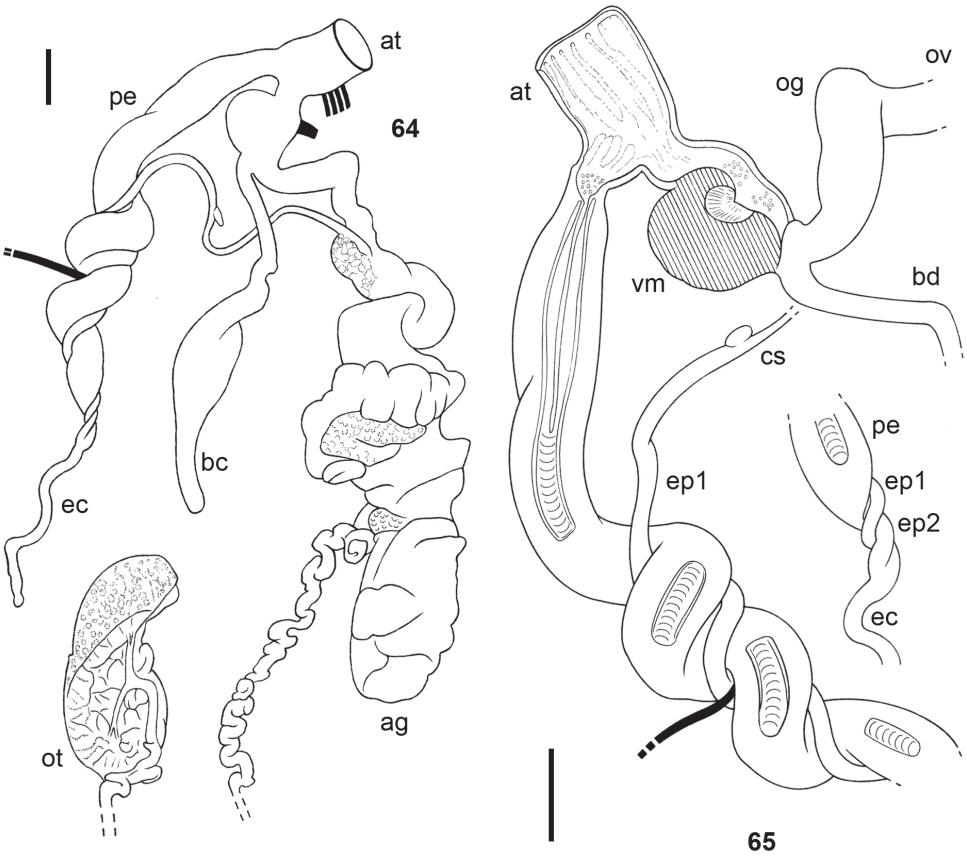
Figures 50–54. *Dendrolimax parensis* sp. n., holotype. **50** genitalia **51** interior of penis and vagina **52** spermatophore **53–54** details of angle and tail serration of spermatophore. All scale bars 5 mm.



Figures 55–58. *Leptichnoides avisexcrementis* sp. n., Paratype 4. **55** genitalia **56** interior of penis and vagina **57–58** *Leptichnoides avisexcrementis* sp. n., holotype **57** spermatophore **58** details of tail serration of spermatophore. Scale bars 1 mm (**55–56**), 100 μm (**57–58**).



Figures 59–63. *Tanzalimax tattersfieldi* gen. & sp. n. **59–62** holotype **59** genitalia **60** interior of penis and vagina **61–62** schematics of genitalia and penis **63** Paratype 2, spermatophore. All scale bars 2 mm.

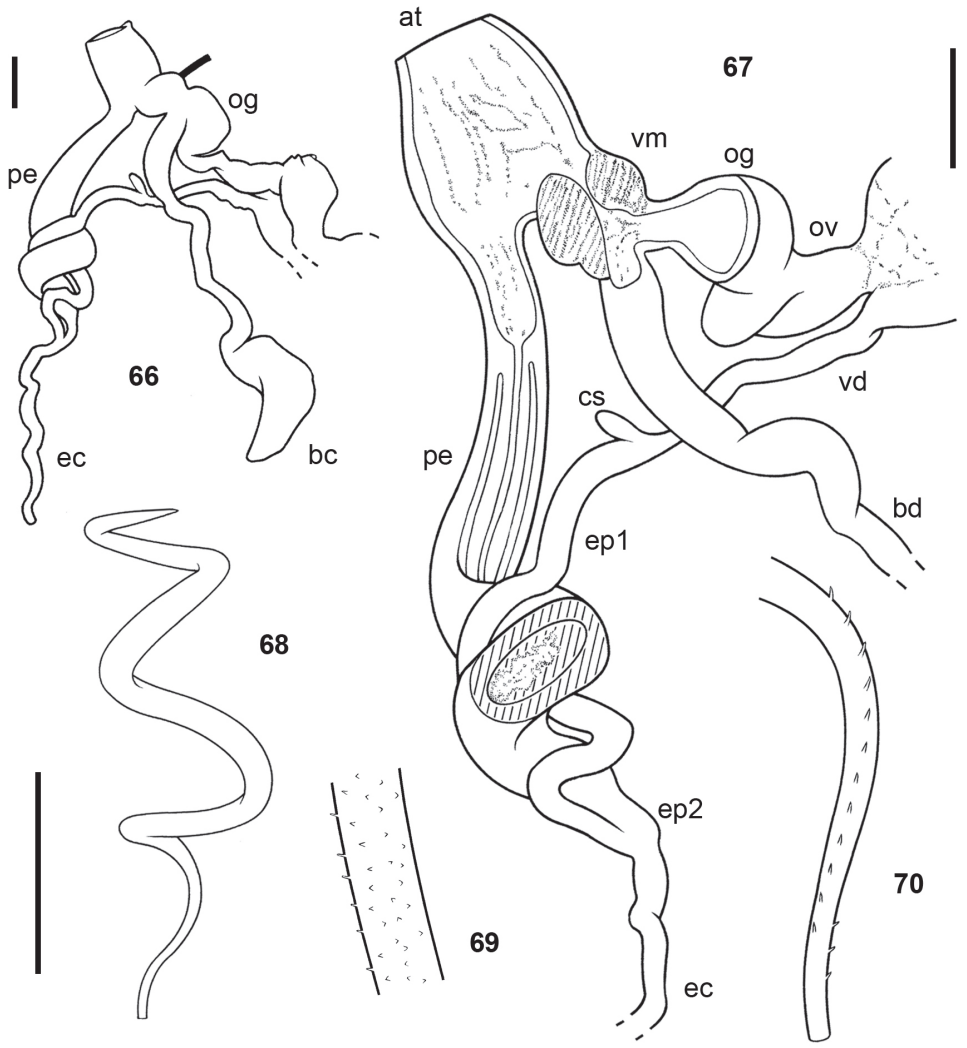


Figures 64–65. *Tanzalimax tattersfieldi* gen. & sp. n., Paratype 1. **64** genitalia **65** interior of penis and vagina. All scale bars 2 mm.

horizontal folds or pilasters at point where free penis narrows. No obvious verge in penis, but a basal constriction present. Very thin, transparent penial sheath present. Atrium long, with weak internal folds. Vagina with a muscular swelling at one side, internally with strong irregular folds. Bursa copulatrix duct robust, very long, not pigmented or ornamented, internally with weak longitudinal pilasters; bursa voluminous, thin-walled, pointed apically. Oviductal gland small, oviductus short and broad, leaving vagina at a sharp angle. Vas deferens short. Ovotestis sited posterior to albumen gland.

Spermatophores (Fig. 75). Two spermatophores from bursa of holotype, up to 18 mm long when coiled, with 4.5 volutions. No clear division between ampulla and tail. Spermatophore pointed at both ends, appearing completely smooth, without obvious hooks or keels; cylindrical, although becoming slightly more laterally compressed towards tail tip.

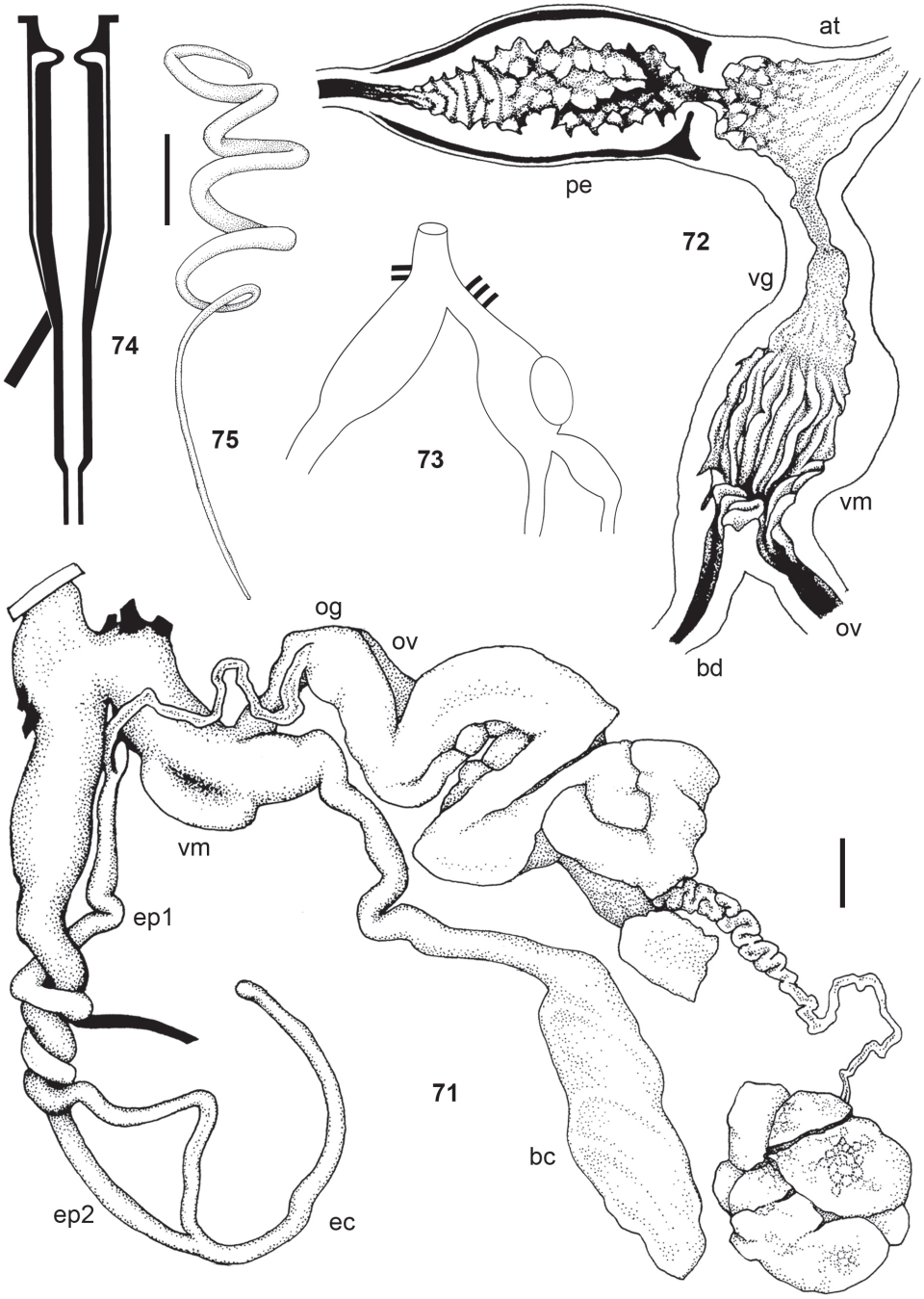
Etymology. From Latin 'suminis', a sow's udders, or a breeding sow, used as a noun in apposition referring to the mamillate surface of the penis.



Figures 66–70. *Tanzalimax seddonae* gen. & sp. n., holotype. **66** genitalia **67** interior of penis and vagina **68** spermatophore **69–70** details of head and tail serration on spermatophore. All scale bars 2 mm.

Distribution and habitat. Probably endemic to forest in the Udzungwa Mts., where several other endemic forest molluscs occur (Rowson & Van Goethem 2012).

Remarks. This species is apparently unique in its hard-tipped, mamillate papillae inside the penis. No similar structures are mentioned or illustrated in Van Goethem (1977) or are present in any other species examined. They are not the same structures as the "lobules" inside the atrium of *A. usambarense* (Verdcourt & Polhill 1961, Van Goethem 1977). Neither are they present in *Emphysetes* Verdcourt, 2003, another recently described genus of Urocyclini from Udzungwa (Verdcourt 2003; observation verified from the holotype by A. J. de Winter, Leiden). The most similar structures



Figures 71–75. *Udzungwalimax suminis* gen. & sp. n., Paratype 1. **71** genitalia **72** interior of penis and vagina **73–74** schematics of penis and genitalia **75** spermatophore. All scale bars 2 mm

seem to be the small, easily dislodged, irregular spines found on the penial prepuce of *Polytoxon robustum* (Simroth, 1896) (Van Goethem 1977), or perhaps the splinter-like crystals described by Verdcourt and Polhill (1961) in their *Atrichotoxon* "sp. n." from the Taita Hills. Van Goethem (1973) described tubercles inside the penis of the the Malawian *Atoxonoides aberrans* Van Goethem, 1973, but they are not mamillate in shape and were not said to have hard tips.

Superfamily Limacoidea Lamarck, 1801
Family Agriolimacidae Wagner, 1935
Genus *Deroceras* Rafinesque, 1820

***Deroceras* cf. *laeve* (Müller, 1774)**

Material. TANZANIA: NMW.Z.2001.040.00001: 2 ads., central Mbeya (8.91°S, 33.46°E), Mbeya District, in a cabbage from town market, approx. 1600-1800 m alt., leg. MBS, PT & AR, 25 Jun. 2001. The cabbage, probably locally grown, also harboured a juvenile *Elisolimax* or *Bukobia* sp. (NMW.Z.2001.040.00002). Comparative material of non-African *Deroceras* spp.: specimens cited in Rowson et al. 2014a; b).

Remarks. The genus *Deroceras* is primarily Palaearctic, but nonetheless is represented by a few species in Ethiopia. It includes several species spread widely by humans. These include the pest *D. reticulatum* (Müller, 1774) and the "tramp slug" *D. invadens* Reise, Hutchinson, Schunack & Schlitt, 2011 (see Reise et al. 2011 for synonymy). Although both species and *D. laeve* (Müller, 1774) are well-established in South Africa (Herbert 2010), records of *Deroceras* in tropical Africa are few. Verdcourt (1960a) recorded *D. laeve andecolum* (D'Orbigny, 1837) from a Nairobi garden. He later listed *D. laeve* from Muguga and Ruiru, both near Nairobi, and from Thika where it was damaging orchids, later listing it from the "Nairobi area" generally (Verdcourt 1965, 2006). Nairobi and Mbeya have relatively similar, cool climates when compared to "Zanzibar", from which two *Deroceras* have been reported: *D. laeve* (Simroth 1895) and *D. reticulatum* (Ellis 1969). The *D. laeve* record seems plausible, given that species' apparently very broad ecological tolerance (Wiktor 2000), although there is some evidence *D. laeve* may comprise more than one species (Rowson et al. 2014a). Rowson (2007) considered the *D. reticulatum* record doubtful and to require confirmation. *Deroceras invadens* has now been intercepted on Kenyan flowers arriving in the USA (Hutchinson et al. 2014). These authors reported *D. laeve* from São Tomé, where it had been identified as *D. invadens*, but also suggest that some records of "*D. laeve*" outside Europe may refer to *D. invadens*. *Deroceras laeve* was also reported from Ethiopia by Simroth (1895) along with *Agriolimax jickelii* "Heynemann", a species Wiktor (2000) considers a nomen dubium. Simroth later (1904) described 14 other *Deroceras* species from Ethiopia. Some could potentially be confused with introduced species, but others

are highly distinctive and doubtless endemic. Wiktor (2000) maintained ten of them in his revision. According to Wiktor (2000) the most southerly native occurrence of Agriolimacidae is *D. uataderensis* (Simroth, 1904), described from Lake Gandjule in the southern Ethiopian Rift (Lake Abaya or Lake Chamo, approx. 6°N, approx. 1200 m alt.). Terrestrial molluscs with apparently Ethiopian or Palaeartic links are known from the archipelago-like Afroalpine and Afromontane regions isolated on the highest East African mountains (e.g. Tattersfield et al. 2001, Verdcourt 2006). However, on a broader scale, and at more moderate altitudes, the Ethiopian biota is biogeographically very distinct from that of southern Tanzania (e.g. Linder et al. 2012).

The Mbeya slugs are 17.5 and 16.8 mm long, larger than most of the preserved *D. laeve* examined but smaller than most *D. invadens*, so in fact within the range of overlap. They resemble *D. reticulatum* (and some Ethiopian species) in being pale cream with black-brown tentacle retractors, and a dusting of light brown pigment along the centre of the mantle and forming a network between the tubercles at the top of the tail. The skin is thin, with the part of the mantle underlain by the shell relatively obvious. The pneumostome is surrounded by a contrastingly pale ring. The tail tip is steeply truncate. The skin, pneumostome and tail features are often considered diagnostic of *D. invadens* or *D. laeve* as compared to *D. reticulatum*, as is the length of the tail, although none may be infallible (e.g. Rowson et al. 2014b and references therein). Indeed, Herbert (2010) notes that some *D. invadens* in South Africa closely resemble *D. reticulatum* externally. Internally, no rectal caecum was found in the Mbeya slugs, ruling out *D. reticulatum* which has a large one (Wiktor 2000). This also would seem to rule out a group of taxa including *D. invadens*, which Wiktor treats as having a shallow, pocket-like caecum. However, it is clear that the caecum can be so shallow as to be undetectable in *D. invadens* (Quick 1960, Reise et al. 2011). The ovotestis lies relatively far forward, anterior of the rectum, and is scarcely exposed. Quick (1960) showed an anterior ovotestis for *D. invadens* and described a "less exposed" ovotestis for *D. laeve*. The female genitalia are well developed but the penis is reduced to a tiny nub without a retractor muscle (an aphallic condition). The combination of aphally and no rectal caecum makes the Mbeya slugs key to *D. laeve* in Wiktor (2000); indeed, aphally has often been used to attribute putative *D. invadens* specimens to *D. laeve* (e.g. Quick 1960, Wiktor 2000, Reise et al. 2006, Hutchinson et al. 2014). Although it has been suggested that *D. invadens* could potentially be aphallic (de Winter 1988), there is as yet no substantiated report of aphally in any *Deroceras* species other than *D. laeve* (J.M.C. Hutchinson pers. comm. 2017). Genetic data also suggest that worldwide *D. laeve* might consist of more than one species (e.g. Rowson et al. 2014a). We therefore attribute the Mbeya slugs to *D.* cf. *laeve*, a matter that could be settled with molecular data from this population. Until then any evidence of the spreading of non-native slugs in tropical Africa seems worth reporting, given the potential economic and conservation implications.

Acknowledgements

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RESEARCH ARTICLE

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New species of *Indocloeon* Müller-Liebenau from South-East Asia (Ephemeroptera, Baetidae)

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Abstract

One new species of *Indocloeon* Müller-Liebenau from Brunei, *I. spathasetis* **sp. n.**, and one new species from Indonesia, *I. timorense* **sp. n.**, are described and illustrated based on their larvae. The total number of known *Indocloeon* species increases from two to four and the generic attributes of the larvae are amended based on the examination of the new species. Results on the genetics of some species (COI) as well as comments on the distribution of *I. indonesiae* Kluge are also provided.

Keywords

Brunei, COI, distribution, Indonesia, Oriental Region, taxonomy

Introduction

The genus *Indocloeon* was established by Müller-Liebenau (1982) for unusual larvae collected in Sri Lanka; the genus was originally monotypic including *Indocloeon primum* Müller-Liebenau. The genus was mainly characterised by a brush of setae between prostheca and mola of the right mandible, a slender maxillary palp reaching far beyond galea-lacinia, a labial palp with a pointed distomedial protuberance, slender

legs with nearly parallel margins, the outer margin of the femur with strong short setae, the outer margin of the tibia with only two apical setae and no setae at outer margin of the tarsus, moderately elongate, pointed claws with two rows of denticles and the posterior margin of terga with long spines, which are fused at base and pointed at apex (Müller-Liebenau 1982). It belongs to the plesiomorphon Protopatellata lineage within the family Baetidae, as the patella-tibial suture is only developed on Middle and hind legs of all stages (Kluge 2012). A second species was described by Kluge (2012) from Indonesia, *Indocloeon indonesiae* Kluge. He also provided a complete re-description of the genus and of *I. primum* as well as the first description of the imaginal stages. Here we describe two new species of *Indocloeon* based on material recently collected in Brunei Darussalam and Indonesia. Further we investigated the genetics of three species (cytochrome oxidase subunit 1, COI). All species of *Indocloeon* are morphologically and genetically well differentiated. The discovery of these new species implied the revision of part of the generic characters.

Materials and methods

The specimens were collected by Kate Baker (King's College London, UK) in the Ulu Temburong National Park in Brunei Darussalam with surber and kick-sampling methods (Baker et al. 2016a, b, 2017a, b) and by Michael Balke (Zoologische Staatssammlung München, ZSM, Germany) on the islands of Flores, Sumbawa, and Timor (Indonesia).

The specimens were preserved in 70%–96% ethanol. The dissection of larvae was done in Cellosolve (2-Ethoxyethanol) with subsequent mounting on slides with Euparal liquid, using an Olympus SZX7 stereomicroscope.

The DNA of part of the specimens was extracted using non-destructive methods allowing subsequent morphological analysis (see Vuataz et al. 2011 for details). We amplified a 658 bp fragment of the mitochondrial gene cytochrome oxidase subunit 1 (COI) using the primers LCO 1490 (GGTCAACAAATCATAAAGATATTGG) and HCO 2198 (TAAACTTCAGGGTGACCAAAAAATCA) (Folmer et al. 1994). The polymerase chain reaction was conducted with an initial denaturation temperature of 98 °C for 30 sec followed by a total of 37 cycles with denaturation temperature of 98 °C for 10 sec, an annealing temperature of 50 °C for 30 sec and an extension at 72 °C for 30 sec, final extension at 72 °C for 2 min. Sequencing was done with the method of Sanger (Sanger et al. 1977). The genetic variability between specimens was estimated using the Kimura-2-parameter distances (Kimura 1980) calculated with the program MEGA 7 (Kumar et al. 2016, http://www.megasoftware.net). The GenBank accession numbers are given in Table 1.

Drawings were made using an Olympus BX43 microscope. Photographs of larvae were taken using a Canon EOS 6D camera and the Visionary Digital Passport imaging system (http://www.duninc.com) and processed with the programs

Table 1. Sequenced specimens.

Species	Locality	Specimen catalog #	GenBank # (COI)	GenSeq Nomenclature
I. spathasetis sp. n.	Brunei	GBIFCH 00280816	MF414701	genseq-1 COI
I. spathasetis sp. n.	Brunei	GBIFCH 00280817	MF414702	genseq-2 COI
I. indonesiae	Flores	GBIFCH 00280818	MF414703	genseq-4 COI
I. indonesiae	Flores	GBIFCH 00280819	MF414704	genseq-4 COI
I. indonesiae	Sumbawa	GBIFCH 00280820	MF414705	genseq-4 COI
I. indonesiae	Sumbawa	GBIFCH 00280821	MF414706	genseq-4 COI
I. timorense sp. n.	Timor	GBIFCH 00280822	MF414707	genseq-1 COI

Adobe PhotoShop Lightroom (http://www.adobe.com) and Helicon Focus version 5.3 (http://www.heliconsoft.com). Photographs were subsequently enhanced with Adobe Photoshop Elements 13.

The distribution map was generated with the program Simple Mapper (http://research.amnh.org/pbi/maps) and the program GEOLocate (http://www.museum.tulane.edu/geolocate/web/WebGeoref.aspx) was used to attribute approximate GPS coordinates to sample locations of Müller-Liebenau (1982) and Kluge (2012).

The taxonomic descriptions presented herein were generated with a DELTA (Dallwitz 1980, Dallwitz et al. 1999) database containing the morphological states of characters of the new *Indocloeon* species.

Results

New species descriptions

***Indocloeon spathasetis* sp. n.**
http://zoobank.org/29C62FD3-7205-4ADB-B658-6740648D746B
Figures 1a, 2, 3, 6a–c

Diagnosis. Larva. Following combination of characters: A) Middle length of antenna with conspicuous large spines at outer lateral margin (Fig. 3a, b); B) labrum with submarginal dorsal arc of setae composed of a medium apically pointed seta plus eight medium, clearly spatulate and apically pointed setae (Fig. 2a, b); C) distomedial protuberance at segment II of labial palp well developed, triangular, apically slightly rounded with partly flattened margin (Fig. 2i); D) claw with two rows of denticles, each with two larger denticles apically and many small denticles basally (Fig. 3h).

Description. Larva (Figs 1a, 2, 3). Body length 3.7 mm; antenna: approximately twice as long as head length.

*Colouration***.** Head, thorax and abdomen dorsally brown (Fig. 1a). Head and thorax dorsally with bright longitudinal line, forewing pads with bright striation, tergum X light

Figure 1. Habitus, larvae: **a** *Indocloeon spathasetis* sp. n., dorsal view **b** *Indocloeon timorense* sp. n., dorsal view **c** *Indocloeon timorense* sp. n., ventral view.

brown. Thorax and abdomen ventrally brown. Legs colourless with a distomedial brown area on femur, medial on tibia and proximal on tarsus. Caudal filaments light brown.

Antenna (Fig. 3a, b) with scape and pedicel subcylindrical; flagellum with long spines on apex of each segment and with scales. Middle part of flagellum with very large and long spines on apex of a few segments at outer lateral margin.

Labrum (Fig. 2a). Rectangular, length 0.7× maximum width. Distal margin with medial emargination and small process. Dorsally with medium, fine, simple setae scattered over surface; submarginal dorsal arc of setae composed of one medium, apically pointed central seta plus eight medium, spatulate, apically pointed setae. Ventrally with submarginal row of setae composed of lateral and partly anterolateral feathery setae and medial as well as partly anterolateral simple setae; short, spine-like setae near lateral and anterolateral margin.

Right mandible (Fig. 2c, d). Incisors fused. Outer and inner sets of denticles with 4 + 3 denticles respectively. Inner margin of innermost denticle with a row of thin setae.

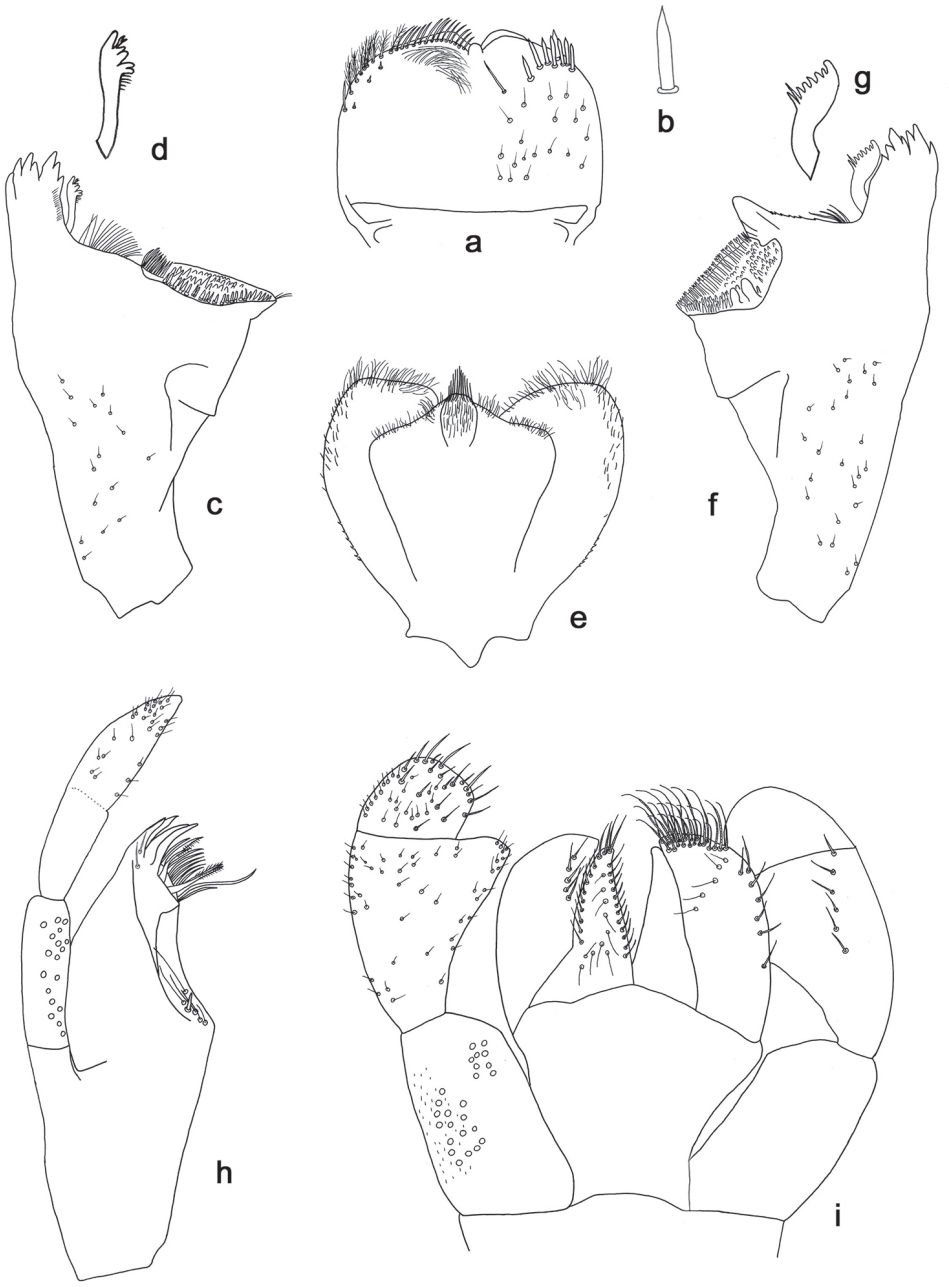

Figure 2. *Indocloeon spathasetis* sp. n., larva morphology: **a** Labrum **b** Seta of the labrum dorsal submarginal arc **c** Right mandible **d** Right prostheca **e** Hypopharynx **f** Left mandible **g** Left prostheca **h** Maxilla **i** Labium.

Prostheca robust, apically denticulate (Fig. 2d). Margin between prostheca and mola straight, tuft of setae present. Tuft of spine-like setae at base of mola absent. Tuft of setae at apex of mola present.

Left mandible (Fig. 2f, g). Incisors fused. Outer and inner sets of denticles with 3 + 4 denticles respectively. Prostheca robust, apically denticulate, with comb-shape structure (Fig. 2g). Margin between prostheca and mola straight, with minute denticles towards subtriangular process. Tuft of setae between prostheca and mola small and directed proximally. Tuft of spine-like setae at base of mola absent. Subtriangular process wide, slightly above level of area between prostheca and mola. Denticles of mola apically constricted. Tuft of setae at apex of mola absent.

Both *mandibles* with lateral margins almost straight. Basal half with fine, simple setae scattered over dorsal surface.

Hypopharynx (Fig. 2e). Lingua shorter than superlingua. Lingua longer than broad. Medial tuft of setae present; distal half laterally expanded. Superlingua apical margin rounded; lateral margin rounded; simple setae scattered over lateral and distal margin, finer and longer at distal margin.

Maxilla (Fig. 2h). With two simple, robust apical setae under crown. Inner dorsal row of setae with three denti-setae, distal denti-seta teeth-like, Middle and proximal denti-setae slender and pectinate. Medially with one spine-like seta and five long, simple setae. Maxillary palp 1.5× as long as length of galea-lacinia; three segmented, segment II and III nearly fused; setae on maxillary palp fine, simple, scattered over surface of segment III, especially at apex. Palp segment II 0.7× length of segment I. Palp segment III 1.3× length of segment II. Apex of last segment conical.

Labium (Fig. 2i). Glossa basally broad, narrowing toward apex, slightly shorter than paraglossa. Inner margin with 12 long, simple setae. Apex with four long, robust, pectinate setae. Outer margin with nine long, simple setae. Ventral surface with long, fine, simple, scattered setae. Paraglossa sub-rectangular, apex obliquely truncate and slightly rounded. Apex with three rows of robust, pectinate setae. Outer margin with row of seven long, spine-like setae. Dorsally with row of five long, simple setae. Ventrally with five long, simple setae near inner margin. Labial palp with segment I 0.7× length of segments II and III combined. Segment I covered with micropores and with tiny, robust, simple setae along outer margin. Segment II with triangular, apically slightly rounded distomedial protuberance; distomedial protuberance 0.5× width of base of segment III; inner margin with short, fine, simple setae, more abundant at apex; outer margin with short, fine, simple setae; dorsally with row of six long, simple setae. Segment III subquadrangular, asymmetrical; length 0.8× width; covered with long, simple setae and short, fine, simple setae, apically more dense.

Hind wing pads absent.

Foreleg (Fig. 3f, g, h). Ratio of foreleg 1.5:1.0:1.0:0.4. *Fore femur*. Length approximately 4× maximum width. Dorsally with row of eight curved, spine-like, short setae on margin and a row of seven stout and somewhat spatulate setae near margin; length of setae 0.2× maximum width of femur. Apex rounded; with two long, curved, spine-like setae. Ventrally with about 14 bipectinate, stout setae, predominantly arranged in one row. *Tibia.* Dorsally bare except one long, spine-like, curved seta near apex. Ventrally with bipectinate, stout setae on margin and close to margin, apical setae very long (pectination in lateral view difficult to see). Tibio-patellar suture absent. *Tarsus.*

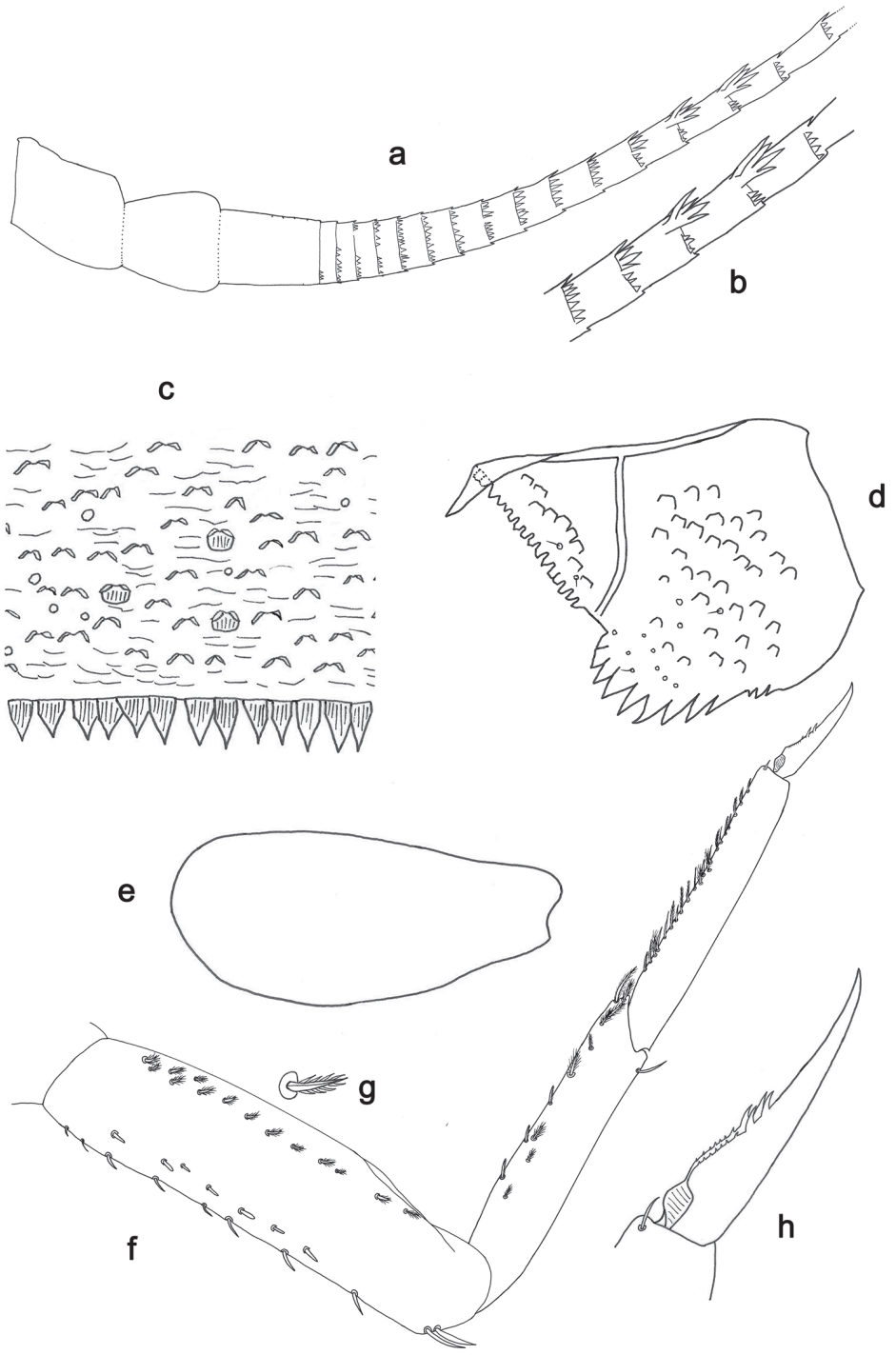

Figure 3. *Indocloeon spathasetis* sp. n., larva morphology: **a** Left antenna, proximal part **b** Left antenna, detail of Middle segments **c** Tergum IV **d** Paraproct **e** Gill VI **f** Foreleg **g** Foreleg, bipectinate seta **h** Fore tarsal claw.

Dorsally bare. Ventrally with many bipectinate, stout setae on margin and close to margin (pectination in lateral view difficult to see). Tarsal claw with two rows of many minute denticles and two large apical denticles; subapical setae absent.

Terga (Fig. 3c). Surface with abundant scales or scale-bases and micropores. Posterior margin with row of irregular triangular or pentagonal spines.

Gills (Fig. 3e). On segments I – VII. Margin smooth. Tracheae restricted to main trunk. Gill I as long as length of segment II; lanceolate. Gill VII about 2/3 length of segment VIII; oblong.

Paraproct (Fig. 3d). With 12 marginal stout spines, laterally smaller. Surface with scale bases, micropores and a few short, fine, simple setae. Postero-lateral extension (cercotractor) with small marginal spines.

Etymology. Refers to the noticeable spatulate submarginal dorsal setae of the labrum.

Distribution. Only known from Brunei, but presence in other regions of Borneo such as Sarawak and Sabah (Malaysia) is possible as their fauna remains poorly known.

Biological aspects. The specimens were collected in lowland tropical rainforest at an altitude of about 100 m a.s.l., directly at the confluence of small tributaries with large rivers (Belalong, Temburong) as well as in upstream pools of these tributaries (Fig. 6a, b, c). Substrates were predominantly characterised by cobbles and gravel.

Type-material. Holotype. Larva (on slide, GBIFCH 00280816), Brunei, Temburong District, Ulu Temburong National Park, 4°32.77'N, 115°09.52'E, May 2014, leg. Kate Baker. **Paratypes.** Brunei, Temburong District, Ulu Temburong National Park, May 2014, leg. Kate Baker: larva (on slide, GBIFCH 00280817), 4°32.77'N, 115°09.52'E; two larvae (one on slide, GBIFCH 00465131; one in alcohol, GBIFCH 00515214), 4°33.67'N, 115°08.87'E; two larvae (one on slide, GBIFCH 00465130; one in alcohol, GBIFCH 00515213), 4°33.64'N, 115°09.07'E; larva (on slide, GBIFCH 00465132), 4°33.39'N, 115°10.03'E; larva (on slide, GBIFCH 00465133), 4°33.21'N, 115°09.31'E; two larvae (one on slide, GBIFCH 00465134; one in alcohol, GBIFCH 00515215), 4°32.87'N, 115°09.47'E. All material deposited in the Museum of Zoology Lausanne (MZL).

Additional material. Five larvae (in alcohol, GBIFCH 00515216). Brunei, Temburong District, Ulu Temburong National Park, near Kuala Belalong Field Studies Centre, tributary to Temburong river, 4°33.21'N, 115°09.31'E, May 2014, leg. Kate Baker. Deposited in the Museum of Zoology Lausanne (MZL).

Indocloeon timorense sp. n.

http://zoobank.org/DDD47504-FDE1-4FD1-BA0C-12C4DDA3DAF3
Figures 1b, c, 4, 5

Diagnosis. Larva. Following combination of characters: A) labrum with submarginal arc of setae composed of one central medium, simple seta plus six medium, simple setae (Fig. 4a); B) distomedial protuberance at segment II of labial palp moderately

developed, apically rounded (Fig. 4h); C) claw with two rows of denticles, each with five larger denticles apically and many small denticles basally (Fig. 5b); D) gills with serrate margin and pointed scales along margin (Fig. 5f).

Description. Larva (Figs 1b, c, 4, 5). Body length 4.6 mm.

Colouration. Head, thorax and abdomen dorsally brown. Head and thorax with bright dorsal line, forewing pads with bright striation (Fig. 1b). Thorax and abdomen ventrally brown, legs brown (Fig. 1c). Caudal filaments colourless, but light brown at base.

Antenna with scape and pedicel subcylindrical; flagellum with broad spines on apex of each segment and with scales. In the Middle part of the flagellum without large spines on apex of segments at outer lateral margin.

Labrum (Fig. 4a). Rectangular, length 0.7× maximum width. Distal margin with medial emargination and small process. Dorsally with medium, fine, simple setae scattered over surface; submarginal dorsal arc of setae composed of 1 + 6 long, apically pointed simple setae. Ventrally with submarginal row of setae composed of lateral long and medial shorter, feathery setae and anterolateral simple setae; ventral surface with short, spine-like setae near lateral and anterolateral margin.

Right mandible (Fig. 4b, c). Incisors fused. Outer and inner sets of denticles with 4 + 3 denticles respectively. Inner margin of innermost denticle with a row of thin setae. Prostheca robust, apicolaterally denticulate. Margin between prostheca and mola straight, tuft of setae present. Tuft of spine-like setae at base of mola absent. Tuft of setae at apex of mola present.

Left mandible (Fig. 4e, f). Incisors fused. Outer and inner sets of denticles with 4 + 3 denticles respectively. Prostheca robust, apically denticulate, with comb-shape structure. Margin between prostheca and mola straight, with minute denticles towards subtriangular process. Tuft of setae between prostheca and mola small and directed proximally. Tuft of spine-like setae at base of mola absent. Subtriangular process wide, slightly above level of area between prostheca and mola. Denticles of mola apically constricted. Tuft of setae at apex of mola absent.

Both *mandibles* with lateral margins almost straight. Basal half with fine, simple setae scattered over dorsal surface.

Hypopharynx (Fig. 4d). Lingua shorter than superlingua. Lingua longer than broad. Medial tuft of setae present; distal half laterally expanded. Superlingua apical margin slightly concave; lateral margin rounded; simple setae scattered over lateral and distal margin, finer and longer at distal margin.

Maxilla (Fig. 4g). With two simple, robust apical setae under crown. Inner dorsal row of setae with three denti-setae, distal denti-seta teeth-like, Middle and proximal denti-setae slender and pectinate. Medially with one spine-like seta and five long, simple setae. Maxillary palp longer than length of galea-lacinia; three segmented; setae on maxillary palp fine, simple, scattered over surface of segments II and III. Palp segment II about as long as segment I. Palp segment III about as long as segment II. Apex segment III slightly pointed.

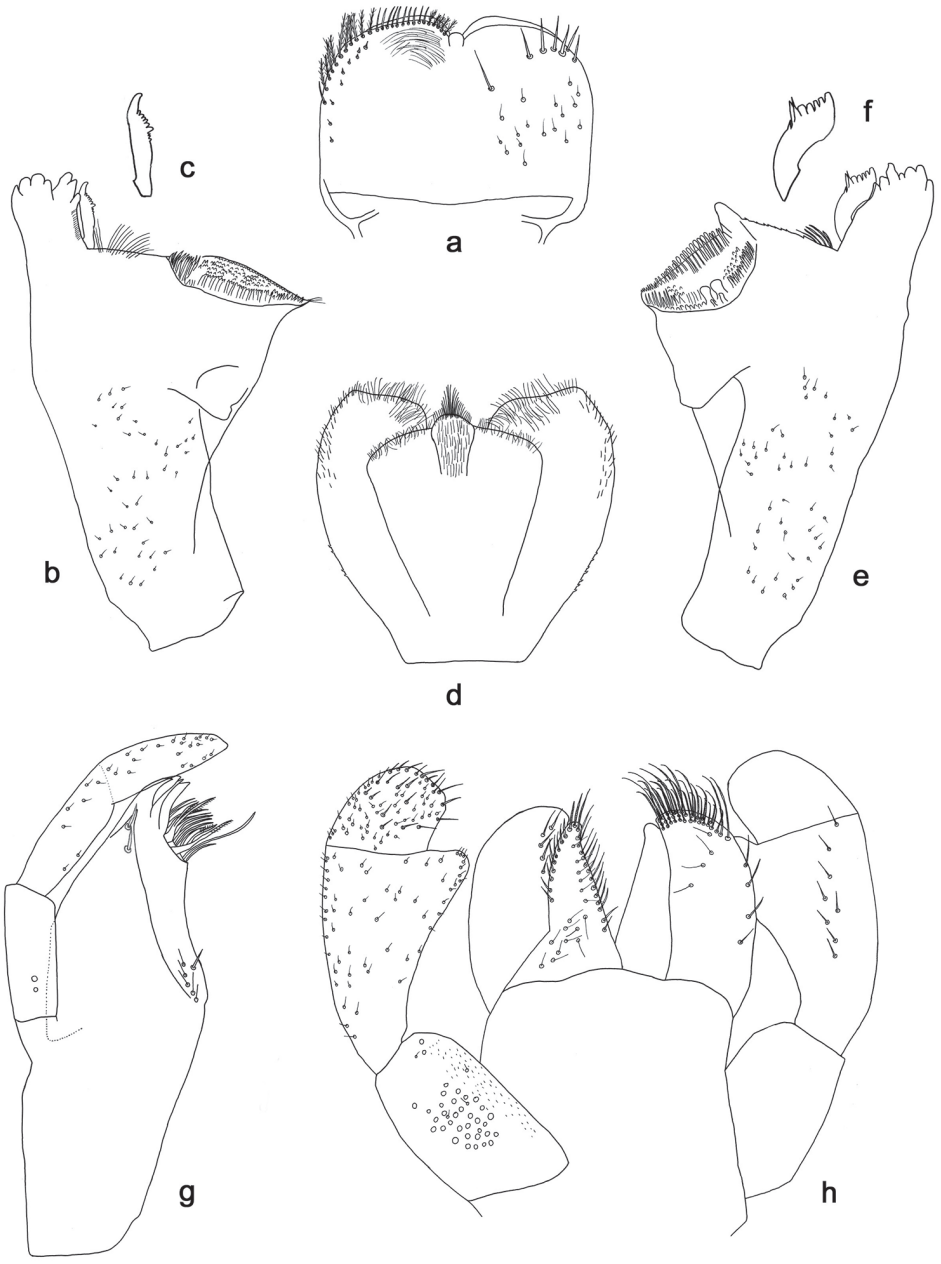

Figure 4. *Indocloeon timorense* sp. n., larva morphology: **a** Labrum **b** Right mandible **c** Right prostheca **d** Hypopharynx **e** Left mandible **f** Left prostheca **g** Maxilla **h** Labium.

Labium (Fig. 4h). Glossa basally broad, narrowing toward apex. Slightly shorter than paraglossa. Inner margin with 13 long, simple setae. Apex with three long, robust, pectinate setae. Outer margin with nine long, simple setae. Ventral surface

with long, fine, simple, scattered setae. Paraglossa sub-rectangular, apex obliquely truncate and slightly rounded. Apex with three rows of robust, pectinate setae. Outer margin with row of four long, spine-like setae. Dorsally with row of four long, simple setae. Ventrally with five long, simple setae near inner margin. Labial palp with segment I 0.6× length of segments II and III combined. Segment I covered with micropores and some short, fine, simple setae as well as with very short, robust, simple setae along inner margin. Segment II with apically rounded distomedial protuberance; distomedial protuberance 0.3× width of base of segment III; inner margin with short, fine, simple setae; outer margin with short, fine, simple setae; dorsally with row of eight long, simple setae. Segment III subquadrangular, asymmetrical; length subequal to width; covered with medium, simple setae and short, fine, simple setae.

Hind wing pads absent.

Middle leg (Fig. 5a, b, c). Ratio of Middle leg 1.6:1.0:0.7:0.2. *Middle femur*. Length approximately 6× maximum width. Dorsally with 20–25 bipectinate, acute setae on margin and close to margin (pectination in lateral view difficult to see); length of setae 0.1× maximum width of femur. Apex rounded; with two long, curved, spine-like setae. Ventrally with around 20 bipectinate, stout setae, predominantly arranged in one row. *Tibia.* Dorsally with row of ten bipectinate, stout setae on margin, two of them near apex (pectination in lateral view difficult to see). Ventrally with many bipectinate, stout setae on margin and close to margin (pectination in lateral view difficult to see). Anterior surface with many bipectinate, stout setae. Tibio-patellar suture present on basal half. *Tarsus.* Dorsally bare. Ventrally with many bipectinate, stout setae on margin and close to margin (pectination in lateral view difficult to see). Tarsal claw with two rows of numerous minute denticles and five large, apical denticles; subapical setae absent.

Terga (Fig. 5d). Surface with abundant scales or scale-bases and micropores. Posterior margin with row of irregular triangular or pentagonal spines.

Gills (Fig. 5f). On segments I – VII. Margin serrate with small spines and with pointed scales along margin. Tracheae extending from main trunk to inner and outer margins. Gill I little longer than segment II; oblong. Gill IV as long as length of segments V and VI combined; oval. Gill VII as long as length of segments VIII and IX; oblong.

Paraproct (Fig. 5e). With 18 marginal stout spines, laterally smaller. Surface with scale bases, micropores, and a few short, fine, simple setae. Postero-lateral extension (cercotractor) with small marginal spines.

Etymology. After the type locality, the island of Timor (Indonesia).

Distribution. Indonesia: Timor.

Biological aspects. The specimen was collected at an altitude of 1580 m a.s.l.

Type-material. Holotype. Larva (on slide, GBIFCH 00280822), Indonesia, Timor, Mt. Mutis, 1580 m, 01.10.2011, 9°38.12'S, 124°12.80'E, leg. M. Balke. Temporary deposited in the Museum of Zoology Lausanne (MZL) before definitely housed in the Museum Zoologicum Bogoriense (MZB) in Indonesia.

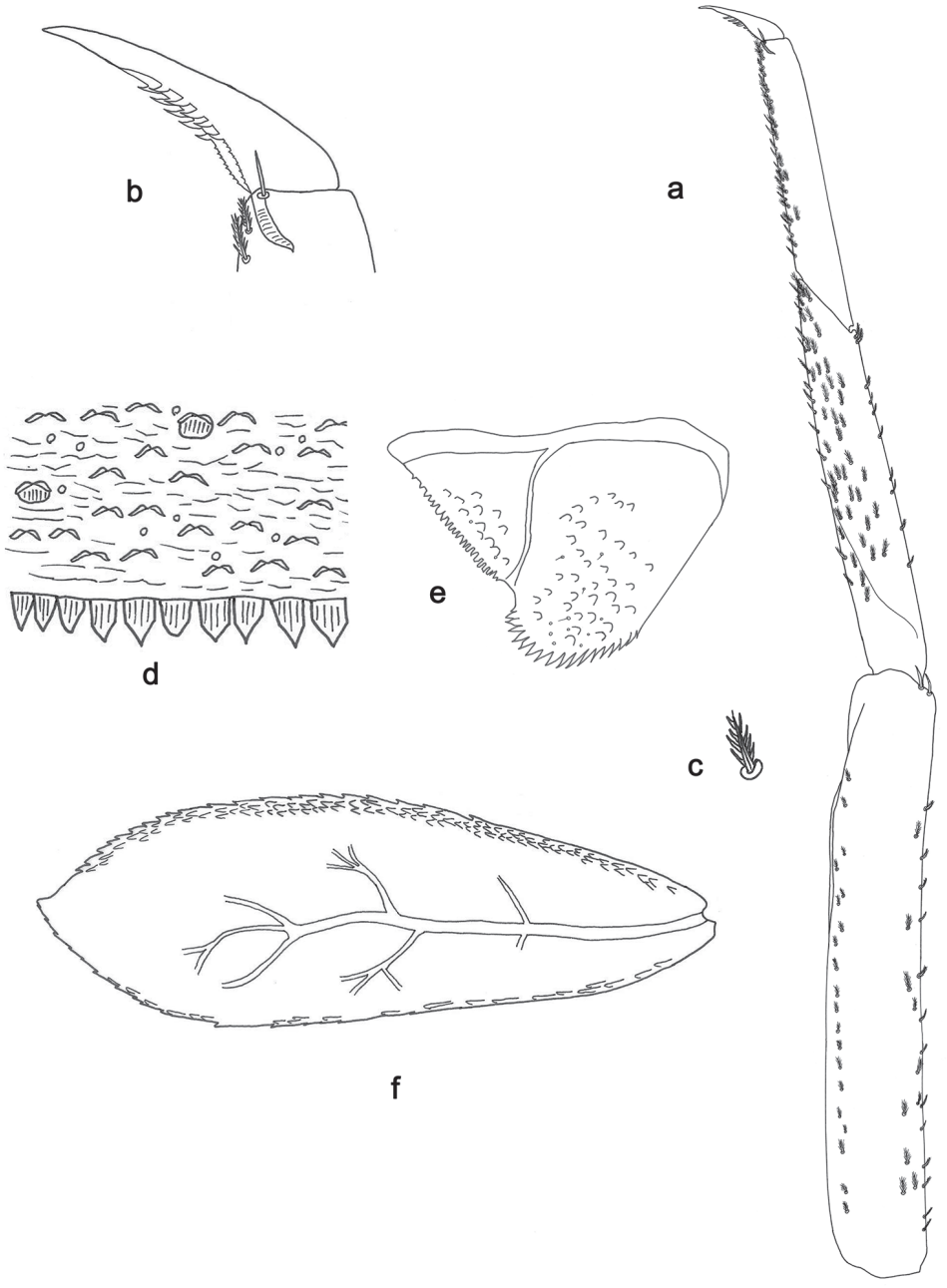

Figure 5. *Indocloeon timorense* sp. n., larva morphology: **a** Middle leg **b** Middle tarsal claw **c** Middle leg, bipectinate seta **d** Tergum IV **e** Paraproct **f** Gill VII.

Distribution

In addition to the two new species found in Brunei and Timor, the occurrence of *Indocloeon indonesiae* on two further Indonesian islands (Flores and Sumbawa) is documented, additionally to Lombok, from where it was described by Kluge (2012). Thus the genus *Indocloeon* is presently known from partly distant locations in the Oriental realm, Sri Lanka on one hand and several islands of Indonesia as well as Brunei on the other (Fig. 7). The GPS coordinates of the new locations are given in Table 2.

Genetics

COI sequences were obtained from two specimens of *I. indonesiae* from Flores (Indonesia) and two from Sumbawa (Indonesia), one specimen of *I. timorense* sp. n. from Timor (Indonesia) and two specimens of *I. spathasetis* sp. n. from Brunei. Only very limited genetic distances were found between specimens of *I. indonesiae* from Flores and Sumbawa (Table 3). The genetic distances between the three species are much higher than 3.5%, generally considered as a likely maximal value for intraspecific divergence (Hebert et al. 2003, Ball et al. 2005, Zhou et al. 2010), *I. timorense* sp. n. being apparently closer to *I. indonesiae* than *I. spathasetis* sp. n. (Table 3).

Figure 6. General aspects of *Indocloeon* larval habitats: **a, b** *I. spathasetis* sp. n., tributaries upstream **c** *I. spathasetis* sp. n., tributary confluence with main river. Photographs by Kate Baker (King's College London).

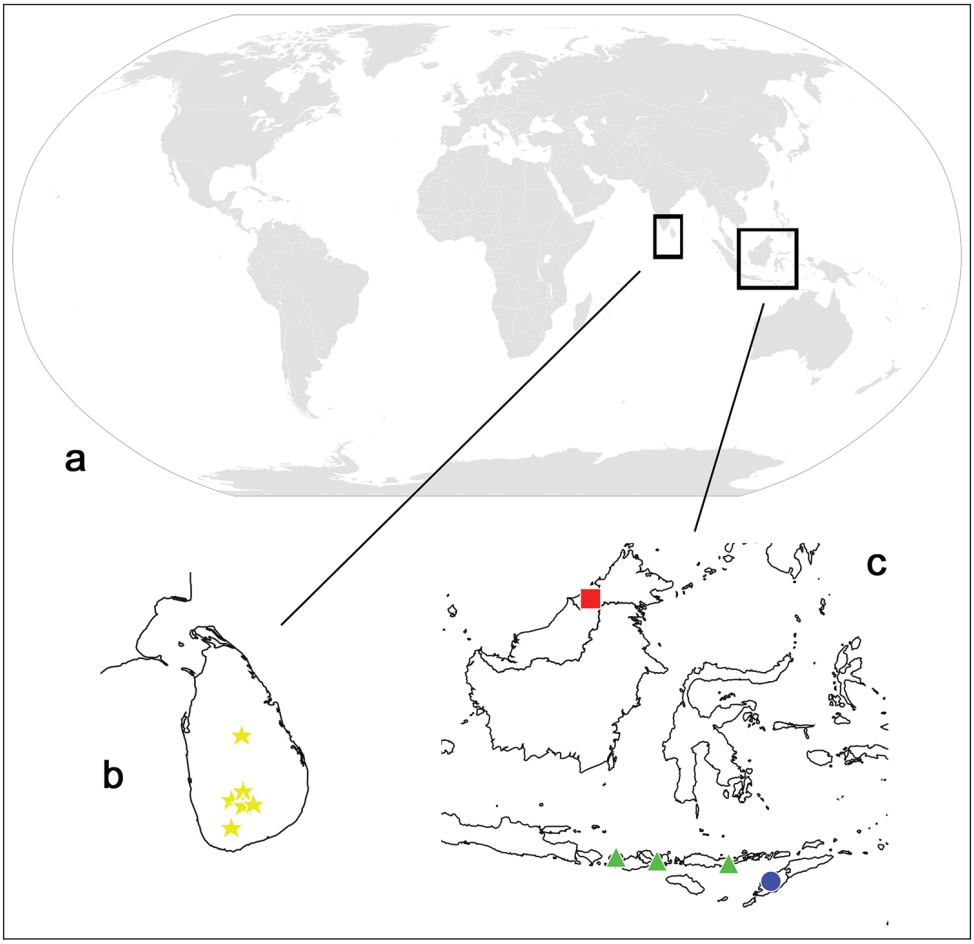

Figure 7. Distribution of *Indocloeon*: **a** World map (http://www.pixabay.com) **b** Sri Lanka **c** Indonesia (partim) and Brunei (yellow stars, *I. primum*; red square, *I. spathasetis* sp. n.; green triangles, *I. indonesiae* (from left to right: islands of Lombok, Sumbawa, Flores); blue spot, *I. timorense* sp. n. (island Timor)).

Table 2. GPS coordinates of locations of examined specimens.

Species	Locality	GPS coordinates	
I. indonesiae	Sumbawa	8°38.54'S	118°30.31'E
	Flores	8°42.92'S	122°04.41'E
I. timorense sp. n.	Timor	9°38.12'S	124°12.80'E
I. spathasetis sp. n.	Brunei	4°32.77'N	115°09.52'E
		4°33.64'N	115°09.07'E
		4°33.67'N	115°08.87'E
		4°33.21'N	115°09.31'E
		4°33.39'N	115°10.03'E
		4°32.87'N	115°09.47'E

Table 3. Genetic distances (COI) between some *Indocloeon* species, using the Kimura 2-parameter.

	I. indonesiae Flores	*I. indonesiae* Sumbawa	*I. timorense* sp.n. Timor
I. indonesiae Sumbawa	0.01		
I. timorense sp. n. Timor	0.15	0.14	
I. spathasetis sp. n. Brunei	0.20	0.20	0.22

Discussion

The generic description was given by Müller-Liebenau (1982) and later more detailed by Kluge (2012). The new species are attributed to *Indocloeon* based on the following characters: frons between antennae forms an elevation more or less narrowing anteriorly; cuticle of abdominal terga nearly unicolour; left mandible with incisors fused, distalmost denticle turned ventrally and terminates before apex, prostheca massive, with a tuft of setae between prostheca and mola; right mandible with incisors fused, distalmost denticle turned ventrally and terminates before apex, prostheca stick-like, with a row of setae between prostheca and mola; hypopharynx with a median tuft of stout setae; legs slender, femora slender and nearly parallel-sided; femora, tibiae and tarsi have stout, pointed, bipectinate setae; outer margin of femur lacks longitudinal row of stout setae, but irregular pectinate setae can be confused with such row (*I. timorense* sp. n. only; *I. spathasetis* sp. n. does have a longitudinal row of stout setae at the dorsal margin of the femur); claw slender, slightly bent, with two rows of denticles; terga with fine, longitudinally striated scales, situated in angulate nests.

Based on the additional two new species, the following adaptations to the generic diagnosis are proposed: the maxillary palp differs between the species, always with three segments and longer than galea-lacinia, but may be very long and slender (*I. primum*, fig. 1e in Müller-Liebenau 1982; *I. indonesiae*, fig. 5 in Kluge 2012) or less long and stouter (*I. spathasetis* sp. n., fig. 2h). The claw is slender, slightly bent with two rows of denticles; some of the distalmost denticles are considerably larger and directed distally, the other ones are very small. *Indocloeon primum*, *I. indonesiae* and *I. timorense* sp. n. possess bipectinate setae along the dorsal margin of the femur. In contrary we found two rows of simple or slightly spatulate setae along the dorsal margin of the femur in *I. spathasetis* sp. n. from Brunei and no pectinate structure can be observed with an optical microscope with a magnification of up to 600 times.

Taking into account the taxa described herein, the genus *Indocloeon* now encompasses four species, all of them occurring in the Oriental realm. In general, the different known species of *Indocloeon* can be easily identified by a combination of a few characters and often even by a single unique character. Overall important characters are the dorsal submarginal arc of setae of the labrum, the shape of the distomedial protuberance of segment II of the labial palp, the shape of the maxillary palp, the number of larger denticles of the claw and also the number of marginal spines of the paraproct.

Indocloeon primum can be recognised by the pointed distomedial protuberance of segment II of the labial palp, the long and slender maxillary palp with a very short segment III and the basally fused spines at the posterior margin of the terga (Müller-Liebenau 1982); *I. indonesiae* by the long and slender maxillary palp with three long segments (Kluge 2012) and *I. spathasetis* sp. n. by the distinctly spatulate, acute dorsal submarginal arc setae on the labrum and the long spines on the apex of a few segments at outer lateral margin in the Middle part of the flagellum.

Contrary to mouthparts, legs and abdomen, which are showing important specific differences within *Indocloeon*, both mandibles seem to be quite uniform inside the genus.

Indocloeon indonesiae and *I. timorense* sp. n. are morphologically the most similar species, especially when referring to the labrum submarginal arc of setae and the labial palps. However, the maxillary palps are clearly different. This similarity is corroborated by the genetic distance (K2P) based on COI (Table 3). Both species seem to be closely related to each other, but their status as different species is confirmed by their K2P distance of 0.14 and 0.15 respectively, which is clearly of the interspecific range (Ball et al. 2005).

From *I. indonesiae* COI sequences were obtained from specimens of the Indonesian islands Sumbawa and Flores, but not from Lombok from where the species was originally described (Kluge 2012). There are no morphological differences between the different islands. Moreover the genetic distance between the specimens from Sumbawa and Flores is extremely low (Table 3), which either indicates ongoing gene flow between the islands or recent colonisation of one of the islands.

Müller-Liebenau (1984: p. 270–271, figs 14, 29, 47) described a Genus No.1 sp.1 from Malaysia, which most probably represents a new species of *Indocloeon*. However, it remains uncertain, if the stout, acute, bipectinate setae typical for *Indocloeon* are present on femur, tibia, and tarsus, as fig. 14h in Müller-Liebenau (1984) is not detailed enough and nothing is mentioned in the description. Genus No.1 sp.1 presents similarities to *I. indonesiae* and *I. timorense* sp. n., but also clear differences. It differs from *I. indonesiae* in the number of large apical denticles of the claw (two in Genus No.1 sp.1 and four in *I. indonesiae*), the left prostheca (fig. 14e in Müller-Liebenau 1984, fig. 16 in Kluge 2012) as well as in the shape of the postero-lateral extension of the paraproct (cercotractor) (fig. 14g in Müller-Liebenau 1984, fig. 8 in Kluge 2012). From *I. timorense* sp. n. it differs in the composition and arrangement of the submarginal arc of setae of the labrum, the maxillary palps (less slender in *I. timorense* sp. n.), the number of large apical denticles of the claw (two in Genus No.1 sp.1, five in *I. timorense* sp. n.) and the spines at the posterior margin of the abdominal terga (figs 14a, d, e, k, 47 in Müller-Liebenau 1984, Figs 4a, g, 5b, d in this study).

The presently known distribution of the genus *Indocloeon* encompasses distant areas like the Indian peninsula on one hand and some South Asian islands on the other hand. Similar distributions can be found in other lineages of Baetidae such as *Liebebiella* Waltz and McCafferty or *Chopralla* Waltz and McCafferty (Kluge et al. 2014, Marle et al. 2016). Because of the poor state of knowledge of most faunas in the Oriental realm (Gattolliat and Nieto 2009),we may expect more new species of *Indocloeon* to be discovered in this area through further collection efforts in the future, which may fill the gaps in its distribution range.

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RESEARCH ARTICLE

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Review of *Stantonia* Ashmead (Hymenoptera, Braconidae, Orgilinae) from Vietnam, China, Japan, and Russia, with descriptions of six new species

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Abstract

The genus *Stantonia* Ashmead, 1904 (Hymenoptera, Braconidae, Orgilinae) is reviewed for Vietnam, China, Japan, and Russia. Six new species of the genus *Stantonia* are described and illustrated: *Stantonia brevicaudata* van Achterberg, **sp. n.**, *S. dickyyui* van Achterberg & Long, **sp. n.**, *S. granulata* Long & van Achterberg, **sp. n.**, *S. robustifemur* van Achterberg & Long, **sp. n.**, *S. stilpnosoma* Long & van Achterberg, **sp. n.**, and *S. vietnamica* van Achterberg, **sp. n.** A new subgenus (*Planitonia* **subg. n.**: type species *Stantonia robustifemur* van Achterberg & Long, **sp. n.**) is proposed for the species with a flat clypeus and face, and reduced vein r-m of the fore wing. Three species are newly recorded from Vietnam: *Stantonia gracilis* van Achterberg, 1987, *S. sumatrana* Enderlein, 1908, and *S. tianmushana* Chen, He & Ma, 2004. A key to species of *Stantonia* from Vietnam, China, Russia, and Japan is provided.

Keywords

Braconidae, China, Japan, key, new species, Orgilinae, Russia, *Stantonia*, Vietnam

Introduction

Members of the small subfamily Orgilinae Foerster, 1863 (Hymenoptera: Braconidae) are comparatively rarely collected and little is known about their biology (Shaw and Huddleston 1991). As far known, all species are solitary koinobiont endoparasitoids mainly in concealed lepidopteran larvae. The subfamily is subdivided into three tribes: Antestrigini van Achterberg, 1987 (Neotropical), Mimagathidini Enderlein, 1905 (Neotropical (including Central America and southern U.S.A.), Afrotropical, Indo-Australian, NE Palaearctic) and Orgilini Ashmead, 1900 (cosmopolitan). The tribe Mimagathidini consists mainly of the genus *Stantonia* Ashmead, 1904, with 75 valid species of which 31 occur in the Oriental region (Braet and Quicke 2004). Four of the Oriental species intrude in the NE Palaearctic region and are included in the review; the only species known from Far East Russia may belong to an Oriental species but without having females available this remains still uncertain. The genus was revised by van Achterberg (1987; Indo-Australian spp.), Braet and Quicke (2004; worldwide), and Chen et al. (2004; for China). In this paper some new species are described, the interpretation of some species are corrected, and a new identification key for the species from Vietnam, China, Japan, and Russia is presented.

Materials and methods

The specimens were mainly collected in Malaise traps, but a few by using a sweep net. The material was stored in 70% ethanol, prepared with the AXA method (van Achterberg 2009; van Achterberg et al. 2010) and glued on card points. Observations and descriptions were made with an Olympus SZX11 stereomicroscope and fluorescent lamps. Photographic images were made with an Olympus motorized stereomicroscope SZX12 with AnalySIS Extended Focal Imaging Software and processed with Adobe Photoshop CC, mostly to adjust the size and background. The photographs of the types deposited in Vietnam were made by KDL with a Digital microscope camera MVV3000 attached to the Olympus SZ61 binocular microscope connecting to a computer at IEBR.

Morphology. For terminology used in this paper, see van Achterberg (1988, 1993). Measurements are taken as indicated by van Achterberg (1988). Additional non-exclusive characters in the key are between brackets. For the identification of the subfamily Orgilinae, see van Achterberg (1993) and for the genera of Orgilinae, van Achterberg (1994).

Material. The examined specimens are kept in the parasitoid collections of Department of Insect Ecology (**IEBR**) at Hanoi, Vietnam; the Naturalis Biodiversity Center, (**RMNH**) at Leiden, The Netherlands; the Institute of Zoology, Chinese Academy of Sciences (**IZAS**) at Beijing, China; the Zoological Institute, Akademia NAUK (**ZISP**) at St. Petersburg, Russia; the Entomological Collection, Zoological Museum, Hokkaido University (**ECHU**) at Sapporo, Japan; School of Life Sciences, Northwest Uni-

versity (**NWUX**) at Xi'an, China, and the Senckenberg Deutsches Entomologisches Institut (**SDEI**) at Müncheberg, Germany.

Inside Vietnam, the distribution of the species is followed in order of provinces from north to south, and outside Vietnam, distribution of species follows in alphabetical order. An asterisk indicates a new record.

Systematics

Stantonia Ashmead, 1904

Figs 1–123

Stantonia Ashmead, 1904: 146; Shenefelt 1970: 266–268; van Achterberg 1987: 20–49; Braet and Quicke 2004: 1515–1582; Chen et al. 2004: 351–367, 531–533; Long and van Achterberg 2014: 408. Type species: *Stantonia flava* Ashmead, 1904 (by monotypy) [examined].

Mimagathis Enderlein, 1905: 450. Type species: *Mimagathis ashmeadi* Enderlein, 1905 (designated by Viereck 1914). Synonymised by Muesebeck (1970) [examined].

Bentonia van Achterberg, 1992: 339. Type species: *Bentonia longicornis* van Achterberg, 1992 (by original designation). Synonymised by Braet and Quicke (2004) [examined].

Diagnosis. Antenna slender and 1.3–2.0 times longer than body, basal flagellar segments with medial constriction; scapus robust and strongly oblique apically (Figs 33, 45,79); clypeus normal (but either convex or flattened) and its ventral margin almost straight; occipital carina lamelliform, reaching up to upper level of eyes (Figs 2, 33); malar suture present (Fig. 35, especially in most Indo-Australian spp.) or absent; length of mesosoma 1.2–1.4 times its height; prepectal carina complete, almost reaching anterior margin of mesopleuron; precoxal sulcus narrowly impressed and more or less crenulate (Figs 25, 61, 72); metapleuron not projecting forwards ventro-laterally (Fig. 83), metapleural flange present or absent; notauli complete, mainly smooth or completely crenulate; mesoscutum evenly short setose, finely punctulate, shiny, smooth or coriaceous; scutellar sulcus crenulate or smooth; propodeum convex to rather flat, smooth or coriaceous-granulate, with some rugae or with medial carinae anteriorly and with areola posteriorly; vein 1-M of fore wing straight; vein r-m of fore wing present and partly sclerotized (Figs 82, 94,96), but completely absent or unsclerotized (Fig. 60) in subgenus *Planitonia* subg. n.; vein cu-a of fore wing antefurcal, (sub)interstitial or shortly postfurcal, (sub)vertical; vein 2-M of fore wing sclerotized basally; vein SR1 of fore wing straight; vein 1-SR+M of fore wing present, rarely absent; hind wing with 3 hamuli; outer side of hind tibia with some pegs apically, rarely obsolescent; middle leg very slender compared with hind leg (Figs 4, 17, 18, 58), more pronounced than in other genera of Orgilinae; length of first metasomal tergite 1.9–3.3 times its apical width, and its dorsal carinae absent (Figs 63, 85, 103, 116); second tergite smooth,

granulate or coriaceous, without depressions; second tergite with sharp lateral crease; second metasomal suture straight (Fig. 64) or curved (Fig. 28); third (except base) and fourth tergites without sharp lateral crease (Fig. 23); ovipositor without notch or nodus; length of ovipositor sheath 0.15–0.7 times fore wing, but 1.0–1.4 times in *S. lutea* and *S. robustifemur.*

Biology. Koinobiont endoparasitoids of Pyralidae and Tortricidae.

Distribution. Mainly circumtropical, with some species in East Palaearctic region.

Notes. The subgenus *Planitonia* subg. n. (with type species *Stantonia robustifemur* van Achterberg & Long, sp. n.) is proposed for the species with flat clypeus and face, reduced vein r-m of the fore wing and long ovipositor sheath (1.0–1.4 times as long as fore wing). Besides the type species described in this paper, *S. lutea* (Szépligeti, 1910) belongs to it. The subgenus is only known from the Oriental region and the biology is unknown. The name is derived from "planus" (Latin for flat, because of the flat clypeus) and the generic name *Stantonia*. Gender: feminine.

The genus *Sulorgilus* van Achterberg, 1994, is superficially similar and occurs in the treated area (Long and van Achterberg 2016). It has vein cu-a of hind wing approximately as long as vein 1-M (vein cu-a much shorter than vein 1-M in *Stantonia*), antenna of ♀ shortened (long) and its 15 subapical segments distinctly moniliform (non-moniliform and slender, but intermediate in *S. robustifemur* and *S. lutea*) and hind femur densely punctate (usually sparsely punctate or punctulate).

Key to species of the genus *Stantonia* Ashmead from Vietnam, China, Japan, and Russia

1 Clypeus flat (Figs 66, 68); length of ovipositor sheath 1.1–1.4 times as long as fore wing; vein r-m of fore wing absent or largely so (Fig. 59); outer side of middle tibia with dense pegs (Fig. 59); face flattened medially; [basal half of hind tibia brownish yellow but with ivory basal ring; hind femur robust (Fig. 65) and ventrally slightly widened subbasally (Fig. 70), with satin sheen and micro-sculpture ventrally; propodeum anteriorly mostly granulate; length of first metasomal tergite 1.8–2.6 times its apical width; humeral plate partly dark brown]; subgenus *Planitonia* subg. n. ..... ***S. robustifemur* van Achterberg & Long, sp. n.**

– Clypeus convex (Figs 88, 90); length of ovipositor sheath 0.1–0.6 times as long as fore wing; vein r-m of fore wing partly pigmented and usually sclerotised (Figs 82, 94, 96); outer side of middle tibia at most with a row of pegs (Fig. 117); face slightly convex medially; subgenus *Stantonia* Ashmead, 1904 ..... **2**

2 Anterior tentorial pits below lower level of eyes or near it (Fig. 19) and malar space comparatively long in lateral view (Fig. 21); anterior half of propodeum distinctly punctate-rugose; [epipleuron of second tergite with vague brownish patch (Fig. 17); second metasomal tergite largely or entirely yellowish; temple

moderately punctate dorsally (Figs 20, 22); basal half of hind coxa reticulate-punctate dorsally] ..... ***S. clappae*** **Kittel, 2016**

– Anterior tentorial pits dorsally distinctly above lower level of eyes (Figs 79, 88, 118) and malar space comparatively short (Figs 76, 120); anterior half of propodeum usually punctulate and largely smooth, spaced punctate or granulate..... **3**

3 Second metasomal suture curved and medial area behind suture convex (Figs 80); length of ovipositor sheath 0.4–0.6 times as long as fore wing (but unknown of *S. spasskensis*); length of first metasomal tergite 3.2–4.2 times its apical width **4**

– Second metasomal suture straight and medial area behind suture flat or nearly so (Figs 28, 64), **if** slightly curved (Fig. 91) then third tergite flat medio-anteriorly; length of ovipositor sheath 0.1–0.6 times as long as fore wing; length of first tergite 2.0–3.7 times its apical width **9**

4 Mesosoma entirely or largely black (Figs 3, 112); submedially antenna with a white or ivory band contrasting with blackish basal third of antenna (Figs 3, 112); hind femur black or dark brown medially (Figs 3, 112); hind tarsus (except basitarsus basally and telotarsus) whitish or ivory; epipleuron of second metasomal tergite dark brown medially (Figs 3, 112)..... **5**

- Mesosoma entirely yellow or brownish yellow (Figs 23, 46, 123); antenna without a pale band, at most somewhat paler submedially (Figs 23, 123); hind femur brownish yellow medially (Figs 23, 36, 123); epipleuron of second tergite entirely yellowish (Fig. 23), but partly darkened in *S. xiangqianensis* (Fig. 123); [second tergite distinctly convex basally; hind tarsus largely ivory or dark brown; apex of first tergite brownish yellow; hind femur with smooth interspaces and shiny ventrally; humeral plate entirely yellowish] ... **7**

5 Antenna of both sexes with 14–17 white or ivory segments submedially (Fig. 112); fore wing evenly infuscated (Fig. 113); propodeum and metapleuron black posteriorly; second metasomal epipleuron with distinctly isolated and well defined dark brown patch medially (Fig. 117); [first tergite distinctly narrowed behind spiracles (Fig. 116); tegulum dark brown; second metasomal tergite 1.7 times longer than wide basally]..... ..... ***S. vietnamica*** **van Achterberg, sp. n.**

– Antenna of both sexes with 6–13 white or ivory segments (Figs 3, 75); fore wing only apically infuscated (Figs 3, 75); propodeum and metapleuron yellowish brown or ivory posteriorly; second metasomal epipleuron with fuzzy dark brown area medially (Fig. 3)..... **6**

6 Epipleuron of second metasomal tergite partly brownish yellow (Fig. 3); propodeum widely pale yellowish or yellowish brown posteriorly (Fig. 3) .... ***S. annulicornis*** **Enderlein, 1921**

– Epipleuron of second metasomal tergite largely infuscated (Fig. 74); propodeum narrowly yellowish brown posteriorly (Figs 74, 77) .... ***S. spasskensis*** **Belokobylskij, 1993**

7 Hind tarsus (except basitarsus) dark brown (Figs 23, 29); hind femur slightly widened subapically (Fig. 23); hind coxa largely coarsely transverse striate (Fig. 25); transverse rugae of propodeum distinctly developed (Fig. 26) ..... ***S. dickyyui* van Achterberg & Long, sp. n.**

– Hind tarsus (except telotarsus) ivory (Figs 46, 52, 123); hind femur parallel-sided subapically (Figs 46, 123); hind coxa largely irregularly and densely finely rugose (Fig. 48); transverse rugae of propodeum weakly developed (Fig. 48) **8**

8 Vein 3-SR+SR1 of fore wing approx. 2.9 times as long as vein r (Fig. 47); second–fourth metasomal tergites entirely yellowish brown and less compressed (Fig. 46); propodeum anteriorly largely smooth.... ***S. issikii* Watanabe, 1932**

– Vein 3-SR+SR1 of fore wing 3.7–3.8 times as long as vein r (Fig. 123); second–fourth tergites posteriorly darkened (Fig. 123) and strongly compressed apically; propodeum anteriorly partly sculptured ..... ***S. xiangqianensis* Chen, He & Ma, 2004**

9 Ventrally hind femur coarsely reticulate-rugose, densely sculptured, rather matt **and** ventrally apical 0.3–0.6 of femur black or dark brown (both sexes); mesopleuron ventrally and mesosternum often largely black; hind tarsus (except telotarsus and base of basitarsus) ivory, but fourth segment more or less dark brown; vertex largely dark brown or black; second epipleuron with large dark brown or brown patch; length of first metasomal tergite 2.0–2.8 times its apical width; [vertex rather coarsely and densely punctate] **10**

- Ventrally hind femur smooth and shiny, finely punctate or finely to moderately coriaceous-rugose or -rugulose and matt; **if** rugose or rugulose, then hind femur ventrally entirely yellowish or nearly so; mesopleuron ventrally and mesosternum yellowish brown; hind tarsus (except basitarsus) and fourth segment largely dark brown or ivory; vertex yellowish brown; area below precoxal suture finely punctate; second epipleuron entirely yellow and without dark patch, but with patch in *S. takeuchii*; length of first metasomal tergite 3.0–3.7 times its apical width, but 2.4–2.7 times in *S. sumatrana* and *S. brevicaudata* **11**

10 Length of ovipositor sheath approx. 0.2 times as long as fore wing and 0.3 times length of metasoma (Fig. 2); length of first tergite 2.4–2.8 times its apical width; precoxal sulcus below crenulae usually coarsely punctate anteriorly; hind basitarsus pale yellow or white basally (Figs 1, 2), at most slightly infuscated; ventrally basal 0.2–0.4 of hind femur yellow; epipleuron of second tergite with nearly equilateral triangular patch (Figs 1, 2); entire antenna pale brown to dark brown, at most slightly paler submedially (Fig. 1); second metasomal tergite shiny and smooth ..... ***S. angustata* van Achterberg, 1987**

– Length of ovipositor sheath 0.4–0.5 times as long as fore wing and approximately as long as metasoma or slightly shorter (Fig. 36); length of first tergite 2.0–2.2 times its apical width; precoxal sulcus below crenulae sparsely

punctulate or spaced punctate anteriorly; hind basitarsus blackish basally (Fig. 36); ventrally basal 0.4–0.6 of hind femur yellow; epipleuron of second tergite with elongate subtriangular patch (Fig. 36); basal half of antenna of ♀ dark brown basally and pale brownish or ivory apically, resulting in a pale submedial band (less clearly defined in ♂); second tergite rather matt and superficially granulate ..... ***S. gracilis* van Achterberg, 1987**

11 Vein r-m omitted comparatively low from vein 2-SR, and petiole of second submarginal cell distinctly longer than wide (Figs 38, 96, 111); fore wing subhyaline apically (Figs 38, 111); hind femur matt ventrally; ovipositor sheath approximately half as long as metasoma (Fig. 111) or longer (Fig. 37)..... **12**

- Vein r-m of fore wing omitted near connection of vein r and 3-SR+SR1 and petiole of second submarginal cell at most slightly longer than wide (Figs 6, 82, 94); fore wing more or less darkened apically (Figs 6, 71, 72); **if** hardly so (Fig. 82) then hind femur shiny ventrally and ovipositor sheath distinctly shorter than half length of metasoma (Fig. 81)..... **13**

12 Vein CU1b subequal to vein 3-CU1 (Figs 95, 111); dorso-apically hind coxa with transverse carinae; length of ovipositor sheath 0.25–0.32 times fore wing, approximately half as long as metasoma (Fig. 111); first metasomal tergite of ♀ distinctly narrowed behind spiracle and 3.0-3.6 times as long as its apical width; propodeum and first–second metasomal tergites largely smooth ..... ***S. tianmushana* Chen, He & Ma, 2004**

- Vein CU1b 0.3 times as long as vein 3-CU1 (Fig. 38); dorso-apically hind coxa without transverse carinae (Fig. 42); length of ovipositor sheath 0.5 times fore wing and somewhat shorter than metasoma (Fig. 37); first tergite of ♀ indistinctly narrowed behind spiracle (Fig. 41) and approximately twice as long as its apical width; propodeum and first–second metasomal tergites finely granulate (Figs 40, 41)..... ***S. granulata* Long & van Achterberg, sp. n.**

13 Length of ovipositor sheath 0.40–0.60 times as long as fore wing (Figs 58, 72, 99); length of first tergite 3.0–3.7 times its apical width (Fig. 103); [hind femur densely finely sculptured and rather matt ventrally] **14**

– Length of ovipositor sheath 0.10–0.25 times as long as fore wing (Figs 4, 16, 71, 81); length of first tergite 2.4–3.3 times its apical width (Figs 9, 85)... **16**

14 Antenna of ♀ with 8–13 white or ivory segments submedially (Fig. 58); vertex moderately punctate; middle lobe of mesoscutum yellowish brown medially; [lateral lobes of mesoscutum more or less dark brown; tegulum brownish yellow; base and apex of first tergite and base of second tergite yellowish brown] ..... ***S. qui* Chen, He & Ma, 2004**

– Antenna of ♀ yellowish brown submedially (Figs 72, 99); vertex coarsely punctate and interspaces approximately as wide as punctures or less (Fig. 107); middle lobe of mesoscutum dark brown medially (Fig. 102) **15**

15 Inner half of humeral plate (Fig. 102), base and apex of first tergite and base of second tergite (Fig. 103) dark brown; hind coxa latero-apically and second

epipleuron with dark brown patch (Fig. 99); [lateral lobes of mesoscutum more or less infuscate medially]..... ***S. takeuchii*** **(Watanabe, 1937)**

– Humeral plate entirely, base and apex of first tergite and base of second tergite yellowish brown (Fig. 73); hind coxa and second epipleuron entirely yellowish brown (Fig. 72) ..... ***S. sauteri*** **Watanabe, 1932**

16 Lobes of mesoscutum dark brown or infuscate medially (Figs 16, 71); antenna of ♀ 1.6–1.7 times as long as fore wing; length of ovipositor sheath 0.17–0.25 times as long as fore wing; frons often entirely dark brown or blackish medially; [basal half of antenna largely yellowish brown; apex of hind coxa more or less dark brown dorsally] **17**

– Lobes of mesoscutum brownish yellow medially (Figs 8, 97); antenna of ♀ 1.7–1.8 times as long as fore wing; length of ovipositor sheath 0.10–0.22 times as long as fore wing; frons more or less brownish yellow medially (Fig. 12) **18**

17 Second and third hind tarsal segments ivory or white (Fig. 71); hind femur dull and densely micro-sculptured ventrally; tegulum dark brown or blackish; [propodeum with coarse transverse rugae]..... ***S. ruficornis*** **Enderlein, 1921**

– Second and third hind tarsal segments dark brown (Fig. 16); hind femur shiny and largely smooth ventrally; tegulum brownish yellow..... ..... ***S. chaoi*** **Chen, He & Ma, 2004**

18 First metasomal tergite of ♀ strongly shiny and 3.3–3.7 times as long as its apical width (Fig. 85); propodeum strongly shiny and with weak transverse rugae (Fig. 85); interspaces between punctures of ventral face of hind femur distinctly shiny; hind coxa strongly shiny dorsally (Fig. 83); length of ovipositor sheath 0.10–0.15 times fore wing; vertex punctulate and interspaces much wider than punctures (Fig. 89); [apex of first tergite and base of second tergite yellowish brown; second tergite of ♀ 1.6–1.7 times as long as wide; hind basitarsus (except apex) ivory or white and remainder dark brown] .... ***S. stilpnosoma*** **Long & van Achterberg, sp. n.**

– First tergite of ♀ with satin sheen and 2.4–3.0 times as long as its apical width (Fig. 9); propodeum with satin sheen and with coarse transverse rugae (Fig. 8); interspaces between punctures of ventral face of hind femur micro-sculptured and rather matt; hind coxa with satin sheen dorsally (Fig. 7); length of ovipositor sheath 0.16–0.22 times fore wing; vertex moderately punctate, interspaces mostly as wide as punctures (Fig. 12) **19**

19 Humeral plate partly brown or dark brown (Fig. 97); penultimate antennal segment of both sexes at least twice as long as wide (Fig. 98); occipital carina wider lamelliform; length of fore wing 4.7–7.5 mm .... ***S. sumatrana*** **Enderlein, 1908**

– Humeral plate entirely pale yellowish or slightly brownish (Fig. 8); penultimate antennal segment of both sexes 1.5–1.7 times as long as wide (Fig. 5); occipital carina narrow lamelliform (Fig. 12); length of fore wing 4.2–4.6 mm ..... ***S. brevicaudata*** **van Achterberg, sp. n.**

***Stantonia angustata* van Achterberg, 1987**
Figs 1, 2

Stantonia angustata van Achterberg, 1987: 27–28; Chen et al. 2004: 354–356, 531; Long and van Achterberg 2014: 408.

Material. 1 ♂ (RMNH), "C. Vietnam: Thua Thien Hué, Phong Dién N.R., n[ea]r base-camp, 15 km W [of] Phong My, 80–120 m, 23.iii.–6.iv.2001, Mal. traps, C. v. Achterberg & R. de Vries, RMNH'01"; 1 ♂ (IEBR), "N. Vietnam: Hoa Binh, Pa Co Hang Kia N.R., 20°44'37"N, 104°56'20"E, 1046 m, 9–23.x.2009, Mal. tr. 5, C. v. Achterberg & R. de Vries, RMNH'09"; 1 ♀ + 2 ♂ (RMNH, IEBR), S. Vietnam: Dông Nai, Cát Tiên N.P., c. 100 m, 13–20.v.2007, Mal. traps, C. v. Achterberg & R. de Vries, RMNH'07"; 1 ♀, (IEBR), "Orgi.009", "NW. Vietnam: Lai Chau, Phong Tho, Tam Duong, Lai Nhi Thang, 09.x.2004, KDLong; 1 ♀ (VNMN), "Orgi.036", "NE. Vietnam: Ninh Binh, Cuc Phuong N.P., 7-9.v.2002, KDLong; 1 ♂ (RMNH), id., but 9.iv.–13.v.2007, Mai Phu Quy & Nguyen Thanh Manh; 1 ♂ (RMNH), "N. Vietnam: Ninh Binh, Cuc Phuong N.P., n[ea]r entrance, c. 225 m, 15.iv.–1.v.2000, Mal. Tr. II, Mai Phu Quy, RMNH'00"; 1 ♂ (RMNH), "S. Vietnam: Dak Lak, Chu Yang Sin N.P., n[ea]r dam, 740–940 m, 1–10.vi.2007, Mal. traps, C. v. Achterberg & R. de Vries, RMNH'07"; 1 ♀ (RMNH), "C. Vietnam: Ha Tinh, Vu Quang N.P., 18°19'47"N, 105°26'28"E, 66 m, 4.iii.–15.iv.2011, Mal. trap 9, C. v. Achterberg & R. de Vries, RMNH'11"; 1 ♀ (RMNH), id., but 18°17'46"N, 105°25'52"E, 106 m, 5.iii.–15.iv.2011, Mal. trap 12; 2 ♂ (IZAS), "[China:] Sichuan, Mt. Emei, 550-750 m, 19 & 20.v.1957".

Diagnosis. Antenna dark brown, but scapus and pedicellus partly pale; vertex rather coarsely and densely punctate and largely dark brown or black; anteriorly precoxal sulcus below crenulae coarsely punctate; mesosoma yellow with black spots; tegulum blackish; mesopleuron dark ventrally and rather coarsely punctate; propodeum rugose medially but anteriorly largely smooth; hind tarsus pale yellow or white but fourth and fifth segments more or less dark brown; ventrally hind femur coarsely reticulate-rugose, densely sculptured and rather matt; ventral apical 0.3-0.6 of femur black or dark brown (both sexes); hind femur 6 times longer than wide; ventrally basal 0.2–0.4 of hind femur yellow; epipleuron of second tergite with equilateral triangular dark brown patch; length of ovipositor sheath 0.18–0.24 times as long as fore wing and 0.3 times length of metasoma; length of fore wing 4.7–6.3 mm.

Variation. Hind tibial spurs blackish (Cát Tiên N.P. and Cuc Phuong N.P.; Fig. 1), brown (Vu Quang N.P.; Fig. 2) or yellowish (Phong Dién N.R.); typical *S. angustata* have blackish spurs. Vietnamese specimens have hind tarsus (except dark telotarsus (Fig. 2) and sometimes (Fig. 1) fourth segment dark brown or brown) ivory or white; typical *S. angustata* have also third hind tarsal segment dark brown and second segment more or less infuscated.

Distribution. China (Sichuan, Yunnan), Brunei, East and West Malaysia, Vietnam (Lai Chau; Ninh Binh, Cuc Phuong N.P. (Long and van Achterberg 2014); *Hoa

Figure 1. *Stantonia angustata* van Achterberg, ♀, Vietnam, Cát Tiên N.P., habitus, lateral aspect.

Binh, Pa Co Hang Kia N.R.; *Thua Thien Hué, Phong Dién N.R.; *Dak Lak, Chu Yang Sin N.P.; *Dông Nai, Cát Tiên N.P.).

Notes. If length of antenna 1.9 times fore wing, head blackish brown (except vertex); metasoma laterally blackish brown; second epipleuron with faint dark spot; length of body 3.8–5.3 mm, cf. *S. jacobsoni* van Achterberg, 1987.

Stantonia annulicornis Enderlein, 1921

Fig. 3

Stantonia annulicornis Enderlein, 1921: 58; Shenefelt 1970: 267; van Achterberg 1987: 21; Chenet al. 2004: 531; Long and van Achterberg 2014: 408.
Stantonia spasskensis; Long and van Achterberg 2014: 408.

Material. 1 ♀ (RMNH), "S. Vietnam: Dông Nai, Cát Tiên N.P., c. 100 m, 9.iv.–13.v.2007, Mal. traps, Mai Phu Quy & Nguyen Thanh Manh, RMNH'07"; 1 ♀ (RMNH), "S. Vietnam: Dak Lak, Chu Yang Sin N.P., n[ea]r dam, 740–940 m, 1–10.

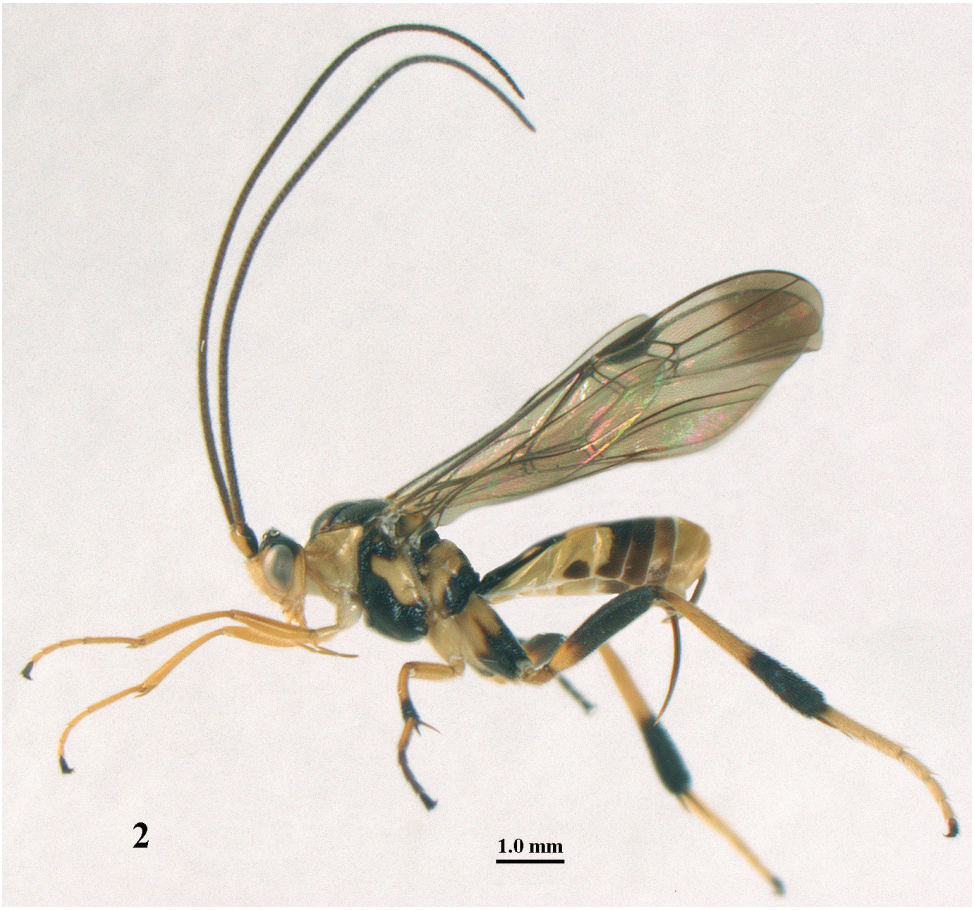


Figure 2. *Stantonia angustata* van Achterberg, ♀, Vietnam, Vu Quang N.P., habitus, lateral aspect.

vi.2007, Mal. traps, C. v. Achterberg & R. de Vries, RMNH'07"; 1 ♀ (VNMN), 'Orgi.039' NE. Vietnam: Ninh Binh, Cuc Phuong NP, Bong forest, 13.v.2005, K.D. Long; 1 ♂ + 1 ♀ (IEBR), "Orgi 050 &051", "C. Vietnam: Thua Thien-Hue, Nam Dong, MT 2–6.v.2005, N.Q. Truong; 1 ♀ (IEBR), "Orgi.068", "NE Vietnam: Phu Tho, Tan Son, Lai Dong, MT, 21°13'N, 104°55'E, 180 m, 20.v.2011, K.D. Long; 1 ♂ (IEBR), "Orgi.003", "NW. Vietnam: Hoa Binh, Yen Thuy, orchard, MT, 20°23'N, 105°36'E, 55 m, 20-30.iv.2002, K.D. Long".

Diagnosis. Antenna of both sexes with band of 10–13 white or ivory segments (Fig. 3); mesosoma largely and telotarsi black or dark brown; tegulum pale brown or pale yellowish; metapleuron and propodeum posteriorly, and propodeum medially more or less yellowish brown or brown; fore wing only apically infuscated; hind tarsus (except base of basitarsus and telotarsus) whitish or ivory and conspicuously bristly setose; hind femur (except basally) and more or less middle coxa black, dark brown or brownish dorsally; ovipositor sheath 0.55–0.60 times as long as fore wing; epipleuron

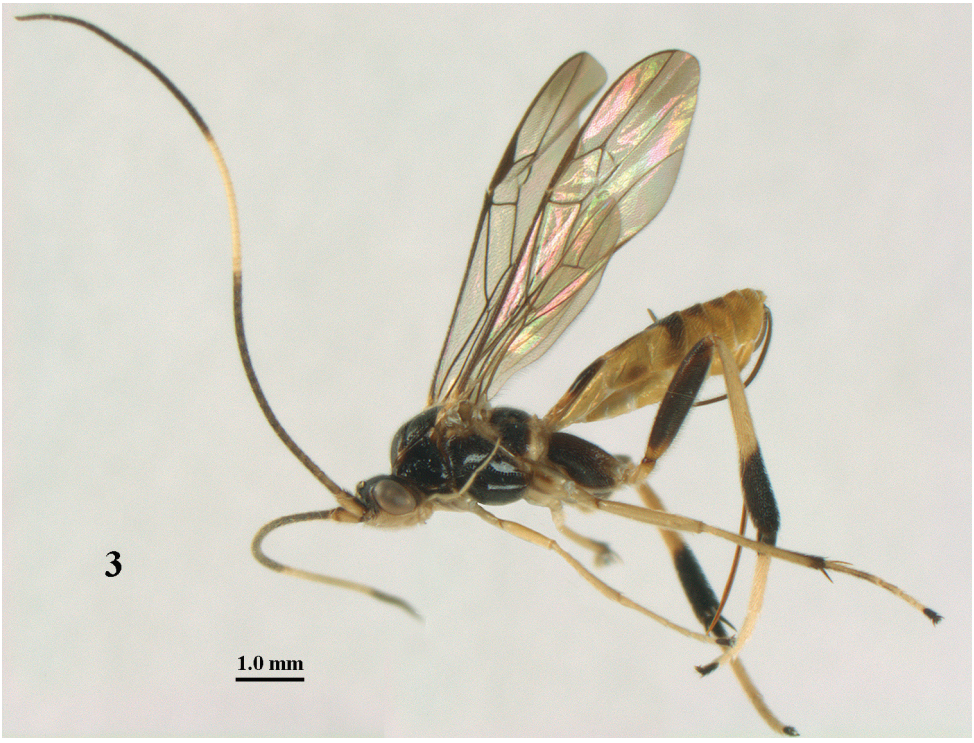


Figure 3. *Stantonia annulicornis* Enderlein, ♀, Vietnam, Cát Tiên N.P., habitus, lateral aspect.

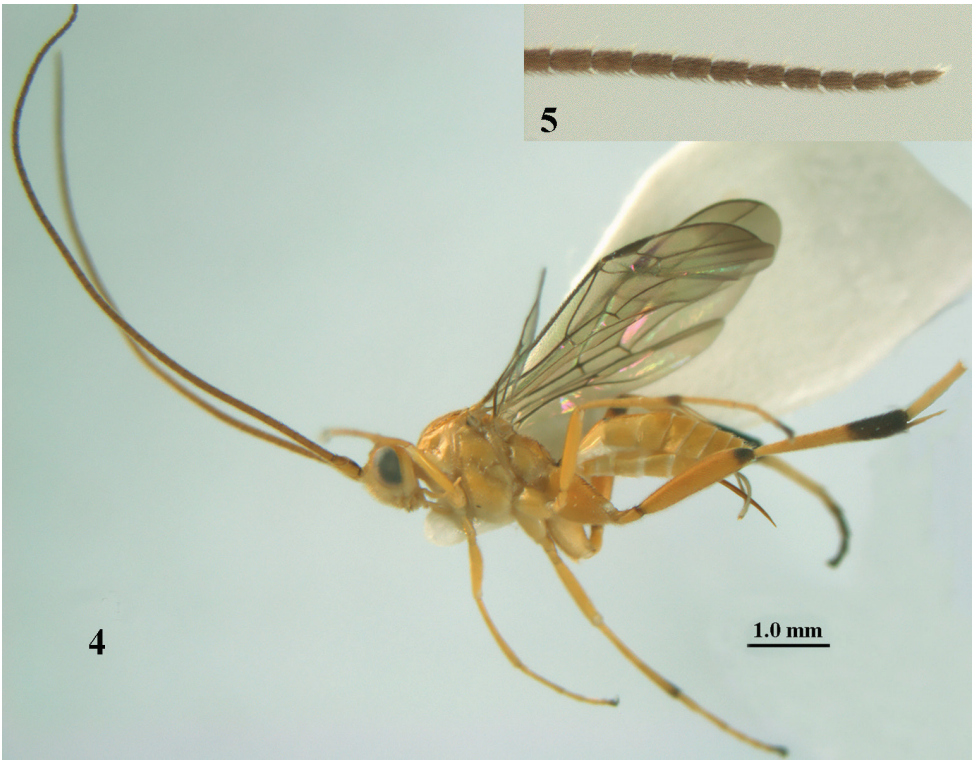
of second metasomal tergite entirely pale yellowish or with a faint brownish spot; length of fore wing 6–9 mm.

Distribution. Myanmar, Vietnam (Phu Tho; Hoa Binh; Ninh Binh, Cuc Phuong N.P.; Thua Thien-Hue (Long and van Achterberg 2014); *Dak Lak, Chu Yang Sin N.P.; *Dông Nai, Cát Tiên N.P.).

Notes. Holotype of *S. annulicornis* from Myanmar has the middle coxa largely black (mainly brown to black in Vietnamese specimens), the propodeum finely punctate (variable in Vietnamese specimens, but often largely smooth) and the tegulum pale yellowish (pale yellowish brown to brown in Vietnamese specimens).

***Stantonia brevicaudata* van Achterberg, sp. n.**
http://zoobank.org/6D75C52B-C75F-464B-8317-4BF78333A6D6
Figs 4–15

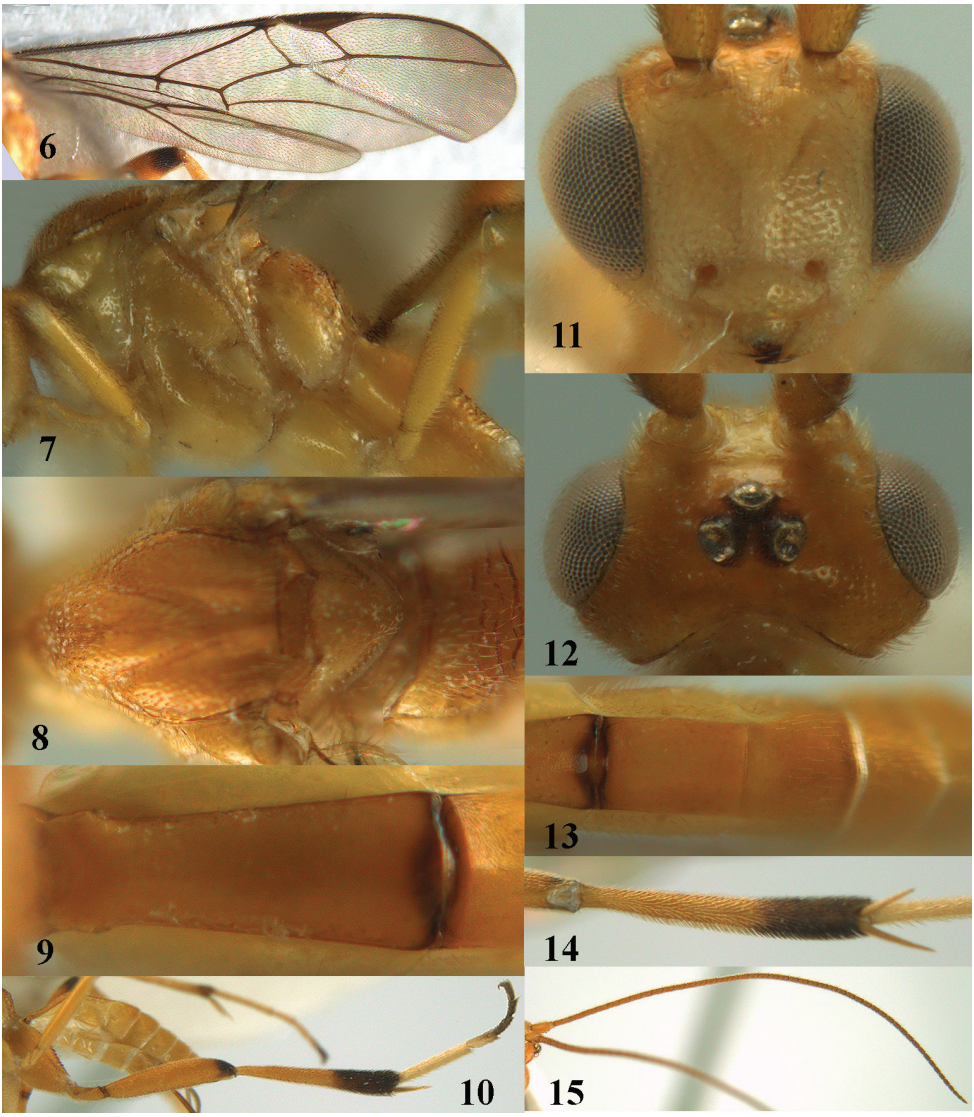
Type material. Holotype, ♀ (RMNH), "Vietnam: Ninh Thuân, Núi Chúa N.P., northeast part, Mal. traps, 90–150 m, 24–30.v.2007, C. v. Achterberg & R. de Vries, RMNH'07". Paratype: 1 ♂ (RMNH), "S. Vietnam: Dông Nai, Cát Tiên N.P., c. 100 m, 13–20.v.2007, Mal. traps, C. v. Achterberg & R. de Vries, RMNH'07".



Figures 4–5. *Stantonia brevicaudata* sp. n., ♀, holotype. **4** habitus, lateral aspect **5** apex of antenna.

Diagnosis. Antenna of ♀ 1.8 times as long as fore wing and largely brown (Fig. 4); apical antennal segments of both sexes 1.5–1.7 times as long as wide; vertex rather densely punctate and yellowish brown, but stemmaticum largely darkened (Fig. 12); mesosoma entirely pale brownish yellow; area below precoxal suture finely spaced punctate; tegulum and humeral plate entirely pale yellowish; propodeum with coarse transverse rugae; vein CU1b of fore wing strongly oblique and distinctly diverging from vein cu-a, short (Fig. 6); fore wing with apical part more or less infuscated (Fig. 6); ventrally hind femur mainly coriaceous, except some rugulae, matt (as outer side) and entirely yellowish brown; third and fourth segments of middle tarsus ivory or pale brown; apex of hind coxa yellowish brown dorsally; apex of hind basitarsus white or ivory (as more or less of second segment); third–fifth hind tarsal segment dark brown; first tergite of ♀ approx. 2.5 (of ♂ 2.6) times as long as its apical width and more or less widened apically; apex (and of ♂ also base) of first tergite and base of second tergite infuscate or dark brown (Fig. 9); second tergite largely smooth; second epipleuron entirely yellow; length of ovipositor sheath 0.2 times as long as fore wing and 0.3 times as long as metasoma; length of fore wing 4–5 mm.

The new species runs in the key by van Achterberg (1987) to *S. sumatrana* Enderlein, but differs by having the humeral plate entirely pale yellowish (partly infuscate or brown in *S. sumatrana*), penultimate antennal segments of both sexes 1.5–1.7 times



Figures 6–15. *Stantonia brevicaudata* sp. n., ♀, holotype. **6** wings **7** mesosoma, lateral aspect **8** mesosoma, dorsal aspect **9** first metasomal tergite, dorsal aspect **10** hind leg, lateral aspect **11** head, anterior aspect **12** head, dorsal aspect **13** second and third metasomal tergites, dorsal aspect **14** hind tibia, ventral aspect **15** antenna.

as long as wide (at least twice as long as wide) and occipital carina narrow lamelliform (wider lamelliform).

Description. Holotype, ♀. Body length 4.6 mm, fore wing length 4.4 mm, ovipositor sheath 0.7 mm.

Head. Antenna with 49 segments and 1.8 times as long as fore wing; middle antennal segments with distinct false division medially and 1.8 times as long as wide; third, fourth

and penultimate antennal segments 3.6, 2.6 and 1.7 times as long as wide, respectively, and third segment 1.4 times as long as fourth segment; width of face equal to height of face and clypeus combined (Fig. 11); maxillary palp approximately as long as height of head; clypeus distinctly convex (Fig. 11); malar space 1.2 times as long as mandible width; distance between tentorial pits 1.8 times as long as distance between pit and eye margin; in anterior view length of eye 1.8 times as long as wide; in dorsal view length of eye 2.6 times as long as temple; POL:OD:OOL = 3:3:6; distance between anterior and lateral ocellus 0.7 times OD (Fig. 12); face remotely and rather coarsely punctate and medium-sized setae; vertex finely remotely punctate and directly behind stemmaticum depressed; temple matt and with indistinct micro-sculpture; occipital flange wide lamelliform.

Mesosoma. Length of mesosoma 1.3 times as long as high; pronotal side smooth dorsally and remainder sparsely finely punctate and medial sulcus anteriorly with few crenulae; notauli rather narrow and moderately crenulate (Fig. 8); mesoscutum and scutellum remotely and often rather coarsely punctate (Fig. 8); precoxal sulcus narrow and finely crenulate, but obsolescent anteriorly and posteriorly (Fig. 7), meso- and metapleuron sparsely finely punctate; propodeum rather shiny, with coarse transverse rugae (Fig. 8), but anteriorly and posteriorly mainly smooth.

Wings. Fore wing (Fig. 6): pterostigma 4.4 times as long as wide; r:2-SR:3-SR+SR1:r-m = 5:7:26:5; r issued submedially from pterostigma; r-m only submedially weakly sclerotized; cu-a slightly postfurcal (Fig. 6); basal half of CU1a largely sclerotized; CU1b: 3-CU1 = 5:9. Hind wing: M+CU:1-M: 1r-m = 5:14:1.

Legs. Ventrally hind femur mainly coriaceous, except some rugulae, matt (as outer side); length of femur, tibia and basitarsus of middle leg 7.4, 11.9 and 11.6 times as long as their width, respectively; inner and outer middle tibial spurs 0.55 and 0.40 times as long as basitarsus; length of femur, tibia and basitarsus of hind leg 5.0, 7.7 and 6.8 times their width, respectively; inner and outer hind tibial spurs 0.5 and 0.4 times as long as basitarsus, respectively.

Metasoma. First tergite gradually widened (Fig. 9), 2.5 times as long as its apical width, its surface largely smooth, rather dull and apically slightly micro-sculptured; second tergite smooth (except some punctures), elongate, 1.5 times longer than its basal width and rather dull; second suture straight and area behind rather flat; length of ovipositor sheath 0.17 times as long as fore wing and 0.3 times as long as metasoma (Fig. 4).

Colour. Yellowish brown dorsally and remainder (including tegulum and humeral plate) pale yellowish, but antenna (except scapus and pedicellus) and ovipositor sheath brown, apex of first tergite, base of second tergite, telotarsi, apex of hind femur, apex of middle tibia, apical 0.4 of hind tibia, third and fourth hind tarsal segments, dark brown; hind basitarsus and second tarsal segment ivory, but apex of latter slightly infuscated (Fig. 10); apex of fore wing moderately darkened and remainder subhyaline (Fig. 6); veins and pterostigma dark brown.

Male. Body length 4.5 mm, fore wing length 4.2 mm; length of first metasomal tergite 2.6 times its apical width.

Distribution. Vietnam (Ha Tinh, Vu Quang N.P.; Ninh Thuân, Núi Chúa N.P.; Dak Lak, Chu Yang Sin N.P.; Dông Nai, Cát Tiên N.P.).

Stantonia chaoi **Chen, He & Ma, 2004**
Fig. 16

Stantonia chaoi Chen, He & Ma, 2004: 356–358, 533; Long and van Achterberg 2014: 408.

Material. 1 ♀ (RMNH), "N. Vietnam: Ninh Binh, Cuc Phuong N.P., n[ea]r entrance, c. 225 m, 1–15.v.2000, Mal. tr. II, Mai Phu Quy, RMNH'00"; 2 ♀ (ZISP), N. Vietnam, Ba Vi, 70 km NW Hanoi, 400 m, forest; 1 ♂ (ZISP), N. Vietnam, Cao Phong, Ky Son, Ha Son Binh, forest; 1 ♀ (IEBR), "Orgi.035", "NW Vietnam: Hoa Binh, Yen Thuy, 20°13'06"N, 105°34'11"E, 315m, 10–20.vi.2002, K.D. Long"; 2 ♂ (IEBR), "Orgi.072 & 075", "NW Vietnam: Hoa Binh, Mai Chau, orchard, MT, 20°43'10.3"N, 104°59'47.0"E, 950 m, 1–10.v.2010, K.D. Long; 1 ♂ (IEBR), "Orgi.082", "C Vietnam: Quang Nam, Dong Giang, P'Rao, 500-600 m 28.v.2006, HV Tru"; 1 ♀ (IEBR), "Orgi.084", "NW Vietnam: Hoa Binh, Kim Boi, Thong Tien NR, MT, 20°39'24.7"N, 105°27'14.3"E, 200 m, 5–15.xi.2012, K.D. Long; 2 ♀ (VNMN), "Orgi.100 & 101" + 1 ♂ (VNMN). "Orgi.102", "NE Vietnam: Tuyen Quang, Na Hang, Thanh Tuong,

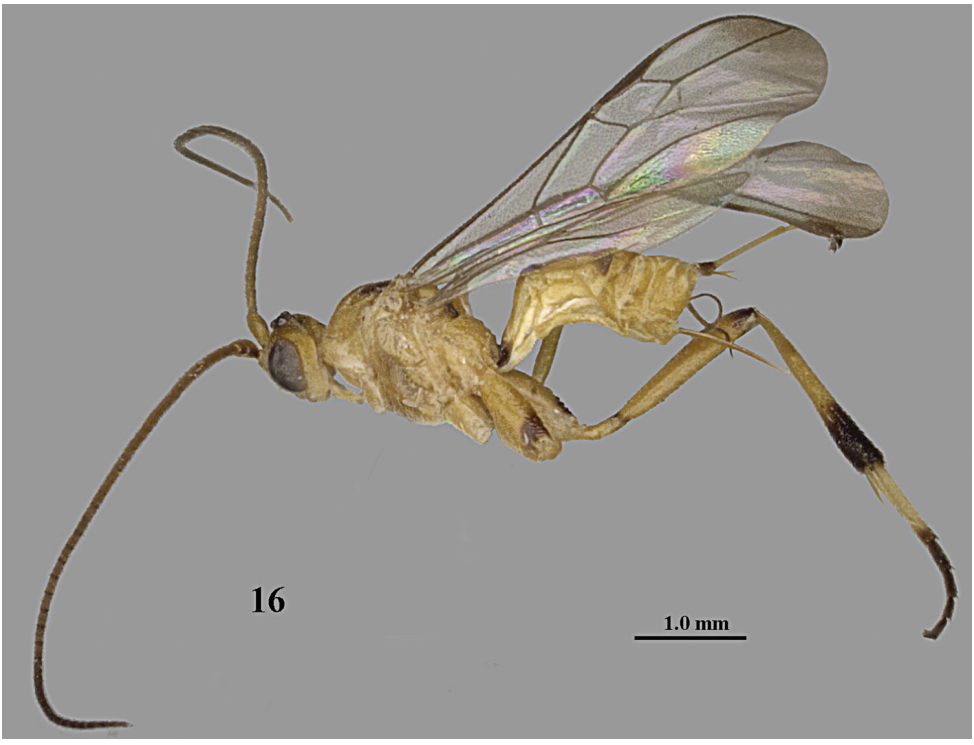


Figure 16. *Stantonia chaoi* Chen, He & Ma, ♀, holotype, habitus, lateral aspect. Photo: Jiachen Zhu.

forest, MT, 22°19'01"N, 105°24'02"E, 162 m, 15.iii.2017, K.D. Long; 1 ♂ (IEBR), "Orgi.033", "NC Vietnam, Ha Tinh, Huong Son, Rao An, forest, 200 m, 11.v.1998, K.D. Long".

Diagnosis. Antenna of ♀ 1.6–1.7 times as long as fore wing and largely dark brown; frons with pair of dark brown spots posteriorly; vertex yellowish brown and strongly punctate, with interspaces approximately as wide as punctures or less; area below precoxal suture finely punctate; mesosoma yellowish brown, but lateral lobes of mesoscutum dark brown medially; mesoscutum and scutellum distinctly punctate; tegulum brownish yellow, but infuscate apically; propodeum rugose medially and remainder nearly smooth; fore wing infuscated apically; third segment of middle tarsus yellow or dark brown; outer side of hind femur rather shiny, parallel-sided and slender (Fig. 16); ventrally hind femur shiny and finely rugulose, and nearly entirely yellowish-brown; apex of hind basitarsus, third and fourth hind tarsal segments dark brown, similar to dark telotarsus; first tergite 2.7–3.0 times as long as wide apically; second epipleuron of metasoma entirely yellow; second metasomal suture straight; length of ovipositor sheath 0.17–0.21 times as long as fore wing and 0.2–0.3 times as long as metasoma; length of fore wing 4–6 mm.

Distribution. China (Yunnan), Vietnam (Hoa Binh (Long and van Achterberg 2014); Tuyen Quang (Na Hang); Hoa Binh (Cao Phong, Kim Boi, Mai Chau, Yen Thuy); Ninh Binh (Cuc Phuong); Ha Tinh (Huong Son); Quang Nam (Dong Giang)).

Stantonia clappae Kittel, 2016

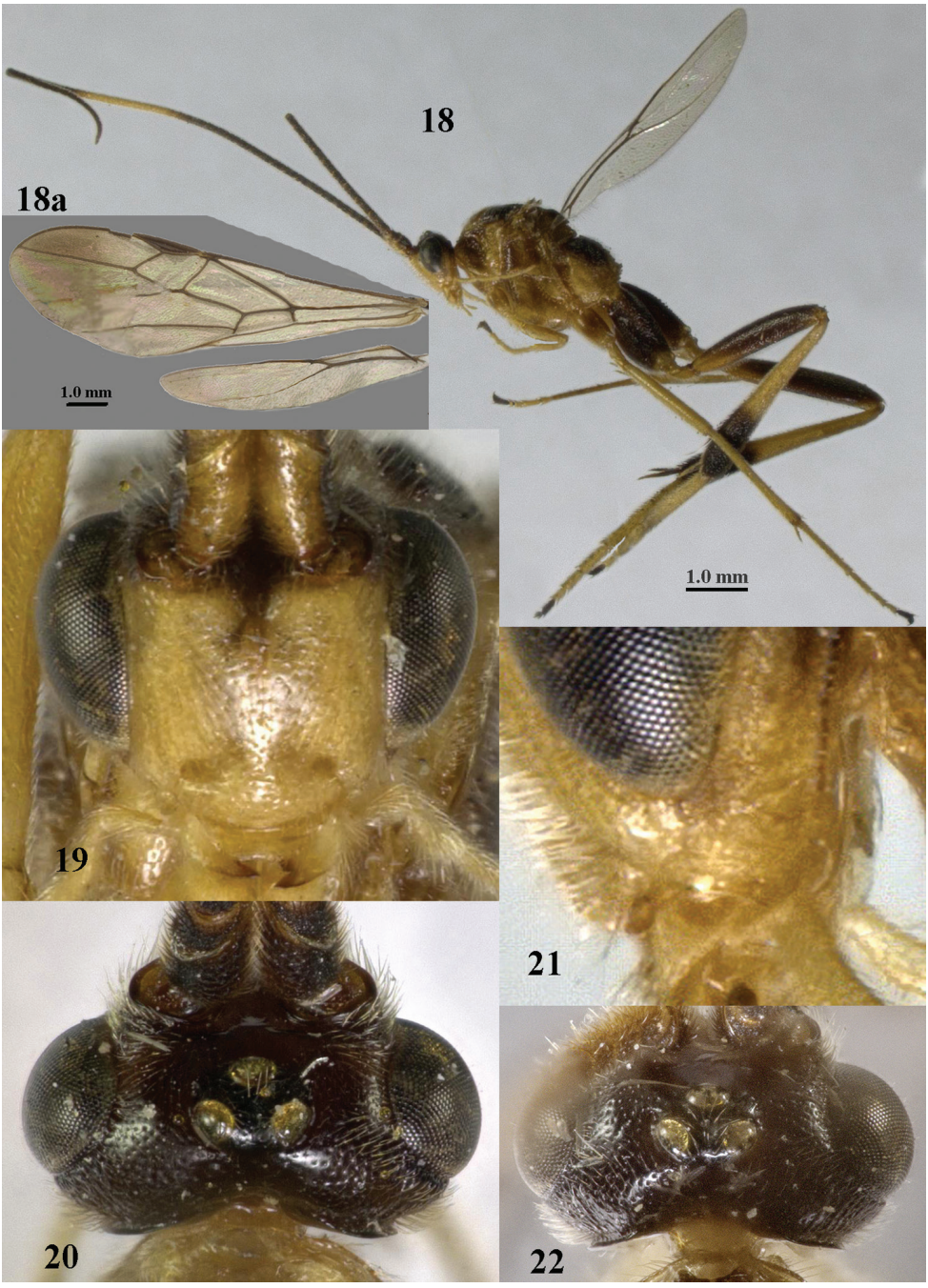
Figs 17–22

Stantonia achterbergi Chen, He & Ma, (Sept.) 2004: 353–354, 531 (not *S. achterbergi* Braet & Quicke, (Feb.) 2004).
Stantonia clappae Kittel, 2016: 163 (replacement name).

Diagnosis. Apical half of antenna of both sexes with band of 6-9 ivory or white segments; anterior tentorial pits distinctly below lower level of eyes and malar space comparatively long (Fig. 19); tegulum brown or dark brown; mesosoma at least largely black or dark brown; anterior half of propodeum distinctly punctate; basal half of hind coxa reticulate-punctate dorsally hind femur (except basally) and more or less middle coxa black or dark brown dorsally; hind tarsus moderately bristly setose and (except basally and apically) whitish or ivory; infuscation of apex of fore wing occupies most of apex of fore wing (Fig. 17); first metasomal tergite approx. 4.3 times as long as wide; second metasomal tergite yellowish; epipleuron of second metasomal tergite with a dark brown or brown spot; length of ovipositor sheath 0.6 times as long as fore wing; length of fore wing 8–9 mm.

Distribution. China (Palaearctic: Jilin; Oriental: Guangdong, Zhejiang).

Figure 17. *Stantonia clappae* Kittel, ♀, paratype, China, Jilin, habitus, lateral aspect. Photo: Jiachen Zhu.



Figures 18–22. *Stantonia clappae* Kittel, ♀, holotype, China, Zhejiang, but 22 of paratype from Jilin. **18** habitus, lateral aspect (a= separated wings) **19** head, anterior aspect **20, 22** head, dorsal aspect **21** detail of malar space, lateral aspect. Photos: Jiachen Zhu.

***Stantonia dickyyui* van Achterberg & Long, sp. n.**
http://zoobank.org/86DF320F-FC9E-40C6-978B-E974ADD5F752
Figs 23–35

Stantonia xiangqianensis; Long and van Achterberg 2014: 408.

Material. Holotype, ♀ (RMNH), "N. Vietnam: Viet Try, n[ea]r Thanh Son, Thuong Cuu, 20°59'N, 105°8'E, 350–400 m, 11–16.x.1999, Malaise traps, R. de Vries, RMNH'99". Paratypes (2 ♀ + 2 ♂): 1 ♀ (RMNH), "N. Vietnam: Ninh Binh, Cuc Phuong N.P., n[ea]r centre ([Mal. tr.] I), c. 225 m, 20.xii.1999–10.ii.2000, Mai Phu Quy, RMNH'00"; 1 ♂ (RMNH), id., but 15.iii.–14.ix.2000; 1 ♂ (RMNH), id., but 1.xi.–20.xii.2000; 2 ♀ (RMNH, IEBR), "C. Vietnam: Ha Tinh, Vu Quang N.P., 18°17'38"N, 105°25'25"E, 169 m, 24.ix.–5.x.2009, Taiw[an] tr[ap] 11, C. v. Achterberg & R. de Vries, RMNH'09"; 1 ♂ (VNMN), "Orgi.069", "NC. Vietnam: Ha Tinh, Vu Quang N.P., forest, 6.x.2009, K.D. Long".

Diagnosis. Basal half of antenna yellowish, without ivory or white segments, its apical half, and outer side of scapus and pedicellus darkened; vertex finely spaced punctate and interspaces distinctly wider than punctures and yellowish brown; mesosoma entirely yellowish brown; inner half of humeral plate yellowish brown, remainder and tegulum brownish yellow; propodeum mainly smooth, medially with coarse transverse rugae (Fig. 26); fore wing moderately infuscated apically (Fig. 24); vein 3-SR+SR1 approx. 4 times as long as vein r; hind femur slightly widened subapically (Fig. 23), partly smooth and shiny ventrally, apically yellowish brown; hind tarsus (except largely ivory basitarsus) dark brown (Fig. 23); hind coxa largely coarsely transversely striate (Fig. 25); length of first metasomal tergite approx. 3.7 times its apical width, tergite strongly shiny; second epipleuron of metasoma without dark spot; apices of first and third metasomal tergites brownish yellow; second metasomal suture curved and medial area behind it convex; length of ovipositor sheath approx. 0.5 times as long as fore wing and somewhat longer than metasoma; length of fore wing 6–7 mm.

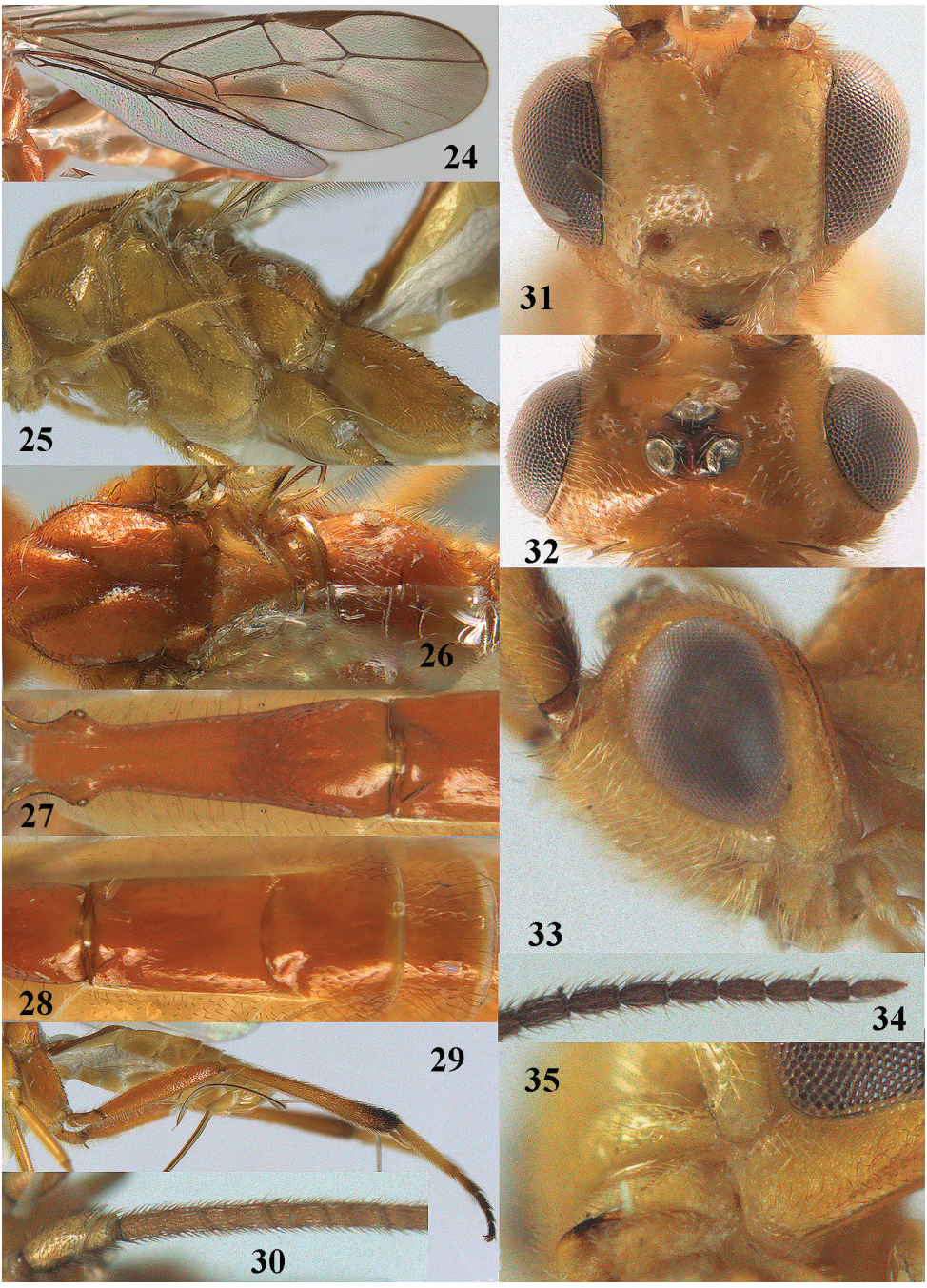
Description. Holotype, ♀. Body length 6.8 mm, fore wing length 6.4 mm, ovipositor sheath 3.1 mm.

Head. Antenna with 58 segments and 1.7 times as long as fore wing; third, fourth and penultimate antennal segments 3.8, 2.4 and 2.1 times as long as wide, respectively, and third segment 1.6 times as long as fourth segment; width of face 0.9 times height of face and clypeus combined (Fig. 31); maxillary palp 1.6 times as long as height of head; clypeus convex dorsally and flattened ventrally, remotely finely punctate (Fig. 31); malar space as long as basal width of mandible; distance between large tentorial pits twice as long as distance between pit and eye margin; in anterior view length of eye 2.3 times as long as wide; in dorsal view length of eye 3.6 times as long as temple and temple directly narrowed behind eye; POL:OD:OOL = 8:10:21; distance between anterior and lateral ocellus 0.6 times OD (Fig. 32); face moderately convex, remotely punctulate, and with long setae; frons laterally and vertex remotely finely punctate

Figure 23. *Stantonia dickyyui* sp. n., ♀, holotype, habitus, lateral aspect.

(interspaces much wider than punctures), interspaces smooth and area directly behind stemmaticum depressed; frons medially smooth; stemmaticum strongly protruding; temple with satin sheen and mainly granulate, dorsally with some rugulae; occipital flange wide lamelliform.

Mesosoma. Length of mesosoma 1.3 times as long as high; pronotal side shiny and largely smooth except some superficial granulation ventrally and rather coarsely crenulate medial sulcus, subposteriorly absent and posteriorly narrowly crenulate; prepectal carina angulate and medium-sized; mesopleuron angulate ventrally; precoxal sulcus narrow and finely crenulate, complete and with wide flange posteriorly (Fig. 25), meso- and metapleuron remotely finely punctate, smooth interspaces much wider than punctures; notauli narrow and finely crenulate; mesoscutum finely punctate, with smooth interspaces much wider than width of punctures; scutellar sulcus smooth; scutellum remotely punctulate; propodeum shiny, mainly smooth but medially with some coarse rugae.



Figures 24–35. *Stantonia dickyyui* sp. n., ♀, holotype. **24** wings **25** mesosoma, lateral aspect **26** mesosoma, dorsal aspect **27** first metasomal tergite, dorsal aspect **28** second and third metasomal tergites, dorsal aspect **29** hind leg, lateral aspect **30** base of antenna, dorsal aspect **31** head, anterior aspect **32** head, dorsal aspect **33** head, lateral aspect **34** apex of antenna, dorsal aspect **35** mandible and malar space, lateral aspect.

Wings. Fore wing (Fig. 24): pterostigma 4.4 times as long as wide; second submarginal cell petiolate; r:2-SR:3-SR+SR1:r-m = 10:12:39:6; r issued behind middle from pterostigma; r-m submedially distinctly sclerotized; cu-a slightly postfurcal (Fig. 25); basal 0.7 of CU1a more or less sclerotized; CU1b: 3-CU1 = 1:2; CU1b short. Hind wing: M+CU:1-M: 1r-m = 21:92:10.

Legs. Hind coxa with coarse curved rugae dorsally and shiny (Fig. 25); ventrally hind femur shiny and remotely finely punctate, long setose; length of femur, tibia and basitarsus of middle leg 7.4, 12.5 and 11.9 times as long as their width, respectively; inner and outer middle tibial spurs 0.50 and 0.35 times as long as basitarsus; length of femur, tibia and basitarsus of hind leg 5.3, 10.4 and 7.0 times their width, respectively; hind basitarsus rather erect setose; inner and outer hind tibial spurs 0.55 and 0.40 times as long as basitarsus, respectively.

Metasoma. First tergite distinctly narrowed behind spiracles (Fig. 27), 3.6 times as long as its apical width, its surface superficially finely granulate subapically and shiny; second tergite convex and smooth anteriorly, remainder smooth and shiny, 1.6 times longer than its basal width; second suture curved and medial area behind it convex; ovipositor sheath 0.49 times as long as fore wing and 0.9 times as long as metasoma (Fig. 23).

Colour. Yellowish brown; inner half of humeral plate yellowish brown, remainder of plate and tegulum brownish yellow; outer side of scapus and pedicellus, stemmaticum, pterostigma, hind tibial spurs, apex of hind basitarsus and base of second hind tarsal segment brown; apical half of antenna, remainder of hind tarsus, fore and middle telotarsi, fourth middle tarsal segment, apical 0.2 of hind tibia and ovipositor sheath dark brown; frons, face, clypeus, palpi, scapus and pedicellus ventrally, remainder of fore and middle legs, meso- and metasoma laterally and ventrally pale yellowish; apex of fore wing darkened and remainder subhyaline (Fig. 24); veins dark brown.

Male. Very similar to holotype; body length 6.6–6.8 mm, fore wing length 5.9–6.0 mm; antenna with 54(1), 56(1) segments and 1.9 times longer than fore wing; propodeum largely smooth and transverse rugae weakly or coarsely developed, length of first metasomal tergite 3.5–3.8 times its apical width; pterostigma and apical 0.3 of hind tibia dark brown.

Variation. Female: length of body 6.2–6.8 mm and of fore wing 5.8–6.4 mm; antenna with 58(1), 57(2) segments; propodeum smooth and without distinct transverse rugae or with some weak or coarse rugae medially; vein cu-a of fore wing antefurcal or narrowly postfurcal; length of first tergite 3.2–3.6 times its apical width; length of ovipositor sheath 0.49–0.54 times fore wing.

Distribution. Vietnam (Phu Tho (Viet Tri); Ninh Binh (Cuc Phuong); Ha Tinh (Vu Quang)).

Etymology. Named after Dr Dicky Sick Ki Yu (Nepean, Canada) for creating Taxapad, the excellent and enormous database on parasitoid Hymenoptera. Nowadays, it is hardly imaginable to study successfully Braconidae without the help of this database.

Stantonia gracilis van Achterberg, 1987

Fig. 36

Stantonia gracilis van Achterberg, 1987: 31–33; Braet and Quicke 2004: 1547.

Material. 2 ♀ (RMNH, IEBR), "S. Vietnam: Dông Nai, Cát Tiên N.P., c. 100 m, 9.iv.–13.v.2007, Mal. traps, Mai Phu Quy & Nguyen Thanh Manh RMNH'07"; 1 ♀ + 1 ♂ (RMNH), id., but 13–20.v.2007, C. v. Achterberg & R. de Vries.

Diagnosis. Antenna of ♀ dark brown basally followed by pale brownish or ivory segments, resulting in a pale submedial band (Fig. 36; less clearly defined in ♂); vertex rather coarsely and densely punctate and largely dark brown or black; anteriorly precoxal sulcus below crenulae sparsely punctulate or spaced punctate; mesosoma yellow with black spots; tegulum blackish; mesopleuron yellowish ventrally and finely punctate; propodeum rugose medially but anteriorly largely smooth; hind tarsus pale yellow or white but base of basitarsus and telotarsus dark brown; ventrally hind femur coarsely reticulate-rugose, densely sculptured and rather matt; ventrally basal 0.6 of hind femur yellow; hind femur 6 times longer than wide; ventrally basal 0.2-0.4 of hind femur yellow; epipleuron of second tergite with elongate triangular dark brown patch; second metasomal tergite with weak triangular basal elevation length of ovipositor sheath 0.4–0.5 times as long as fore wing and approximately as long as metasoma or slightly shorter; length of fore wing 3.7–5.2 mm.

Distribution. Indonesia (Sulawesi), Philippines (Luzon; Mindanao; Braet and Quicke 2004), *Vietnam (*Dông Nai, Cát Tiên N.P.). New record for Vietnam.

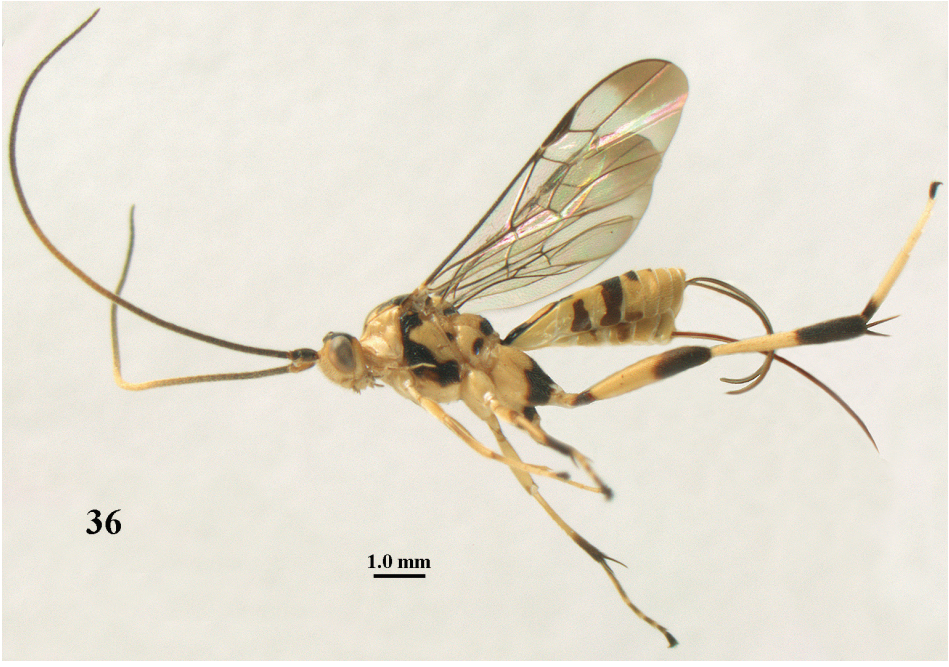


Figure 36. *Stantonia gracilis* van Achterberg, ♀, Vietnam, Cát Tiên N.P., habitus, lateral aspect.

***Stantonia granulata* Long & van Achterberg, sp. n.**
http://zoobank.org/0F5C009B-0E0E-4453-8C9F-9F82BC37FC3D
Figs 37–45

Type material. Holotype, ♀ (VNMN), "Orgi.008", "NC Vietnam: Huong Son, Ha Tinh, Son Tay, forest, 5–8.v.2004, TX Lam".

Diagnosis. Antenna of ♀ incomplete, with 37 segments remaining; basal two-thirds of remaining part of antenna yellow, apical third brown; tentorial pits at lower level of eyes (Fig. 43); malar space medium-sized; vertex finely punctate; anteriorly precoxal sulcus rugose-punctate, posterior area above precoxal sulcus finely granulate; propodeum finely granulate; hind basitarsus yellow basally and ivory apically; hind telotarsus dark brown and remainder of hind tarsus ivory; hind coxa yellow, rugose dorsally, granulate laterally; hind femur 6.6 times longer than wide and ventrally rugose-punctate; first metasomal tergite slightly narrowed behind spiracle; second metasomal suture straight; second tergite parallel-sided and granulate; ovipositor sheath 0.5 times as long as fore wing; length of fore wing 4.4 mm.

Description. Holotype, ♀. Body length 4.6 mm, fore wing length 4.4 mm, ovipositor sheath 2.2 mm and exserted ovipositor 2.5 mm.

Head. Antenna incomplete, with 37 segments remaining; ventral length of scapus 2.3 times its maximum width; middle antennal segments 1.7–1.8 times as long as wide; third segment 1.2 times as long as fourth segment; width of face as long as height of face and clypeus combined (Fig. 43); maxillary palp nearly as long as height of head (30:31); clypeus distinctly convex (Fig. 43); malar space 1.75 times as long as mandible width (Fig. 45); distance between tentorial pits twice as long as distance between pit and eye margin; in anterior view length of eye 1.5 times as long as wide; in lateral view, width of eye 2.6 times temple; in dorsal view length of eye 2.8 times as long as temple; occipital carina broadly absent dorsally; ocelli large, POL:OD:OOL = 3:4:7; distance between anterior and lateral ocellus 0.5 times OD (Fig. 44); face largely punctate; vertex and temple finely punctate.

Mesosoma. Length of mesosoma 1.55 times as long as high; pronotal side crenulated medio-anteriorly; notauli deep, punctate, widened posteriorly; lobes of mesoscutum sparsely punctate; scutellar sulcus deep, 0.5 times as long as scutellum; precoxal sulcus short, punctate; anterior area above precoxal sulcus rugose-punctate; mesopleuron finely granulate posteriorly and ventrally; metapleuron granulate (Fig. 39); scutellum almost smooth (Fig. 40); propodeum finely granulate; propodeal spiracle rather large, 1.5 times as long as wide.

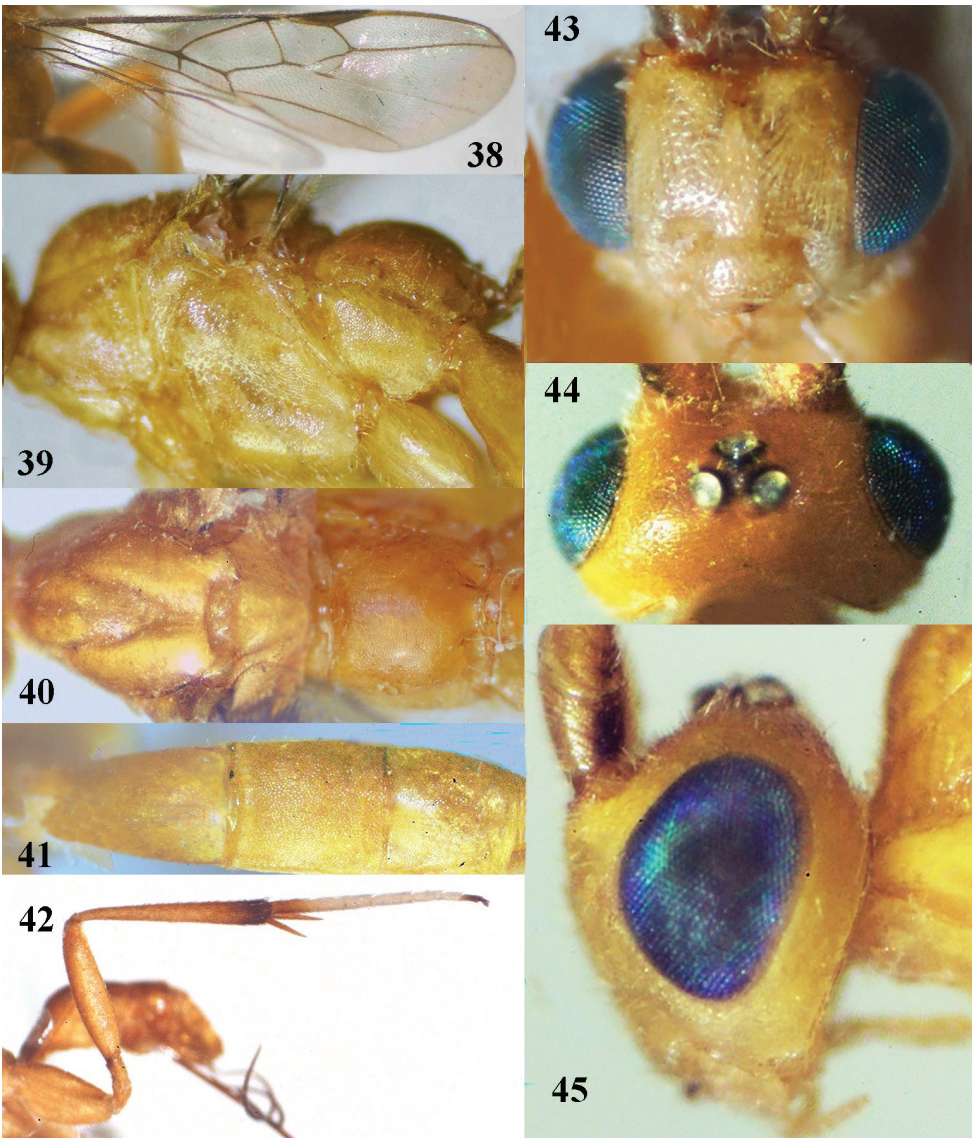
Wings. Fore wing (Fig. 38): pterostigma 4.8 times as long as wide; second submarginal cell petiolate; r:2-SR:3-SR+SR1:r-m = 11:12:48:8; vein r issued behind middle from pterostigma; cu-a slightly postfurcal, vein 1-CU1 nearly quadrate (Fig. 38); vein CU1b sclerotized, 0.4 times as long as 3-CU1 (Fig. 38). Hind wing: M+CU:1-M: 1r-m =16:29:3.

Legs. Hind coxa rugose dorsally, finely granulate laterally; length of femur and tibia of middle leg 6.6 and 10.4 times as long as their width, respectively; basitarsus

Figure 37. *Stantonia granulata* sp. n., ♀, holotype, habitus, lateral aspect.

of middle leg missing; length of femur, tibia and basitarsus of hind leg 4.4, 8.4 and 8.0 times their width, respectively; hind basitarsus 0.9 times as long as second-fifth segments; inner and outer hind tibial spurs 0.55 and 0.45 times as long as basitarsus, respectively.

Metasoma. First tergite slightly narrowed behind spiracles (Fig. 41), 2.1 times as long as its apical width, its surface finely granulate and 1.8 times as long as propodeum; second metasomal suture straight; second tergite parallel-sided, 1.15 times longer than



Figures 38–45. *Stantonia granulata* sp. n., ♀, holotype. **38** wings **39** mesosoma, lateral aspect **40** mesosoma, dorsal aspect **41** first–third metasomal tergites, dorsal aspect **42** hind leg, lateral aspect **43** head, anterior aspect **44** head, dorsal aspect **45** head, lateral aspect.

third tergite; first and second metasomal tergites finely and densely granulate; third tergite granulate basally, punctate medially and smooth apically; ovipositor sheath 0.50 times fore wing and as long as metasoma; ovipositor thick (Fig. 37).

Colour. Yellow; antenna brownish yellow basally, dark brown apically; fore and middle legs yellow; hind leg yellow but telotarsus and apex of hind tibia dark brown, hind basitarsus yellow basally, remainder of hind tarsus white.

Male. Unknown; but two very similar males are present in VNMN (Orgi.086&087, NE Vietnam, Cao Bang; Trung Khanh, Cao Thang, MT 21-29.iv.2012, N.Q. Truong). They differ by having the body surface shinier and its sculpture less pronounced (propodeum rugulose-granulate, first–second metasomal tergites superficially granulate and sparsely punctate, and hind coxa more or less punctate laterally) and vein cu-a of fore wing interstitial.

Distribution. NC Vietnam: Ha Tinh (Huong Son).

Etymology. Named after the granulate hind coxae and propodeum; "granum" is Latin for "grain".

Stantonia issikii Watanabe, 1932

Figs 46–57

Stantonia issikii Watanabe, 1932: 187–188; Shenefelt 1970: 267; Braet and Quicke 2004: 1550–1551; Chen et al. 2004: 358–359, 532.

Type material. Holotype, ♀ (ECHU), "Formosa [= Taiwan], Matsumura/ Kuraru, 21.iii.1926", *Stantonia issikii* Watanabe, Type".

Material. 1 ♀ (IZAS), China, Beijing, Shangfangshan National Forest Park, 400 m.

Diagnosis. Antenna yellowish ventrally, only dorsally and apically darkened; vertex finely spaced punctate and interspaces distinctly wider than punctures and yellowish brown; mesosoma entirely yellowish brown; inner half of humeral plate dark brown, remainder and tegulum yellowish brown; propodeum medio-anteriorly smooth; fore wing moderately infuscated apically; vein 3-SR+SR1 approx. 3 times as long as vein r; hind femur partly smooth and shiny ventrally, slender and apically yellowish brown; hind tarsus (except telotarsus) ivory or white; length of first metasomal tergite approx. 3.7 times its apical width; second epipleuron of metasoma without dark spot; apices of first and third metasomal tergites brownish yellow; length of ovipositor sheath 0.5–0.6 times as long as fore wing and somewhat longer than metasoma; length of fore wing approximately 8 mm.

Very similar to *S. xiangqianensis* as indicated in the original description, but differs mainly by small colour differences and the relative length of vein r of the fore wing. The variation of these characters is unknown for both species and only large series may prove the validity of *S. xiangqianensis*.

Description. Holotype, ♀. Body length 7.8 mm, fore wing length 8.2 mm, ovipositor sheath missing, exserted ovipositor 5.5 mm.

Head. Antenna broken; third and fourth antennal segments 3.2 and 2.7 times as long as wide, respectively, and third segment 1.2 times as long as fourth segment; width of face 0.9 times height of face and clypeus combined (Fig. 54); maxillary palp 1.6 times as long as height of head; clypeus distinctly convex (Fig. 54); malar space 1.2 times as long as mandible width; distance between large tentorial pits twice as long as distance between pit and eye margin; in anterior view length of eye 2.7 times as long

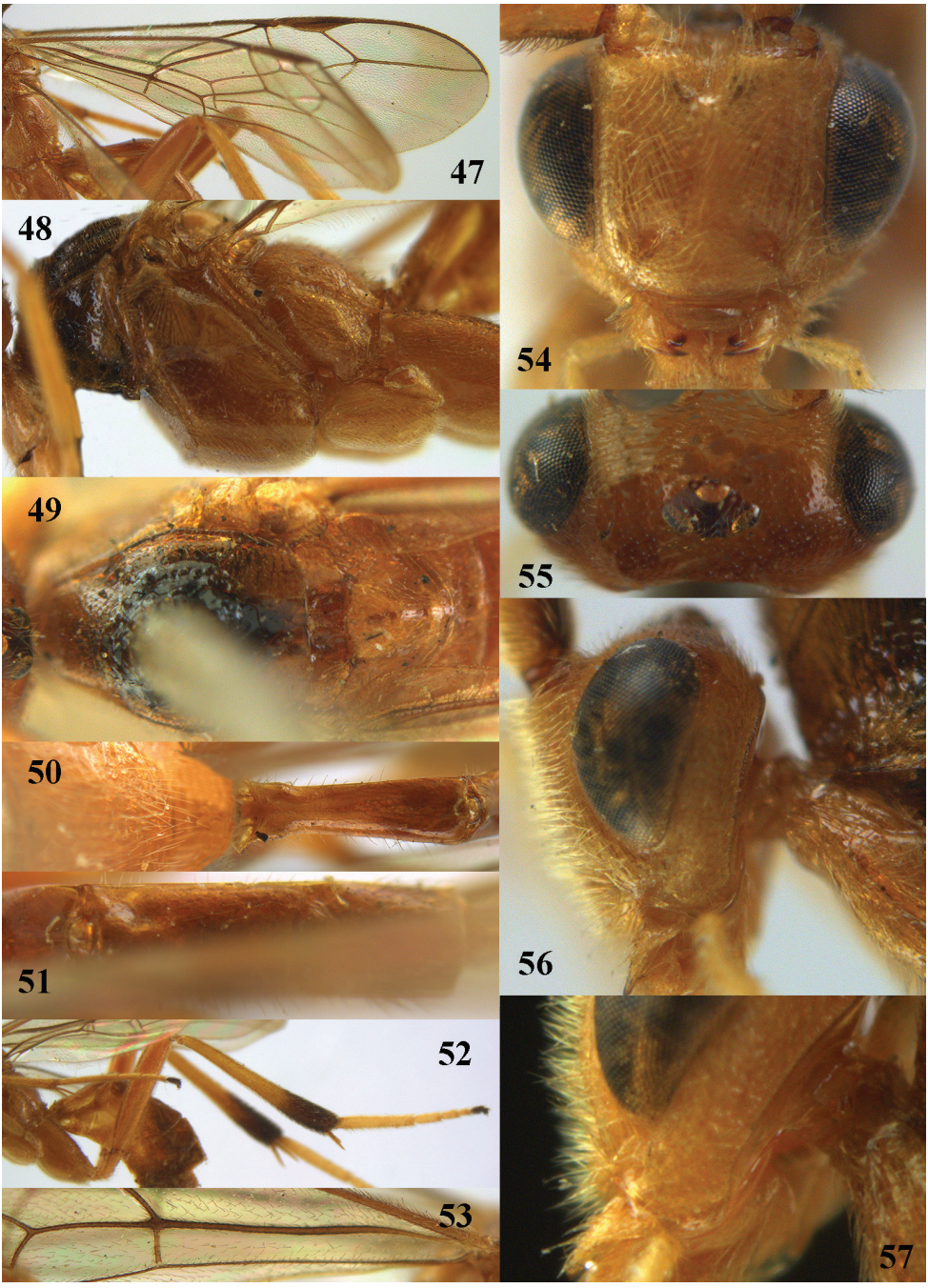
Figure 46. *Stantonia issikii* Watanabe, ♀, holotype, habitus, lateral aspect.

as wide; in dorsal view length of eye 2.4 times as long as temple; POL:OD:OOL = 9:10:17; distance between anterior and lateral ocellus 0.6 times OD (Fig. 55); face remotely and moderately punctate and long setae; vertex remotely punctate, wide interspaces smooth and area directly behind stemmaticum depressed; temple with satin sheen and with mainly coriaceous; occipital flange wide lamelliform.

Mesosoma. Length of mesosoma 1.4 times as long as high; pronotal side largely smooth (with few punctures near dorsal rim) and medial sulcus coarsely and widely crenulate anteriorly, subposteriorly with two crenulate branches and posteriorly finely crenulate; precoxal sulcus narrow and finely crenulate, complete and with wide flange posteriorly (Fig. 48), mesopleuron remotely finely punctate; metapleuron moderately punctate; notauli rather narrow and moderately crenulate; mesoscutum and scutellum remotely and moderately punctate (Fig. 49); propodeum rather shiny, anteriorly smooth, posteriorly punctate and with some short transverse rugae medially and sublaterally.

Wings. Fore wing (Fig. 47): pterostigma 3.6 times as long as wide; second submarginal cell petiolate; r:2-SR:3-SR+SR1:r-m = 20:23:58:13; r issued behind middle from pterostigma; r-m submedially distinctly sclerotized; cu-a interstitial (Fig. 47); basal 0.7 of CU1a sclerotized; CU1b: 3-CU1 = 3:5. Hind wing: M+CU:1-M: 1r-m = 23:82:10.

Legs. Hind coxa largely and densely rugose dorsally, only posteriorly transversely striate; ventrally hind femur shiny, basally rugulose and apically largely smooth; length of femur, tibia and basitarsus of middle leg 7.0, 12.6 and 12.4 times as long as their width, respectively; inner and outer middle tibial spurs 0.40 and 0.35 times as long as basitarsus; length of femur, tibia and basitarsus of hind leg 5.2, 8.5 and 6.8 times their



Figures 47–57. *Stantonia issikii* Watanabe, ♀, holotype. **47** fore wing **48** mesosoma, lateral aspect **49** mesosoma, dorsal aspect **50** propodeum and first metasomal tergite, dorsal aspect **51** second and third metasomal tergites, dorsal aspect **52** hind leg, lateral aspect **53** detail of submedial and first subdiscal cells of fore wing **54** head, anterior aspect **55** head, dorsal aspect **56** head, lateral aspect **57** occipital flange, postero-lateral aspect.

width, respectively; hind basitarsus rather adpressed; inner and outer hind tibial spurs 0.40 and 0.35 times as long as basitarsus, respectively.

Metasoma. First tergite slightly narrowed behind spiracles (Fig. 50), 3.7 times as long as its apical width, its surface smooth and shiny; second tergite convex anteriorly, smooth (except some punctures), elongate, 1.8 times longer than its basal width and shiny; second suture curved and medial area behind it convex; ovipositor sheath missing, considering length of ovipositor approx. 0.6 times as long as fore wing and approximately as long as metasoma (Fig. 46).

Colour. Yellowish brown; inner half of humeral plate dark brown, remainder of plate, tegulum and tibial spurs yellowish brown; basal segments of antenna (except scapus and pedicellus) dorsally dark brown and ventrally brownish yellow; outer side of scapus and pedicellus partly dark brown; face, clypeus, palpi and hind tibia (except apical third) rather pale yellowish; stemmaticum dark brown; apical third of hind tibia and telotarsi dark brown; remainder of hind tarsus ivory (Fig. 52); apex of fore wing moderately darkened and remainder subhyaline (Fig. 47); veins and pterostigma dark brown.

Distribution. China (*Beijing (Shangfangshan N.F.P.), Zhejiang, Hunan, Taiwan).

Notes. This species was reported from Papua New Guinea by Braet and Quicke (2004) with a question mark, but this concerns another species. The holotype differs by having distinctly rugose hind coxa (Fig. 48) and the fore wing is distinctly infuscated apically (Fig. 47).

Stantonia qui **Chen, He & Ma, 2004**

Fig. 58

Stantonia qui Chen, He & Ma, 2004: 359–361, 531.

Diagnosis. Antenna with a submedial band consisting of 8–13 white or ivory segments (Fig. 58); face transversely punctate-rugose; vertex spaced punctate, interspaces wider than punctures; middle and lateral lobes of mesoscutum yellowish brown medially; tegulum brownish yellow; only apical half of marginal cell of fore wing infuscated; hind femur largely brownish yellow, at most its apical 0.3 dark brown; hind femur shiny and finely sculptured basally; middle and hind coxa pale yellowish; first metasomal tergite approx. 3.7 times as long as its apical width; metasoma dark yellowish brown; epipleuron of second metasomal tergite entirely yellowish brown (Fig. 58); length of ovipositor sheath approx. 0.5 times as long as fore wing; length of fore wing approx. 7 mm.

Similar to *S. magnifica* van Achterberg, 1987, from Indonesia and Malaysia, but *S. magnifica* differs by having the vertex largely smooth; the face finely punctate; the wing membrane dark brown up to apical 0.7 of the marginal cell; the hind coxa largely yellow or orange brown and the mesosoma entirely dark brown or black (Chen et al. 2004).

Distribution. China (Guangdong, Zhejiang).

Figure 58. *Stantonia qui* Chen, He & Ma, ♀, holotype, habitus, lateral aspect. Photo: Jiachen Zhu.

***Stantonia robustifemur* van Achterberg & Long, sp. n.**
http://zoobank.org/402C8998-6372-45AF-82CC-1ED0D8DD4A6B
Figs 59–70

Stantonia sp. A Braet & Quicke, 2004: 1522.

Type material. Holotype, ♀ (RMNH), "S. Vietnam: Dông Nai, Cát Tiên N.P., c. 100 m, 13–20.v.2007, Mal. traps, C. v. Achterberg & R. de Vries, RMNH'07". Paratypes (5 ♀ + 1 ♂): 2 ♀ + 1 ♂ (RMNH, IEBR), same data as holotype; 1 ♀ (RMNH),

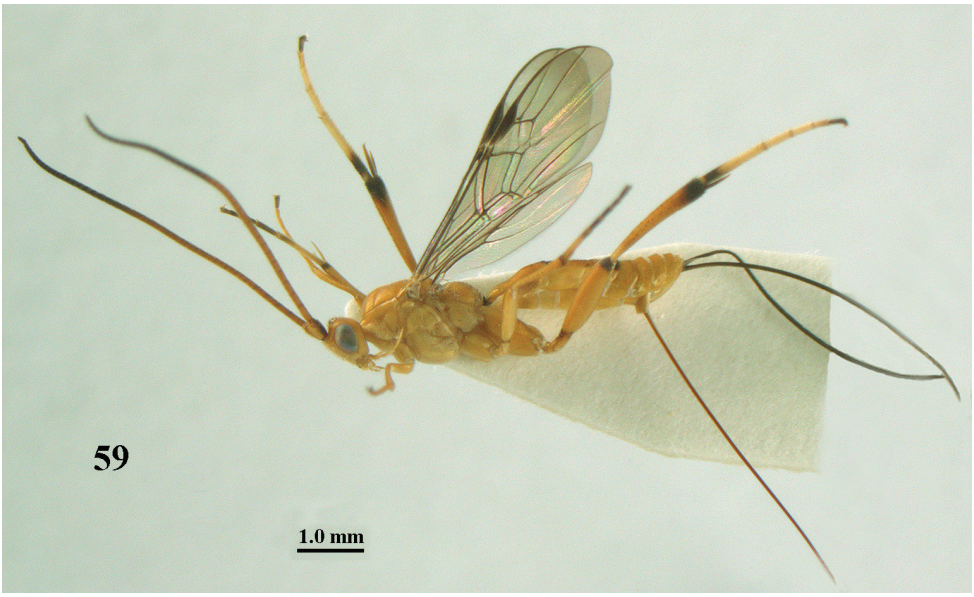
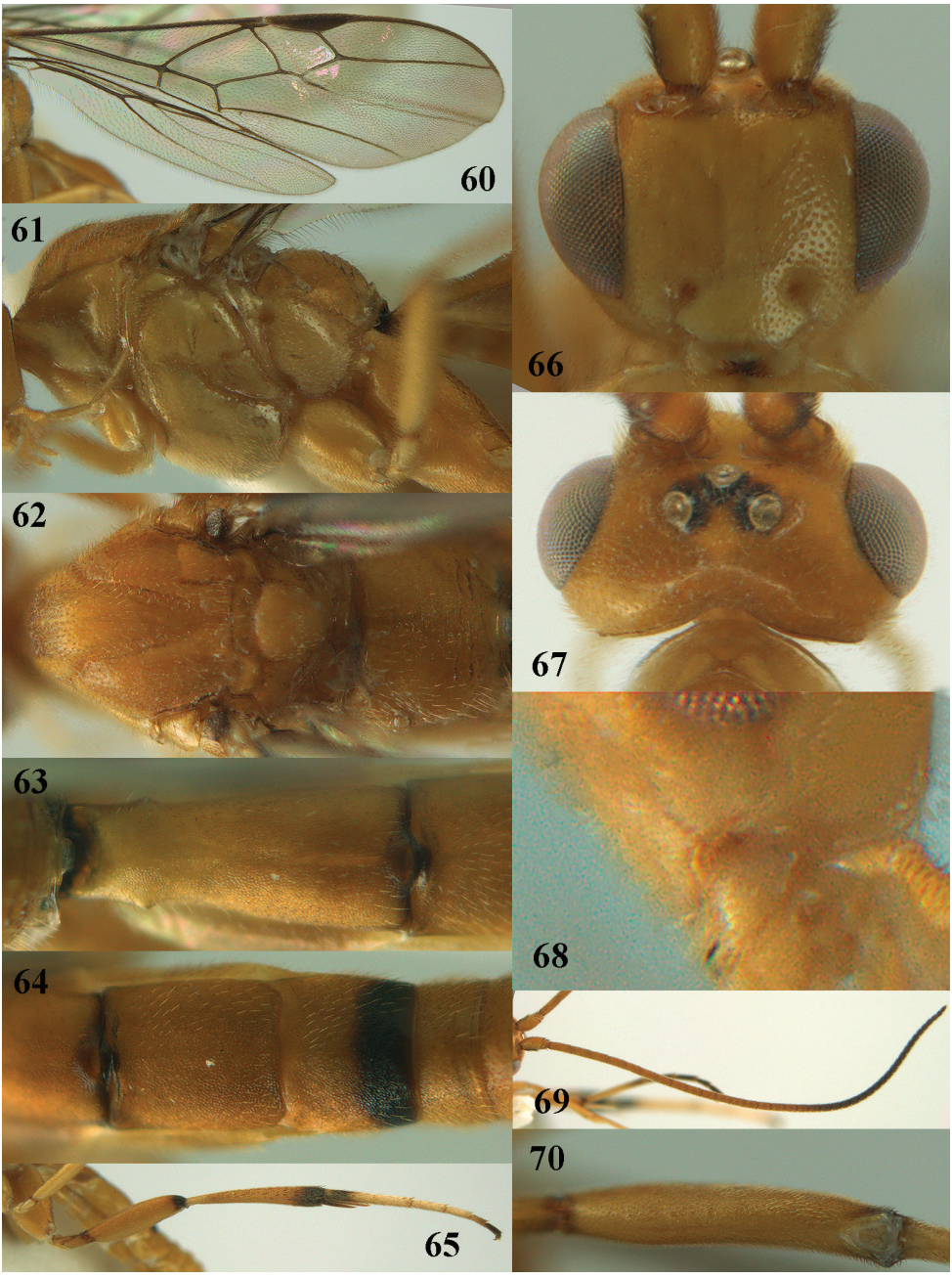


Figure 59. *Stantonia robustifemur* sp. n., ♀, holotype, habitus, lateral aspect.

id., but Bird trail, Mal trap[s] 30–35, 15–20.v.2007; 1 ♂ (IEBR), same data, but 9.iv.–13.v.2007, Mai Phu Quy & Nguyen Thanh Manh; 1 ♀ + 1 ♂ (VNMN), "Orgi.078 & 079", "S Vietnam: Dong Nai, Cat Tien N.P., MT 11-25.iv.20 07, M.P. Quy, N.T. Manh"; 1 ♀ (RMNH), "N. Vietnam: Ninh Binh, Cuc Phuong N.P., n[ea]r entrance, c. 225 m, 15.iv.–1.v.2000, Mal. tr. II, Mai Phu Quy, RMNH'00"; 1 ♂ (RMNH), "S. Vietnam: Dak Lak, Chu Yang Sin N.P., Krong K'Mar, 740–900 m, 2–10.vi.2007, Mal. traps, C. v. Achterberg & R. de Vries, RMNH'07". Excluded from type series: 1 ♀ (VNMN), "Orgi.006", "NW Vietnam: Hoa Binh, Yen Thuy, orchard, MT 20°23'N, 105°36'E 55 m, 01-10.viii.2003, K.D. Long".

Diagnosis. Antenna without a pale band, its basal two-thirds brownish yellow and apical third dark brown, 1.3 times as long as fore wing and subapical segments approximately 1.5 times longer than wide; clypeus flat and rather long (Fig. 66); length of malar space 1.3–1.5 times basal width of mandible; tegulum brownish yellow; humeral plate partly dark brown; mesosoma entirely brownish yellow; propodeum anteriorly mostly granulate; vein r-m of fore wing absent or largely so (Fig. 60); hind femur robust and slightly widened subbasally (Fig. 65), ventrally with satin sheen and micro-sculpture; basal ring of hind tibia and hind tarsus ivory, except dark brown telotarsus and base of basitarsus; length of first tergite 2.0–2.6 times as long as wide apically; epipleuron of second tergite entirely yellow; second tergite rather matt and finely granulate; length of ovipositor sheath 1.1–1.4 times as long as fore wing; length of fore wing 4–5 mm.

The new species runs in the key by van Achterberg (1987) to *S. lutea* (Szépligeti, 1910) if the colour of the hind tarsus is not used, because of the long ovipositor sheath



Figures 60–70. *Stantonia robustifemur* sp. n., ♀, holotype. **60** wings **61** mesosoma, lateral aspect **62** mesosoma, dorsal aspect **63** first metasomal tergite, dorsal aspect **64** second–fourth metasomal tergites, dorsal aspect **65** hind leg, lateral aspect **66** head, anterior aspect **67** head, dorsal aspect **68** detail of clypeus and malar space, lateral aspect **69** antenna **70** hind femur, ventral aspect.

(1.0–1.4 times as long as fore wing), antenna 1.3 times as long as fore wing, yellowish tegulum and mesosoma, reduced vein r-m of fore wing, largely granulate propodeum, coriaceous-granulate first–third tergites, flat clypeus, ivory basal ring of hind tibia and dark brown apex of third tergite. It differs by the white or ivory third–fourth hind tarsal segments (dark brown in *S. lutea*), hind femur robust (normal), hind tibia without dark subbasal ring (present), and propodeum with few coarse transverse rugae in posterior half (entirely granulate or with rather weak transverse rugae).

Description. Holotype, ♀. Body length 6.1 mm, fore wing length 4.9 mm, ovipositor sheath 5.3 mm.

Head. Antenna with 41 segments and 1.3 times as long as fore wing; middle antennal segments with distinct false division medially and twice as long as wide; third, fourth and penultimate antennal segments 3.0, 2.7 and 1.4 times as long as wide, respectively, and third segment 1.1 times as long as fourth segment; width of face equal to height of face and clypeus combined (Fig. 66); maxillary palp approximately as long as height of head; malar space 1.3 times as long as mandible width; distance between tentorial pits 1.7 times as long as distance between pit and eye margin; in anterior view length of eye 2.2 times as long as wide; in dorsal view length of eye 3.2 times as long as temple; POL:OD:OOL = 7:5:8; distance between anterior and lateral ocellus 0.6 times OD (Fig. 67); face remotely and rather coarsely punctate and medium-sized setae; vertex finely remotely punctate, with large smooth interspaces and gradually lowered behind stemmaticum; temple matt and finely coriaceous; occipital flange medium-sized lamelliform (Fig. 68).

Mesosoma. Length of mesosoma 1.3 times as long as high; pronotal side smooth above oblique and anteriorly crenulate medial sulcus, sparsely finely punctate posteriorly and ventrally superficially coriaceous; notauli complete and posteriorly moderately crenulate (Fig. 62); mesoscutum and scutellum remotely and finely crenulate but mesoscutum posteriorly rather coarsely punctate (Fig. 62); precoxal sulcus narrow and finely crenulate, but obsolescent anteriorly (Fig. 61), meso- and metapleuron sparsely finely punctate, mesopleuron with some crenulae anteriorly; propodeum rather matt and granulate, with few coarse transverse rugae posteriorly (Fig. 62).

Wings. Fore wing (Fig. 60): first discal cell distinctly truncate dorsally; pterostigma 4.4 times as long as wide; r-m absent; r:2-SR:3-SR+SR1 = 10:16:51; r issued behind middle from pterostigma; cu-a interstitial (Fig. 35); basal half of CU1a largely sclerotized; CU1b: 3-CU1 = 2:7. Hind wing: M+CU:1-M: 1r-m = 11:27:5; R1 with three distinct hamuli.

Legs. Hind coxa mainly coriaceous, postero-dorsally with rugulae; ventrally hind femur mainly coriaceous, with satin sheen (as outer side); middle and hind tibia with numerous short spines; length of femur, tibia and basitarsus of middle leg 5.9, 9.4 and 11.4 times as long as their width, respectively; inner and outer middle tibial spurs 0.55 and 0.35 times as long as basitarsus; length of femur, tibia and basitarsus of hind leg 4.1, 7.6 and 9.1 times their width, respectively; inner and outer hind tibial spurs 0.55 and 0.40 times as long as basitarsus, respectively.

Metasoma. First tergite gradually widened (Fig. 63), 2.3 times as long as its apical width, its surface finely granulate and rather dull apically slightly micro-sculptured; second and third tergites granulate, stout and rather dull; second suture straight and area behind nearly flat; length of ovipositor sheath 1.07 times as long as fore wing and 1.1 times as long as metasoma (Fig. 59).

Colour. Yellowish brown dorsally and remainder (including tegulum) pale brownish yellow; antenna brownish yellow, but outer side of scapus and pedicellus, and apical third of antenna dark brown; ovipositor sheath, base and apex of first tergite narrowly, base of second tergite slightly, apex of third tergite, telotarsi, hind basitarsus subbasally (but basally narrowly white), apex of hind femur, apex of middle tibia, apical 0.2 of hind tibia, and middle tarsus (but basitarsus largely yellowish), dark brown; basal ring of hind tibia and hind tarsus ivory, but basitarsus subbasally and telotarsus dark brown; apical fifth of fore wing slightly darkened and remainder subhyaline (Fig. 60); veins and pterostigma dark brown.

Male. Very similar to female: body length 5.0–5.5 mm, fore wing length 4.0–4.6 mm; antenna with 37(1), 38(2), 39(1) segments; length of hind femur 3.5 times its maximum width; length of first metasomal tergite 2.3–2.6 times its apical width.

Variation. Female: body length 4.9–6.8 mm, fore wing length 4.2–5.2 mm; antenna with 40(1), 41(2) segments; length of hind femur 3.9–4.1 times its maximum width; inner spur of hind tibia 0.50–0.55 times as long as hind basitarsus; length of first metasomal tergite 1.9–2.6 times its apical width; medial length of second tergite 1.1–1.3 times its basal width and 1.3 times length of third tergite; length of ovipositor sheath 1.07–1.36 times as long as fore wing. The female from Yen Thuy is excluded from the type series because it has the second and third metasomal tergites more convex, resulting in a slenderer metasoma in dorsal view.

Distribution. Vietnam (Ninh Binh (Cuc Phuong N.P).; Dak Lak, Chu Yang Sin N.P.; Dông Nai (Cát Tiên N.P.)).

Stantonia ruficornis Enderlein, 1921

Fig. 71

Stantonia ruficornis Enderlein, 1921: 58; Shenefelt 1970: 267; van Achterberg 1987: 24; Long and Belokobylskij 2003: 396; Braet and Quicke 2004: 1561; Chen et al. 2004: 361–362, 532; Long and van Achterberg 2014: 408.

Material. 1 ♀ (RMNH), "N. Vietnam: Ninh Binh, Cuc Phuong N.P., n[ea]r entrance, c. 225 m, 1–15.v.2000, Mal. tr. II, Mai Phu Quy, RMNH'00"; 1 ♂ (RMNH), "C. Vietnam: Ha Tinh, Vu Quang N.P., 18°17'42"N, 105°25'34"E, 123 m, 5.iii.–15.iv.2011, Mal. trap 15, C. v. Achterberg & R. de Vries, RMNH'11"; 1 ♂ (IEBR), "Orgi.034", "NW. Vietnam: Hoa Binh, Yen Thuy, forest, MT, 20°13'06"N, 105°34'11"E, 315 m, 10-20.iv.2002, K.D. Long".

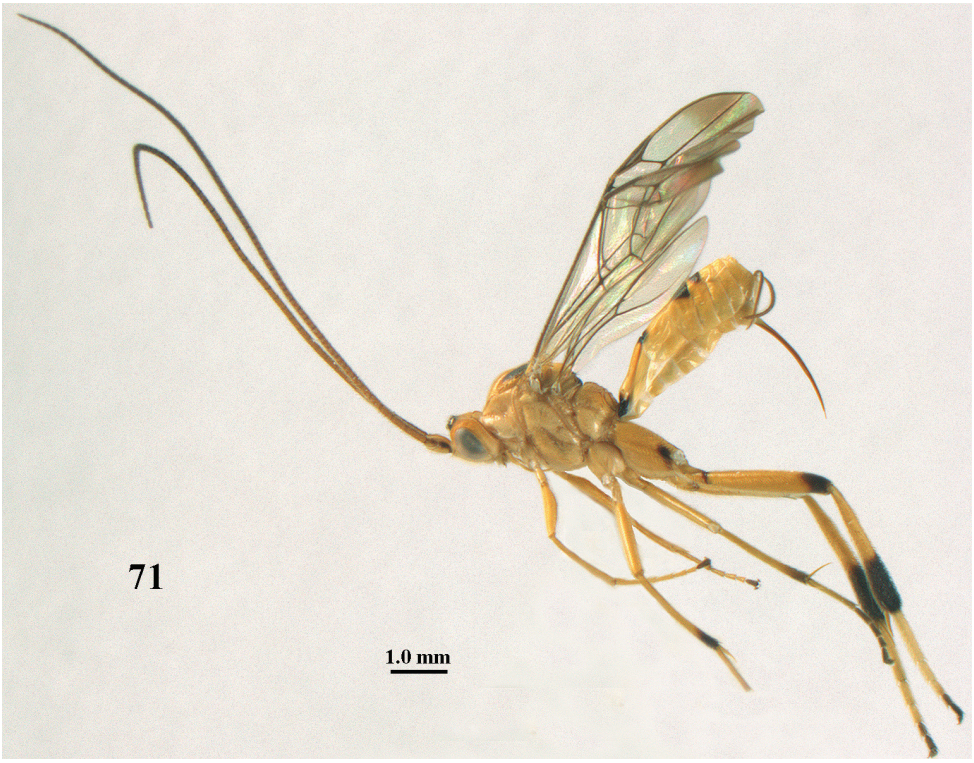


Figure 71. *Stantonia ruficornis* Enderlein, ♀, Vietnam, Cuc Phuong N.P., habitus, lateral aspect.

Diagnosis. Antenna of ♀ 1.6–1.7 times as long as fore wing and its basal half yellowish brown, apically dark brown; vertex finely punctate or punctulate and interspaces distinctly wider than punctures; vertex and frons (especially of ♂) medially often dark brown; tegulum dark brown or infuscated; middle and lateral lobes of mesoscutum infuscate or dark brown medially; remainder of mesosoma brownish yellow; propodeum with coarse transverse rugae; fore wing infuscated apically; middle tarsus (except basitarsus) dark brown; apex of hind coxa more or less dark brown dorsally; apical half or quarter of hind femur dark brown; third hind tarsal segment ivory; outer side of hind femur rather shiny; ventrally hind femur rather matt and densely microsculptured ventrally; middle tarsus (except its basitarsus) more or less dark brown; first metasomal tergite darkened basally and approximately 3 times as long as its apical width; epipleuron of second tergite without a dark spot; length of ovipositor sheath 0.17–0.25 times as long as fore wing; length of fore wing 5.5–8.0 mm.

Distribution. China (Jiangsu, Zhejiang, Hunan, Taiwan, Yunnan), West Malaysia, Philippines (Mindoro), Nepal (Braet and Quicke 2004) and Vietnam (Tonkin (Enderlein 1921, ♂); Hoa Binh, Lai Chau, Ha Tinh (Long and van Achterberg 2014); Ninh Binh).

Stantonia sauteri Watanabe, 1932

Figs 72, 73

Stantonia sauteri Watanabe, 1932: 188–189; Shenefelt 1970: 268; van Achterberg 1987: 24; Chen et al. 2004: 362, 532.

Type material. Holotype, ♀ (SDEI), "Formosa [= Taiwan], Kankau (Koshun), vii.1012, H. Sauter", "*Stantonia sauteri* Watanabe, Type", "Holotypus", "DEI-GY-SHym 10631". Specimen examined and photographed by Mr A.D. Liston.

Diagnosis. Antenna of ♀ largely brownish yellow, without band of white or ivory segments submedially; vertex densely punctate and interspaces smaller than width of punctures and yellowish brown; mesosoma (including tegulum and humeral plate) brownish yellow, but middle lobe of mesoscutum with dark brown patch medially; fore wing infuscated apically; hind femur rugose ventrally, 5.2 times as long as wide and apically rather dark brown; hind tarsus (except telotarsus) ivory; length of first metasomal tergite approx. 2.5 times its apical width; base and apex of first tergite and base of second tergite yellowish brown; third and fourth tergites with dark brown patch; length of ovipositor sheath approx. 0.6 times as long as fore wing; length of fore wing approx. 5.5 mm. *Stantonia xiangqianensis* is similar, but has vertex sparsely punctate with interspaces much wider than punctures, hind femur smooth and shiny ventrally and first tergite approx. 3.7 times longer than wide posteriorly.

Distribution. China (Taiwan).

Stantonia spasskensis Belokobylskij, 1993

Figs 74–80

Stantonia spasskensis Belokobylskij, 1993: 97, 1998: 503.

Diagnosis. Antenna of ♂ with approximately 8 white or ivory segments (Fig. 75); anterior tentorial pits dorsally distinctly above lower level of eyes and malar space comparatively short (Fig. 79); temple coarsely rugose ventrally and (except for spaced punctures) largely smooth dorsally; mesosoma largely dark brown, only metanotum, propodeum and metapleuron posteriorly yellowish brown (Figs 74, 77); tegulum dark brown; anterior half of propodeum punctulate and largely smooth; hind femur dark brown medially; hind tarsus (except basally) whitish or ivory and moderately bristly setose; base of hind basitarsus dark brown; infuscation of apex of fore wing mainly restricted to marginal cell and just below it (Fig. 75); length of first tergite approx. 4 times its apical width (Fig. 78); second tergite dark brown and with shiny triangular area basally, its epipleuron largely rather fuzzy dark brown (Fig 74); length of fore wing approx. 7.5 mm.

Distribution. Far East Russia.

Figures 72, 73. *Stantonia sauteri* Watanabe, ♀, holotype. **72** habitus, lateral aspect **73** habitus, dorsal aspect. Photos: A.D. Liston.

Figure 74. *Stantonia spasskensis* Belokobylskij, ♂, holotype, habitus, lateral aspect. Photo: K. Samartsev.

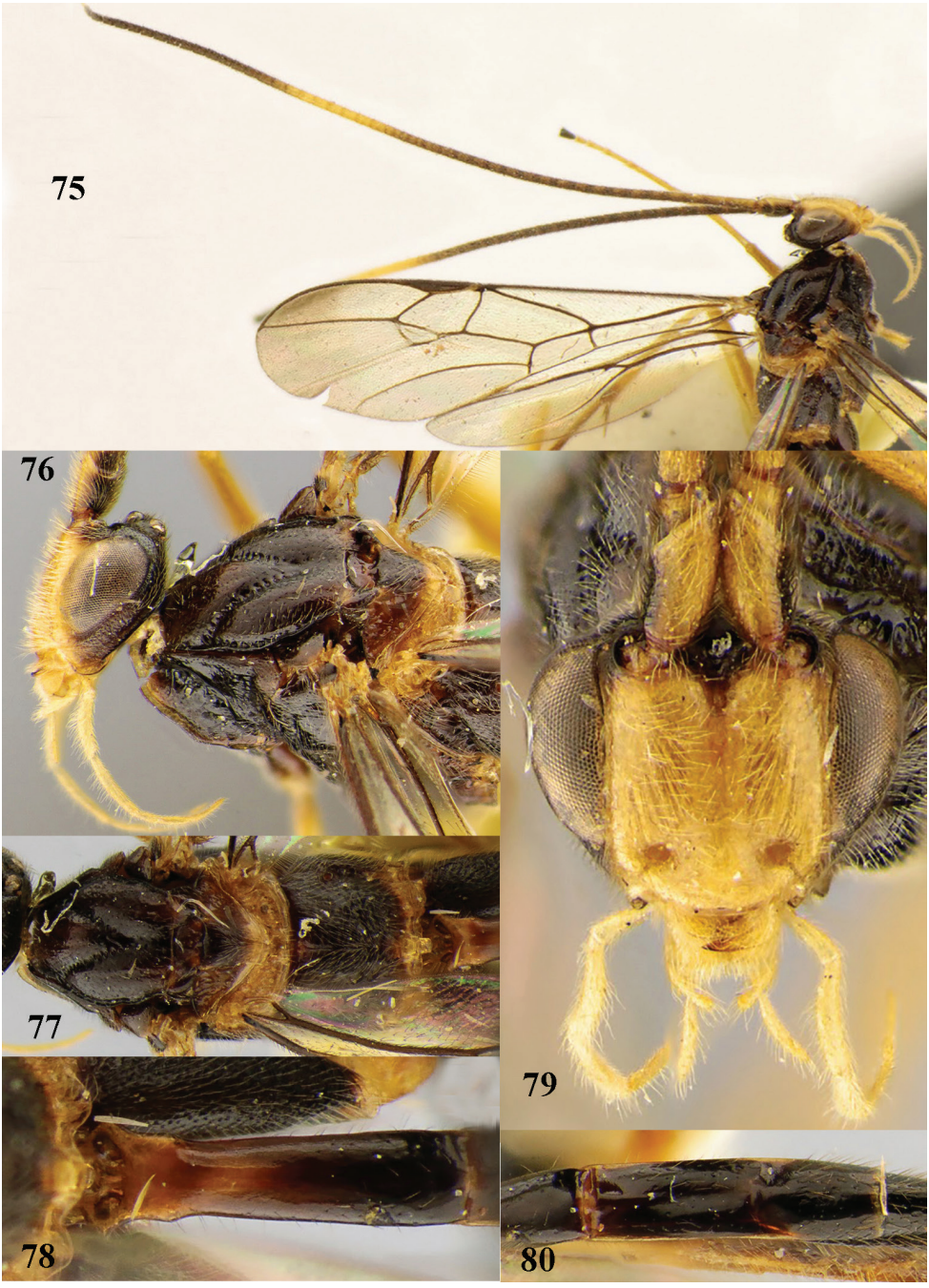
Notes. The scanty material does not allow a conclusion about the validity of the taxon; the holotype may concern the melanistic male of *S. annulicornis* Enderlein, 1921. The male of *S. spasskensis* reported from Vietnam (Long and van Achterberg 2014) was re-examined and proved to belong to *S. annulicornis* Enderlein.

Stantonia stilpnosoma Long & van Achterberg, sp. n.

http://zoobank.org/1792CFA7-76D2-4759-84EB-284D98422434
Figs 81–94

Type material. Holotype, ♀ (IEBR), "Orgi.004", "N.W. Vietnam: Hoa Binh, Yen Thuy, orchard, MT 20°23'N, 105°36'E, 55 m, 1–10.ix.2001, K.D. Long". Paratypes (2 ♀ + 4 ♂): 1 ♂ (IEBR), "Orgi.038", "N.E. Vietnam, Phu Tho, Xuan Son N.P., 20.v.2005, P.Th. Nhi"; 1 ♀ (RMNH), "N. Vietnam: Ninh Binh, Cuc Phuong N.P., n[ea]r entrance, c. 225 m, 15.v.–27.v.2000, [Mal. tr.] I, Mai Phu Quy, RMNH'00"; 2 ♂ (RMNH, IEBR), id., but 1–15.v.2000, Malaise trap II; 1 ♀ + 1 ♂ (RMNH), id., 18.viii–17.ix.2000.

Diagnosis. Antenna of ♀ 1.7–1.8 times as long as fore wing (of ♂ 2.1 times), without white or ivory segments and largely dark brown; anterior tentorial pits dor-



Figures 75–80. *Stantonia spasskensis* Belokobylskij, ♂, holotype. **75** antenna and wings **76** head, lateral aspect and mesosoma, latero-dorsal aspect **77** mesosoma, dorsal aspect **78** first metasomal tergite, dorsal aspect **79** head, anterior aspect **80** second and third metasomal tergites, dorsal aspect. Photos: K. Samartsev.

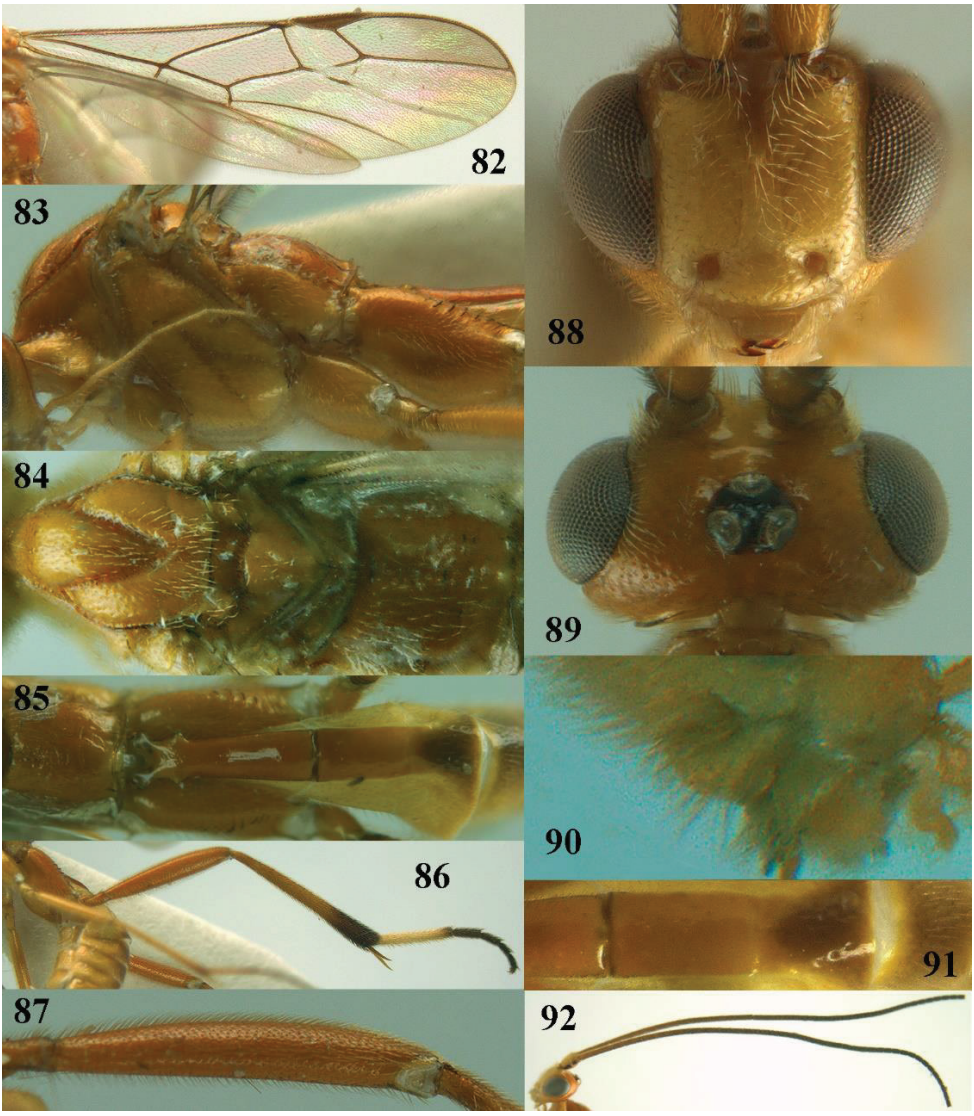
Figure 81. *Stantonia stilpnosoma* sp. n., ♀, paratype, Cuc Phuong N.P., habitus, lateral aspect.

sally distinctly above lower level of eyes and malar space comparatively short (Fig. 88); frons brownish yellow medially; clypeus convex (Fig. 88); middle lobe of mesoscutum brownish yellow medially; mesopleuron ventrally and mesosternum yellowish brown; propodeum strongly shiny and with weak transverse rugae; vein r-m of fore wing partly pigmented (Fig. 82); fore wing hardly darkened apically (Fig. 82); hind femur slender, ventrally nearly entirely yellowish, finely punctate and interspaces smooth and shiny; hind coxa strongly shiny dorsally (Fig. 86); hind basitarsus moderately slender, whitish and usually erect bristly setose (Fig. 86), remainder dark brown; first metasomal tergite of ♀ strongly shiny and 3.3–3.6 times as long as its apical width; apex of first tergite and base of second tergite yellowish brown; second tergite of ♀ 1.6–1.7 times as long as wide; second metasomal suture straight and medial area behind suture flat or nearly so (Fig. 85); second epipleuron entirely yellow; third tergite distinctly punctate posteriorly; length of ovipositor sheath 0.10–0.17 times fore wing, distinctly less than half length of metasoma.

The new species runs in the key by van Achterberg (1987) to *S. sumatrana* Enderlein, but differs by having the first metasomal tergite of ♀ 3.3–3.7 times as long as its apical width (2.4–2.7 times in *S. sumatrana*), ventrally hind femur smooth and shiny between punctures (coriaceous and dull), length of ovipositor sheath 0.10–0.15 times fore wing (0.16–0.19 times), and second and following hind tarsal segments dark brown (white or ivory, except dark telotarsus, rarely infuscated).

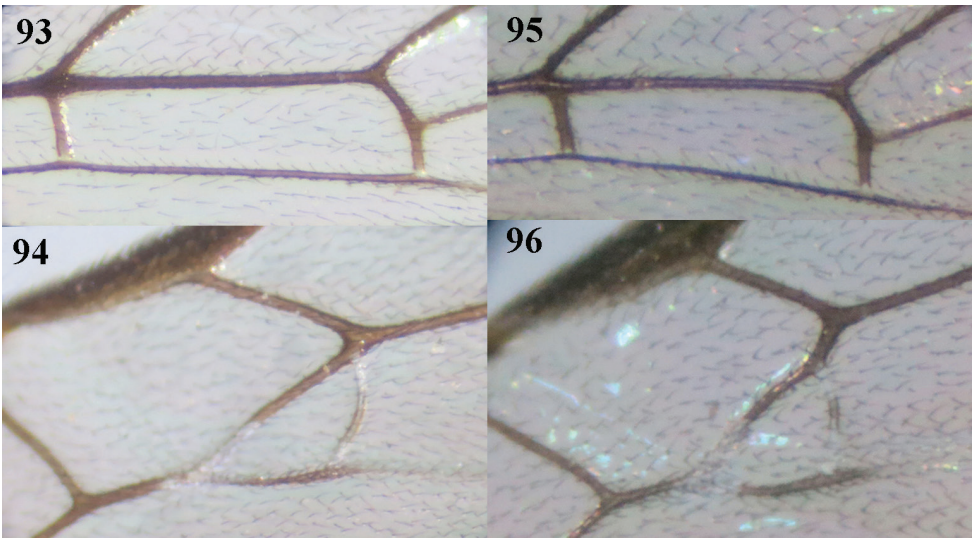
Description. Holotype, female. Body length 5.4 mm, fore wing length 5.6 mm, ovipositor sheath 0.6 mm.

Head. Antenna with 46 segments but incomplete, at least 1.6 times as long as fore wing; middle segments twice as long as wide, third and fourth segments 3.3 and 2.3



Figures 82–92. *Stantonia stilpnosoma* sp. n., ♀, paratype, Cuc Phuong N.P. **82** wings **83** mesosoma, lateral aspect **84** mesosoma, dorsal aspect **85** first–fourth metasomal tergites, dorsal aspect **86** hind leg, lateral aspect **87** hind femur, ventral aspect **88** head, anterior aspect **89** head, dorsal aspect **90** detail of clypeus and malar space, lateral aspect **91** second and third metasomal tergites, dorsal aspect **92** antenna.

times as long as wide, respectively, and third segment 1.2 times fourth segment; width of face 0.9 times height of face and clypeus combined (Fig. 88); maxillary palp 1.25 times as long as height of head; malar space 1.5 times as long as basal width of mandible; clypeus distinctly convex (Figs 88, 90); distance between tentorial pits twice as long as distance from pit to eye margin; in frontal view length of eye 2.4 times as long as its width; in dorsal view length of eye 2.5 times as long as temple; POL:OD:OOL



Figures 93–96. 93, 94 *Stantonia stilpnosoma* sp. n., ♀, holotype **95, 96**. *S. tianmushana* Chen, He & Ma, ♀, Vietnam, Vu Quang N.P. **93, 95** first subdiscal cell of fore wing **94, 96** second submarginal cell of fore wing.

= 2:3:7; distance between anterior and lateral ocellus 0.5 times OD (Fig. 88); face dull with sparse fine punctures and long setae; vertex and temple with sparse fine punctures; occipital flange wide and lamelliform.

Mesosoma. Length of mesosoma 1.4 times its height; pronotal side smooth dorsally and remainder sparsely finely punctate, medial sulcus with several crenulae anteriorly; notauli narrow and sparsely crenulate (Fig. 84); lobes of mesoscutum and scutellum with sparse fine punctures; precoxal sulcus narrow and finely crenulate (Fig. 83), area above precoxal sulcus almost smooth, area below precoxal sulcus with sparse fine punctures as metapleuron; propodeum shiny and largely smooth with basal mediolongitudinal carina and 2 transverse carinae medially (Fig. 84).

Wings. Fore wing: pterostigma 5.0 times as long as wide; r:2-SR:3-SR+SR1:r-m = 7:9:31:5; r issued behind middle of pterostigma; r-m present (Fig. 82); cu-a interstitial; basal half of CU1a mainly only pigmented; CU1b: 3-CU1 = 3:4. Hind wing: M+CU:1-M: 1r-m = 4:26:1; R1 with three distinct hamuli.

Legs. Ventrally hind femur punctate and interspaces smooth and shiny; length of femur, tibia and basitarsus of middle leg 10.2, 11.7 and 13.3 times as long as their width, respectively; inner and outer middle tibial spurs 0.5 and 0.4 times as long as basitarsus; length of femur, tibia and basitarsus of hind leg 4.9, 8.0 and 9.2 times their width, respectively; inner and outer hind tibial spurs 0.4 and 0.3 times as long as basitarsus, respectively.

Metasoma. First tergite almost parallel-sided, 3.3 times as long as its apical width, its surface largely smooth (Fig. 85); first tergite 1.4 times as long as propodeum; second tergite smooth (except for some punctures), elongate and shiny, 1.7 times longer than its basal width; length of ovipositor sheath 0.10 times as long as fore wing; ovipositor thick.

Colour. Yellowish brown; antenna brown but apically dark brown; tegulum and humeral plate pale yellow; stemmaticum, pterostigma, veins and middle tarsus dark brown or infuscated, but middle basitarsus yellowish basally; apical one fourth of hind tibia and second–fifth hind tarsal segments black; hind basitarsus ivory, but apically dark brown; fore wing slightly infuscated apically.

Male. Very similar to female: length of body 6.0–7.1 mm, of fore wing 3.3–6.0 mm; antenna with 55(1), 57(1) segments and 2.1 times as long as fore wing; length of femur, tibia and basitarsus of hind leg 4.8, 8.6 and 9.0 times their width, respectively; fore wing: r:2-SR:3-SR+SR1 = 8:10:27; CU1b: 3-CU1 = 3:7; hind wing: M+CU:1-M: 1r-m = 8:30:2; propodeum without or with basal medio-longitudinal carina and with 2–5 transverse carinae medially.

Variation. Female: length of body 5.4–6.9 mm, of fore wing 5.3–6.0 mm; vein cu-a of fore wing antefurcal (Fig. 82) or interstitial; length of first tergite 3.3–3.6 times length of fore wing; length of ovipositor sheath 0.10–0.17 times fore wing; first tergite 3.3–3.6 times its apical width; length of mesosoma 1.4–1.5 times its height; length of first metasomal tergite 3.4–3.8 times its apical width; length of ovipositor sheath 0.10-0.17 times length of fore wing; fore wing slightly infuscated apically.

Distribution. Vietnam (Phu Tho (Xuan Son N.P.); Hoa Binh; Ninh Binh (Cuc Phuong N.P.)).

Etymology. Named after the very shiny ("stilpnos" is Greek for "glittering, glisterning") body ("soma" in Greek) of this species.

Stantonia sumatrana Enderlein, 1908

Figs 97, 98

Stantonia sumatrana Enderlein, 1908: 110; Shenefelt 1970: 268; van Achterberg 1987: 24, 47–48; Braet and Quicke 2004: 1579; Chen et al. 2004: 362–363, 532.

Material. 2 ♀ (IZAS), China: Guangxi, Pingxiang, 230 m & Mt. Daqing, 600-700 m; 1 ♀ (ZISP), Vietnam: Tản Lĩnh, Ba Vi, 70 km NW Hanoi, 400 m, forest; 1 ♀ + 1 ♂ (NWUX), "SW. China: Yunnan, Yaoqu, Menglun, c. 540 m, 21°93'N, 101°26'E, 5.x.2010, Jiangli Tan, NWUX"; 1 ♂ (RMNH), "Vietnam: Ninh Thuân, Núi Chúa N.P., northeast part, Mal. traps, 90–150 m, 24–30.v.2007, C. v. Achterberg & R. de Vries, RMNH'07"; 1 ♂ (IEBR), id., but dry south part, 100–180 m, 22–29.v.2007.

Diagnosis. Antenna of ♀ 1.7–1.8 times as long as fore wing, without white or ivory segments, largely dark brown and penultimate antennal segments of ♀ at least twice as long as wide (Fig. 98); anterior tentorial pits dorsally distinctly above lower level of eyes and malar space comparatively short; frons brownish yellow medially; clypeus convex; vertex finely to moderately punctate; middle lobe of mesoscutum brownish yellow medially; mesopleuron ventrally and mesosternum yellowish brown; propodeum with satin sheen and with coarse transverse rugae; vein r-m of fore wing partly pigmented (Fig. 97); fore wing hardly darkened apically (Fig. 97); humeral plate

Figures 97, 98. *Stantonia sumatrana* Enderlein, ♀, Malaysia, Sabah, Poring. **97** habitus, lateral aspect **98** apices of antennae.

partly brown or dark brown; ventrally hind femur interspaces between punctures of ventral face micro-sculptured and rather matt, ventrally nearly entirely yellowish; hind femur slender (Fig. 97); hind coxa with satin sheen dorsally (Fig. 97); hind basitarsus moderately slender, apex brownish or dark brown and usually distinctly erect bristly setose (Fig. 97), remainder dark brown; first metasomal tergite of ♀ with satin sheen and 2.4–2.9 times as long as its apical width; apex of first tergite and base of second tergite yellowish brown; second tergite of ♀ 1.6–1.7 times as long as wide; second metaso-

mal suture straight and medial area behind suture flat or nearly so; second epipleuron entirely yellow; length of ovipositor sheath 0.16–0.22 times fore wing, less than half length of metasoma; length of fore wing 4.7–6.0 mm.

Variation. Apex of middle femur yellowish brown apically (also at inner side).

Distribution. Indonesia (Sumatra, Java, Sulawesi), West Malaysia (van Achterberg 1987), Singapore, Australia (Northern Territory; Queensland), China (Hainan, Guangxi, Hunan, Yunnan), Philippines (Mindanao) (Braet and Quicke 2004), Vietnam (Ha Noi, Ba Vi, Tản Lĩnh; Ninh Thuan, Nui Chua). New record for Vietnam.

***Stantonia takeuchii* (Watanabe, 1937)**

Figs 99–110

Microtypus takeuchii Watanabe, 1937: 95.
Stantonia takeuchii; Shenefelt, 1970: 268; Watanabe 1957: 45; Belokobylskij 1998: 503.

Type material. Holotype, ♀ (ECHU), "[Japan: Honshu], Kyoto, 21.ix.1925, Takeuchi" (with extra label in Japanese), "*Microtypus takeuchii* Watanabe, Type".

Additional material. 1 ♀ (RMNH), "China: Zhejiang, Hangzhou, 7.vii.1985, no. 851849, He Junhua".

Diagnosis. Antenna of ♀ yellowish submedially; vertex strongly punctate and interspaces approximately as wide as punctures or less (Fig. 107); anterior tentorial pits dorsally distinctly above lower level of eyes and malar space comparatively short (Fig. 106); face strongly convex; clypeus convex (Fig. 106); middle lobe of mesoscutum largely dark brown; lateral lobes of mesoscutum more or less infuscate medially; mesopleuron ventrally and mesosternum yellowish brown; anterior half of propodeum rugose and posterior half smooth; inner half of humeral plate dark brown; vein r-m of fore wing partly pigmented (Fig. 100); fore wing narrowly darkened apically (Fig. 100); hind femur slender, densely finely sculptured and rather matt ventrally (Fig. 109); hind coxa with dark brown patch latero-apically; length of first tergite approx. 3.3 times its apical width and tergite hardly narrowed behind spiracles (Fig. 103), its surface largely superficially granulate; base and apex of first tergite and base of second tergite dark brown; second metasomal suture straight and medial area behind suture flat or nearly so (Fig. 104); length of ovipositor sheath 0.5–0.6 times as long as fore wing; length of body approx. 6 mm.

Description. Holotype, ♀. Body length 6.1 mm, fore wing length 5.8 mm, ovipositor sheath missing, but length of ovipositor in normal position 3.2 mm.

Head. Antenna broken; third and fourth antennal segments 3.4 and 2.5 times as long as wide, respectively, and third segment 1.4 times as long as fourth segment; width of face equal to height of face and clypeus combined (Fig. 106); maxillary palp 1.2 times as long as height of head; clypeus distinctly convex and punctate (Fig. 106); malar space 1.1 times as long as mandible width; distance between large tentorial pits 1.9 times as long as distance between pit and eye margin; in anterior view length of

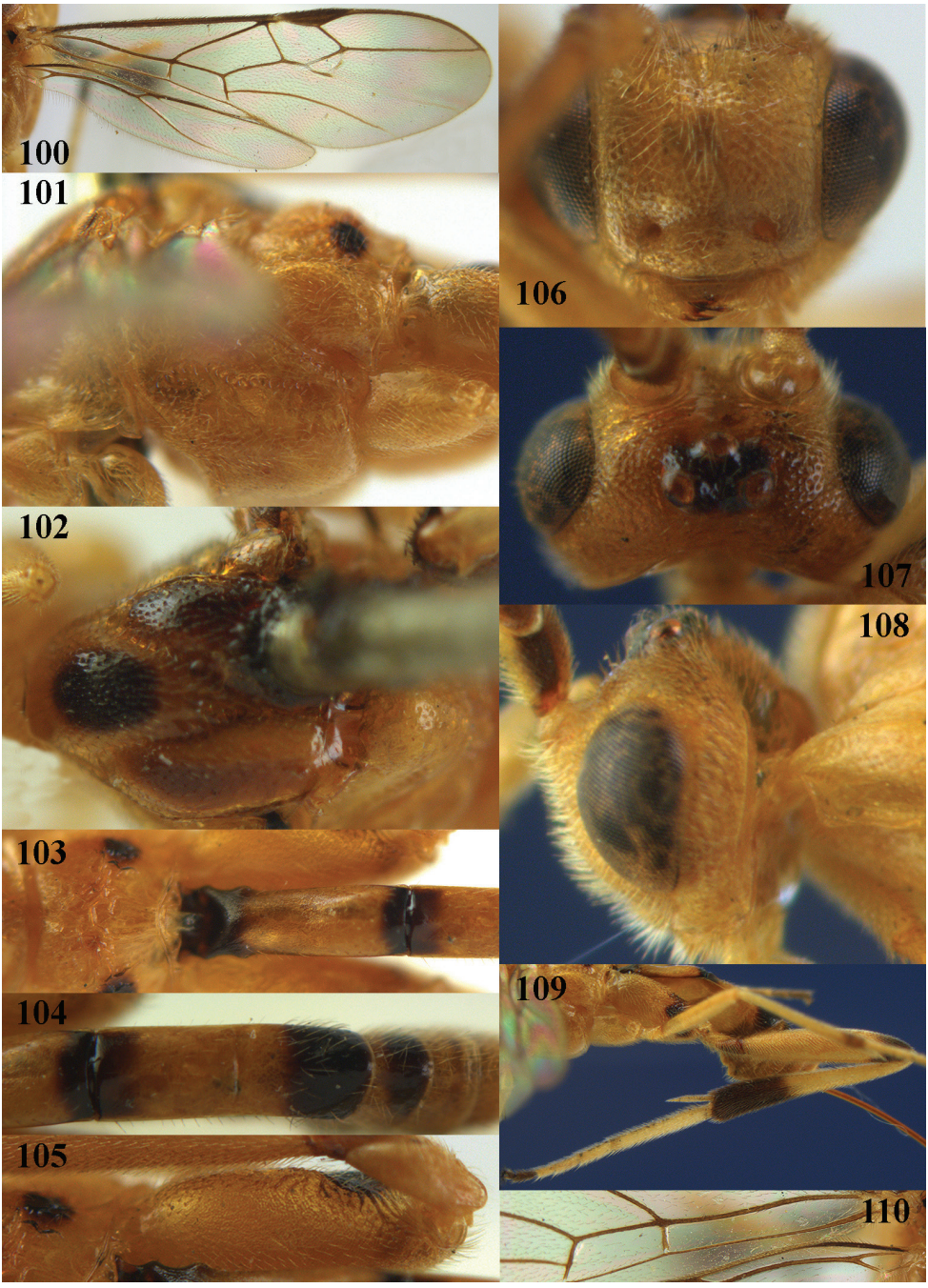
Figure 99. *Stantonia takeuchii* (Watanabe), ♀, holotype, habitus, lateral aspect.

eye 2.5 times as long as wide; in dorsal view length of eye 2.2 times as long as temple; POL:OD:OOL = 11:9:16; distance between anterior and lateral ocellus 0.8 times OD (Fig. 107); face convex, rather densely and coarsely punctate, smooth interspaces about equal to diameter of punctures and with medium-sized setae; frons laterally and vertex densely punctate (interspaces somewhat narrower than punctures), interspaces smooth and area directly behind stemmaticum depressed; frons medially smooth; stemmaticum strongly protruding; temple with satin sheen and with mainly rugose-coriaceous; occipital flange wide lamelliform.

Mesosoma. Length of mesosoma 1.2 times as long as high; pronotal side largely smooth except some spaced coarse punctures and coarsely and widely crenulate medial sulcus, subposteriorly with two crenulate branches and posteriorly narrowly crenulate; precoxal sulcus narrow and finely crenulate, complete and with wide flange posteriorly (Fig. 101), mesopleuron remotely coarsely punctate, smooth interspaces much wider than punctures; metapleuron coarsely punctate, with smooth interspaces approximately as wide as punctures; notauli rather narrow and moderately crenulate; mesoscutum and scutellum rather coarsely punctate, with smooth interspaces equal to width of punctures (middle lobe) or wider (lateral lobes and scutellum; Fig. 102); propodeum rather shiny, anterior half coarsely reticulate-rugose and posteriorly half mainly smooth.

Wings. Fore wing (Fig. 100): pterostigma 3.9 times as long as wide; second submarginal cell petiolate; r:2-SR:3-SR+SR1:r-m = 20:25:86:16; r issued submedially from pterostigma; r-m submedially distinctly sclerotized; cu-a slightly antefurcal (Fig. 100); basal 0.7 of CU1a more or less sclerotized; CU1b: 3-CU1 = 10:13. Hind wing: M+CU:1-M: 1r-m = 19:59:5.

Legs. Anterior half of hind coxa punctate-rugulose and posterior half coarsely rugose dorsally (Fig. 105); ventrally hind femur rather matt, largely rugulose-coriaceous; length of femur, tibia and basitarsus of middle leg 6.3, 10.7 and 12.2 times as long as their width, respectively; inner and outer middle tibial spurs 0.40 and 0.35 times



Figures 100–110. *Stantonia takeuchii* (Watanabe), ♀, holotype. **100** wings **101** mesosoma, lateral aspect **102** mesosoma, dorsal aspect **103** propodeum and first metasomal tergite, dorsal aspect **104** second and third metasomal tergites, dorsal aspect **105** hind coxa, dorsal aspect **106** head, anterior aspect **107** head, dorsal aspect **108** head, lateral aspect **109** hind leg, lateral aspect **110** detail of submedial and first subdiscal cells of fore wing.

as long as basitarsus; length of femur, tibia and basitarsus of hind leg 5.3, 7.8 and 7.6 times their width, respectively; hind basitarsus rather adpressed setose; inner and outer hind tibial spurs 0.50 and 0.35 times as long as basitarsus, respectively.

Metasoma. First tergite hardly narrowed behind spiracles (Fig. 103), 3.3 times as long as its apical width, its surface superficially finely granulate and with satin sheen; second tergite convex and smooth anteriorly, remainder superficially granulate, rather elongate, 1.5 times longer than its basal width and with satin sheen; second suture straight and medial area behind it nearly flat; ovipositor sheath missing, considering position and length of ovipositor 0.56 times as long as fore wing and approximately as long as metasoma (Fig. 99).

Colour. Yellowish brown; inner half of humeral plate dark brown, remainder of plate and tegulum yellowish brown; tibial spurs, fore and middle legs (but telotarsi, third and fourth middle tarsal segments and apex of hind tibia dark brown) pale yellowish; remainder of hind tarsus ivory (Fig. 99); basal half of antenna (but scapus and pedicellus dark brown laterally) brownish yellow; lateral lobes of mesoscutum slightly darkened medially; stemmaticum, middle lobe of mesoscutum, pair of lateral patches on propodeum, base and apex of first metasomal tergite, base of second tergite, apex of third and fourth segments, patch on hind coxa subapically, hind trochantellus, apex of hind femur, apical third of hind tibia, large patch on second epipleuron and apical half of third epipleuron dark brown; apex of fore wing anteriorly slightly darkened and remainder subhyaline (Fig. 100); veins and pterostigma dark brown.

Distribution. Japan (Honshu, Kyushu), China (Taiwan (Belokobylskij 1998), *Zhejiang).

Notes. Very similar to *S. sauteri* Watanabe and differs mainly by the partly dark brown basal metasomal tergites and hind coxa. The pair of dark brown patches of the propodeum is absent in the specimen from Hangzhou.

Stantonia tianmushana Chen, He & Ma, 2004

Figs 95, 96, 111

Stantonia sp. C Braet & Quicke, 2004: 1522.
Stantonia tianmushana Chen, He & Ma, 2004: 364–365, 533.

Material. 1 ♀ (RMNH), N. Vietnam: Vinh Phu, Tam Dao, 700 m, *Pinus* forest, 14.ii.1990, S.A. Belokobylskij; 1 ♀ (ZISP), id., but 1000 m; 1 ♀ (ZISP), N. Vietnam, Ba Vi, 70 km NW Ha Noi, 400 m; 1 ♀ (RMNH), "N. Vietnam: Hai Phong, Cat Ba N.P., 95 m, 20°48'2"N, 107°0'18"E, 18–24.x.2009, Mal. tr., C. v. Achterberg & R. de Vries, RMNH'09"; 1 ♀ (IEBR), "Orgi.070", "NC Vietnam: Ha Tinh, Vu Quang N.P., 4.x.2009, K.D. Long".

Diagnosis. Antenna of ♀ without white or ivory segments and largely dark brown; anterior tentorial pits dorsally above lower level of eyes and malar space comparatively short; frons brownish yellow medially; clypeus convex; vertex finely to moderately

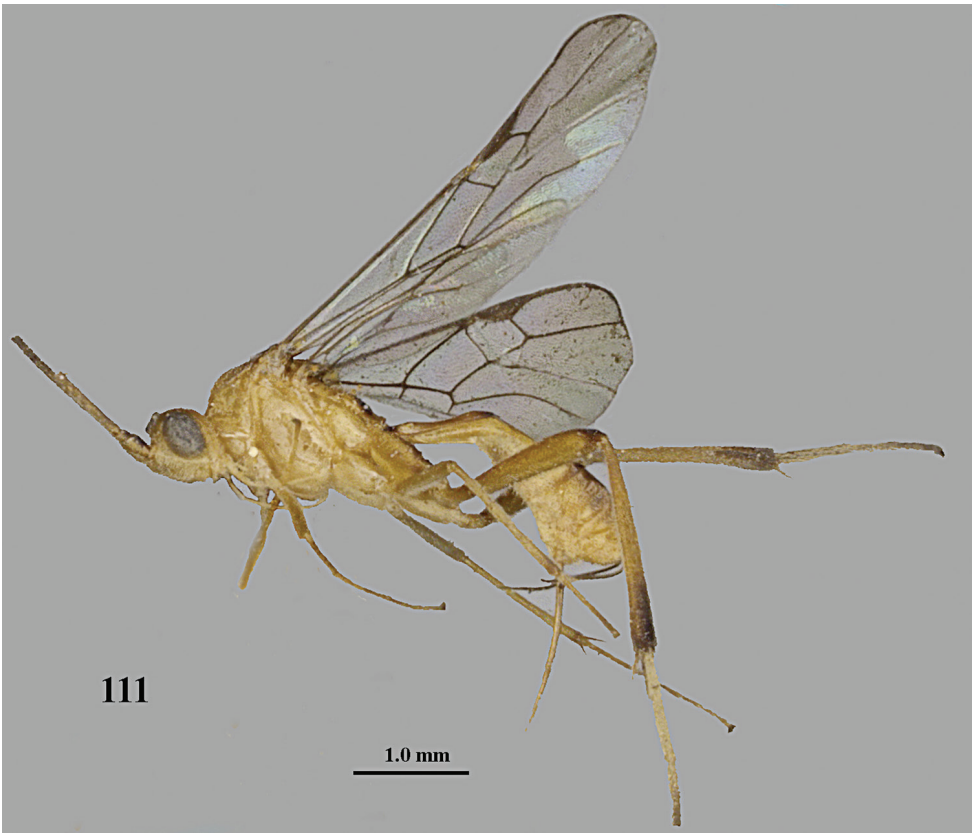


Figure 111. *Stantonia tianmushana* Chen, He & Ma, ♀, holotype, habitus, lateral aspect. Photo: Jiachen Zhu.

punctate; middle lobe of mesoscutum brownish yellow medially; mesopleuron ventrally and mesosternum yellowish brown; propodeum with satin sheen and with coarse transverse rugae; vein r-m of fore wing partly pigmented (Fig. 111); fore wing subhyaline apically (Fig. 111); humeral plate partly brown or dark brown; ventrally hind femur densely micro-sculptured and matt, ventrally nearly entirely yellowish; hind femur slender (Fig. 111); hind coxa with satin sheen dorsally; hind basitarsus slender and rather adpressed setose (Fig. 111); first metasomal tergite of ♀ 3.0–3.6 times as long as its apical width; apex of first tergite and base of second tergite yellowish brown; second tergite of ♀ 1.6–1.7 times as long as wide; second metasomal suture straight and medial area behind suture flat or nearly so; second epipleuron entirely yellowish; length of ovipositor sheath 0.25–0.32 times fore wing, approximately half as long as metasoma; length of body 4–5 mm.

Variation. First tergite 3.0-3.6 times as long as wide apically.

Distribution. China (Zhejiang), *Vietnam (Vinh Phuc (Tam Dao N.P.); Ha Noi (Ba Vi N.P.); Ha Tinh (Vu Quang N.P.)). New record for Vietnam.

***Stantonia vietnamica* van Achterberg, sp. n.**
http://zoobank.org/D6DAA97B-F5B1-4A9E-BDE0-BE4A13FB1EF6
Figs 112–122

Stantonia spasskensis; Braet & Quicke, 2004: 1578–1579.

Type material. Holotype, ♀ (RMNH), "S. Vietnam: Dak Lak, Chu Yang Sin N.P., n[ea]r dam, 740–940 m, 1–10.vi.2007, Mal. traps, C. v. Achterberg & R. de Vries, RMNH'07". Paratypes (3 ♀): 1 ♀ (IEBR), same data as holotype; 1 ♀ (RMNH), "C. Vietnam: Ha Tinh, Vu Quang N.P., 18°19'47"N, 105°26'28"E, 66 m, 4.iii.–15.iv.2011, Mal. trap 9, C. v. Achterberg & R. de Vries, RMNH'11"; 1 ♀ (ZISP), "Vietnam, pr[ovince] Ha Son Binh, Da Bac, forest bamboo, 22.x.1990, Tuly & Belokobylskij".

Diagnosis. Antenna with a submedial band consisting of 14–17 ivory or white segments contrasting with blackish or dark brown basal third of antenna (Fig. 112); clypeus moderately convex (Fig. 118); mesosoma entirely black; tegulum and humeral plate dark brown; fore wing evenly infuscated (Fig. 113); hind tarsus (except narrowly basally) whitish or ivory; middle tarsus conspicuously bristly setose; hind femur (except basally) and more or less middle coxa black or dark brown dorsally; first metasomal tergite 3.4–3.6 times as long as wide apically; epipleuron of second metasomal tergite with an isolated and well defined dark brown spot (Fig. 117); second metasomal tergite dark brown to brownish yellow antero-dorsally; length of ovipositor sheath 0.5–0.6 times as long as fore wing; length of fore wing 7.9–9.2 mm.

The new species runs in the key by van Achterberg (1987) to *S. annulicornis* Enderlein, but differs by having the face yellowish brown and rather densely punctate (pale yellowish and sparsely finely punctate in *S. annulicornis*), clypeus partly convex (rather flat), scapus partly infuscated (pale yellow), antenna with 14–17 white or ivory segments submedially (11–12 segments), fore wing evenly slightly infuscate (only apically distinctly infuscate), tegulum dark brown (pale brown or yellowish), and propodeum black medially (more or less yellowish brown or brown).

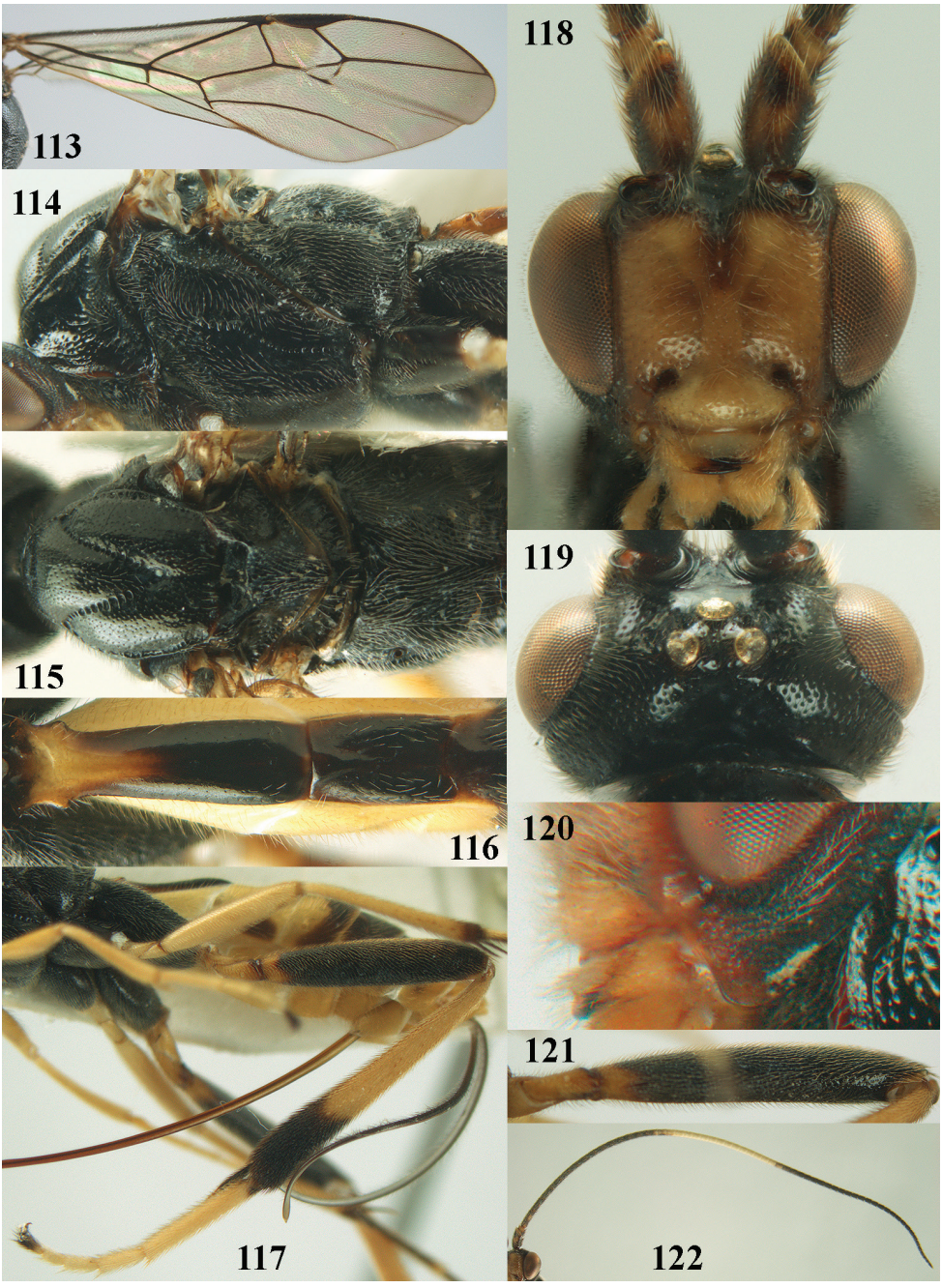
Description. Holotype, ♀. Body length 9.7 mm, fore wing length 9.2 mm, ovipositor sheath 4.9 mm.

Head. Antenna with 61 segments and 1.6 times as long as fore wing; middle antennal segments with distinct false division medially and 1.8 times as long as wide; third, fourth and penultimate antennal segments 4.5, 2.9 and 1.8 times as long as wide, respectively, and third segment 1.6 times as long as fourth segment; width of face 0.9 times height of face and clypeus combined (Fig. 118); maxillary palp 1.5 times as long as height of head; malar space 0.7 times as long as mandible width, largely coriaceous and with distinct groove; distance between tentorial pits 2.2 times as long as distance between pit and eye margin; in anterior view length of eye 2.2 times as long as wide; in dorsal view length of eye 3.5 times as long as temple; POL:OD:OOL = 8:10:15; distance between anterior and lateral ocellus 0.5 times OD (Fig. 119); face remotely and moderately punctate, interspaces smooth and much wider than punctures and medium-sized setae; vertex finely remotely punctate and directly behind stemmaticum

Figure 112. *Stantonia vietnamica* sp. n., ♀, holotype, habitus, lateral aspect.

steeply depressed; temple matt, granulate, punctate and postero-ventrally with rugae; occipital flange wide and lamelliform.

Mesosoma. Length of mesosoma 1.5 times as long as high; pronotal side with complete Y-shaped crenulate grooves, postero-ventrally connected to crenulate border, largely smooth dorsally, partly coarsely punctate and with some rugae ventrally and remainder sparsely finely punctate (Fig. 114); notauli rather narrow and moderately crenulate, but widened posteriorly and ending far in front of scutellar sulcus (Fig. 115); scutellar sulcus smooth, except for some remnants of crenulae posteriorly; mesoscutum and scutellum remotely finely punctate (Fig. 115); precoxal sulcus complete and rather narrowly crenulate (Fig. 114), mesopleuron sparsely finely punctate, but mainly smooth near precoxal sulcus; metapleuron rather densely punctate; propodeum spaced punctate with interspaces smooth and at least as wide as diameter of punctures, rather dull and with few weak transverse rugae (Fig. 115).



Figures 113–122. *Stantonia vietnamica* sp. n., ♀, holotype. **113** wings **114** mesosoma, lateral aspect **115** mesosoma, dorsal aspect **116** first–second metasomal tergites, dorsal aspect **117** hind leg, lateral aspect **118** head, anterior aspect **119** head, dorsal aspect **120** detail of clypeus and malar space, lateral aspect **121** hind femur, ventral aspect **122** antenna.

Wings. Fore wing (Fig. 113): first discal cell truncate anteriorly; pterostigma 5.0 times as long as wide; r:2-SR:3-SR+SR1:r-m = 20:19:67:10; second submarginal cell narrowly petiolate; r issued behind middle of pterostigma; r-m largely sclerotized; cu-a interstitial; basal three-quarters of CU1a sclerotized; CU1b: 3-CU1 = 10:23, CU1b oblique, distinctly diverging posteriorly from cu-a. Hind wing: M+CU:1-M: 1r-m = 6:21:2; R1 with three distinct hamuli; area in front of cu-a and behind it glabrous.

Legs. Ventrally hind femur rugose, but posteriorly becoming obsolescent, with satin sheen (as outer side); length of femur, tibia and basitarsus of middle leg 5.5, 9.3 and 10.0 times as long as their width, respectively; inner and outer middle tibial spurs 0.45 and 0.30 times as long as basitarsus; middle tarsus very bristly; length of femur, tibia and basitarsus of hind leg 5.0, 8.3 and 6.4 times their width, respectively; inner and outer hind tibial spurs 0.50 and 0.35 times as long as basitarsus, respectively.

Metasoma. First tergite parallel-sided, 3.6 times as long as its apical width, its surface with satin sheen, largely smooth (except some superficial micro-sculpture and some punctures; Fig. 116); second and third tergites smooth (except some punctures and superficial micro-sculpture), and rather dull, except a shiny triangular basal area; second tergite 1.7 times longer than its basal width; length of ovipositor sheath 0.51 times as long as fore wing and 0.9 times as long as metasoma (Fig. 112).

Colour. Black; antenna dark brown but 3 basal antennal segments with pale brownish or greyish spots, 33rd segment pale brown, 17th–18th segments partly ivory and 19th–32nd segments white; tegulum, humeral plate, apex of middle tibia, patch on second epipleuron, third tergite (except antero-laterally), fourth and fifth tergites largely, sixth tergite dorsally and ovipositor sheath dark brown; middle tibial spurs, inner apex of middle femur, seventh and eight tergites dorsally, brown; tarsi ivory, but telotarsi black, hind basitarsus basally narrowly blackish and middle tarsus dark brown ventrally; coxae, hind femur (except basally), apical third of hind tibia, hind tibial spurs, first (except basal triangle) and second tergites dorsally, black; remainder of legs and of metasoma, palpi and clypeus pale yellowish; face brownish yellow; entire fore wing infuscated; veins and pterostigma dark brown.

Male. Unknown.

Variation. Length of body 7.2–9.7 mm; length of fore wing 7.0–9.2 mm; antenna with 55(1), 61(2) segments; length of first metasomal tergite 3.6–3.7 times its apical width; length of ovipositor sheath 0.51–0.54 times fore wing; 18th–30th or –32nd, or 19th–32nd antennal segments white.

Distribution. Vietnam (Hoa Binh; Ha Tinh (Vu Quang N.P.); Dak Lak (Chu Yang Sin N.P.)).

Notes. A male from Thanh Son (RMNH) has 14 pale antennal segments, yellow mesopleuron, mesosternum, middle coxa and middle of propodeum, and probably belongs to a related species. Except for having less pale antennal segments than the examined holotype of *S. spasskensis*, it differs by having vein cu-a of fore wing distinctly postfurcal (slightly antefurcal in *S. vietnamica*), less extensive infuscation of fore wing (most of apex of fore wing), and base of T1 yellowish-brown (ivory).

***Stantonia xiangqianensis* Chen, He & Ma, 2004**
Fig. 123

Stantonia sp. B Braet & Quicke, 2004: 1522.
Stantonia xiangqianensis Chen, He & Ma, 2004: 365–367, 532; Long and van Achterberg 2014: 408.

Material. 1 ♂ (RMNH), "S. China: Hunan, n[ea]r Zhangjiajie, Badagong Mts, Bamaoxi, 2–3.vi.2009, 540 m, X.-Y. Li, RMNH'09".

Diagnosis. Basal half of antenna yellowish and apical half darkened, antenna 1.6 times as long as fore wing; vertex finely spaced punctate and interspaces distinctly wider than punctures and yellowish brown; mesosoma entirely yellowish brown; inner half

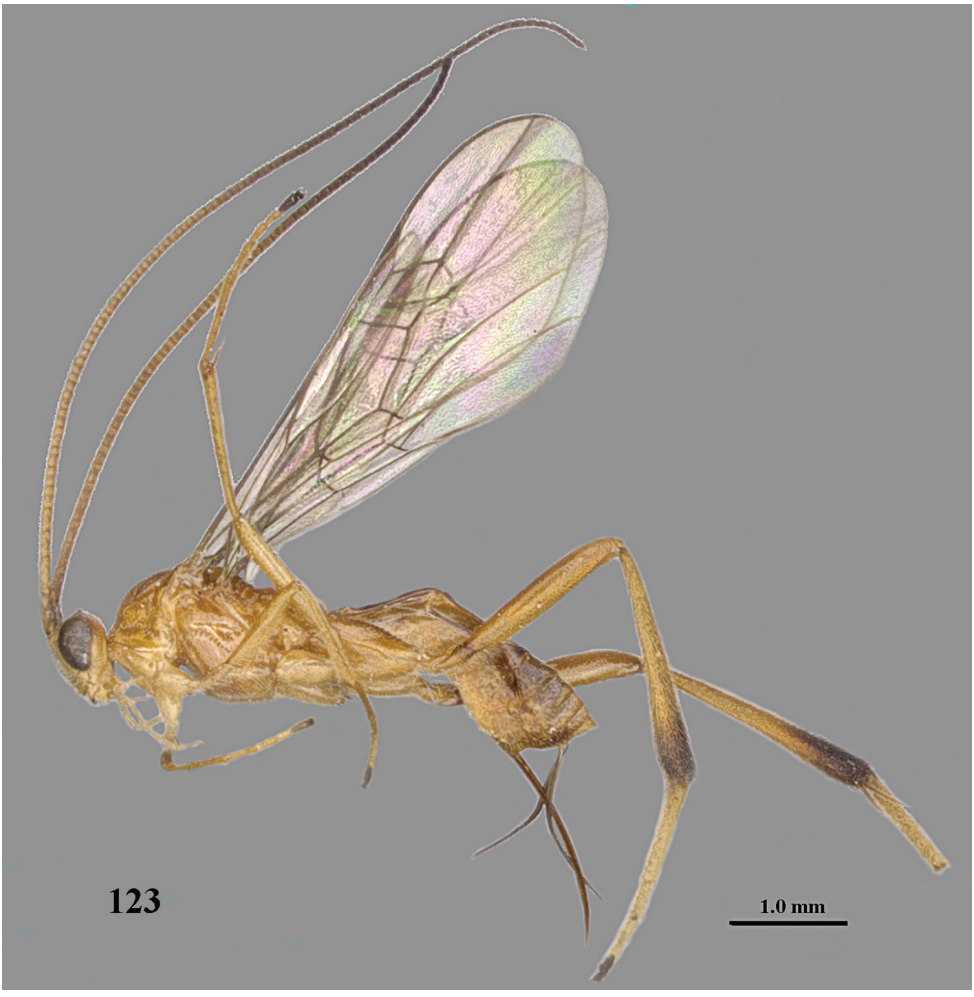


Figure 123. *Stantonia xiangqianensis* Chen, He & Ma, ♀, holotype, habitus, lateral aspect. Photo: Jiachen Zhu.

of humeral plate dark brown, remainder of plate and tegulum yellowish brown; propodeum medio-anteriorly sparsely punctate anteriorly; fore wing moderately infuscated apically; vein 3-SR+SR1 approx. 3.7 times as long as vein r; hind femur partly smooth and shiny ventrally, slender and apically yellowish brown; hind tarsus (except telotarsus) ivory or white; length of first metasomal tergite approx. 3.7 times its apical width; epipleuron of second tergite partly darkened (Fig. 123); apices of first and third metasomal tergites brownish yellow; length of ovipositor sheath 0.5–0.6 times as long as fore wing and somewhat longer than metasoma; length of fore wing approximately 7 mm.

Distribution. China (Hunan, Guizhou).

Notes. Very similar to *S. issikii* Watanabe, 1932, and differs mainly by the colour and shape of the tergites and the longer vein 3-SR+SR1 of fore wing.

Acknowledgements

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The genus *Gallerucida* Motschulsky in Taiwan (Insecta, Coleoptera, Chrysomelidae, Galerucinae)

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Abstract

Species within the genus *Gallerucida* Motschulsky recorded in Taiwan are revised. *Gallerucida bifasciata* Motschulsky, 1861, *G. lutea* Gressitt & Kimoto, 1963, *G. sauteri* Chûjô, 1938, and *G. shirozui* Kimoto, 1969 are redescribed. *Sphenoraia chujoi* Lee, 2014 is proposed as a junior synonym of *G. flaviventris* (Baly, 1861). *Gallerucida thoracica* (Jacoby, 1888) is recorded as new for Taiwan and redescribed. Lectotypes are designated for *Gallerucida nigrita* Chûjô, 1935, *G. sauteri* Chûjô, 1938, and *Eustetha thoracica* Jacoby, 1888. Biological notes are given on all Taiwanese species of *Gallerucida*.

Keywords

Host plants, leaf beetles, Polygonaceae, taxonomic revision, Vitaceae

Introduction

The genus *Gallerucida* Motschulsky, 1861 is widespread in the Oriental and East Palaearctic regions, with highest species diversity in China. Of 66 valid species that were recognized by Wilcox (1971), 43 species were recorded from China. A number of new and newly recorded species have been added recently to the Chinese fauna (Chen 1992,

Yang 1994a, 1994b, 1997). Currently, 60 species are recognized from China (Yang et al. 2015). In addition, one additional species, *Galluercida gebieni* Weise, 1922 should be added to the Chinese fauna since it was removed from synonymy with *G. singularis* Harold, 1880 by Lee and Bezděk (2013).

Adults within the genera *Gallerucida* Motschulsky, 1861 and *Laphris* Baly, 1864 are easily recognized by their projecting anterior metasterna that cover most of the mesosterna. *Gallerucida* adults can be separated from those of *Laphris* by the comparatively shorter antennomeres III (subequal or twice length of antennomeres II; by contrast antennomeres III are four times the lengths of II in *Laphris*). Adults of the genus *Sphenoraia* Clark, 1865 also look like those of *Gallerucida* and *Laphris*, but they can be distinguished easily by the absence of the projecting anterior process of the metasternum. *Gallerucida nigromaculata* (Baly, 1861) and *G. singularis* Harold, 1880 were firstly recorded from Taiwan by Chûjô (1935) together with description of a new species, *G. nigrita* (*G. nigromaculata* and *G. nigrita* were synonymized with *G. bifasciata* Motschulsky). Chûjô (1938) described a new species, *G. sauteri* Chûjô. Kimoto (1969) recorded *G. flaviventris* (Baly, 1861) and *G. lutea* Gressitt & Kimoto, 1963 for the first time and described a new species, *G. shirozui* Kimoto. Takizawa (1978) described a new species, *G. quadraticollis* Takizawa which was synonymized with *G. sauteri* Chûjô. Lee and Bezděk (2013) first listed *G. gebieni* Weise, 1922 from Kimen and Nankan islands. This brings the total to seven species reported from Taiwan to date.

Gallerucida bifasciata Motschulsky is an abundant species that is considered as biological control agent for invasive species of Polygonaceae (Ding et al. 2004; Wang et al. 2008; Wang et al. 2010). However, others are little-known except for scattered original taxonomic descriptions.

The Taiwan Chrysomelid Research Team (TCRT) was founded in 2005 and is composed of 10 members. All of them are amateurs interested in producing a complete inventory of Chrysomelid species in Taiwan. Members of the genus *Gallerucida* have been collected and studied, and host plants recorded. Life histories for almost all species were documented by laboratory rearing. The results of these efforts are the subject of the current paper.

Materials and methods

For rearing studies, larvae were placed in small glass containers (diameter 142 mm × height 50 mm) with cuttings from their host plants. When mature larvae began searching for pupation sites, they were transferred to smaller plastic containers (diameter 90 mm × height 57 mm) filled with moist soil (about 80% of container volume).

For taxonomic study, the abdomens of adults were separated from the fore body and boiled in 10 % KOH solution, followed by washing in distilled water to prepare genitalia for illustrations. The genitalia were then dissected from the abdomen, mounted on slides in glycerin, and studied and drawn using a Leica M165 stereomicroscope. For detailed examinations a Nikon ECLIPSE 50i microscope was used.

At least three pairs from each species were examined to delimit variability of diagnostic characters. For species collected from more than one locality, at least one pair from each locality was examined. Length was measured from the anterior margin of the eye to the elytral apex, and width at the greatest width of the elytra.

Specimens studied herein are deposited at the following institutes and collections:

BMNH The Natural History Museum, London, UK [Michael Geiser];
BPBM Bernice P. Bishop Museum, Hawaii, USA [James Boone];
CAS California Academy of Sciences, California, USA [David H. Kavanaugh];
EIHU Systematic Entomology, The Hokkaido University Museum, Sapporo, Japan [Masahiro Ôhara];
EUMJ Ehime University, Matsuyama, Japan [Hiroyuki Yoshitomi];
JBCB Jan Bezděk collection, Brno, Czech Republic;
KMNH Kitakyushu Museum of Natural History and Human History, Kitakyushu, Japan [Yûsuke Minoshima];
KUEC Faculty of Agriculture, Kyushu University, Fukuoka, Japan [Osamu Tadauchi];
MCZC Museum of Comparative Zoology, Harvard University, Massachusetts, USA [Philip D. Perkins];
MNHN Museum National d'Histoire naturelle, Paris, France;
NHMB General collection, Naturhistorisches Museum, Basel, Switzerland [Matthias Borer];
NMNS National Museum of Natural Science, Taichung, Taiwan [Ming-Luen Jeng];
SDEI Senckenberg Deutsches Entomologisches Institut, Müncheberg, Germany [Konstantin Nadein]
TARI Taiwan Agricultural Research Institute, Taichung, Taiwan.

Exact label data are cited for all type specimens of described species; a double slash (//) divides the data on different labels and a single slash (/) divides the data in different rows. Other comments and remarks are in square brackets: [p] – preceding data are printed, [h] – preceding data are handwritten, [w] – white label, [y] – yellow label, [g] – green label, [b] – blue label, and [r] – red label.

Taxonomy

***Gallerucida bifasciata* Motschulsky**
Figs 1–3

Gallerucida bifasciata Motschulsky, 1861: 24 (Japan); Solsky 1872: 259 (East Siberia); Chûjô 1940: 6 (Korea); Chûjô 1941: 160 (Korea); Gressitt and Kimoto 1963: 721 (China: Jilin, Shaanxi, Gansu, Sichuan, Hubei, Guizhou, Jiangxi, Fujian, Zhejiang, Jiangsu); Kimoto 1965a: 399 (infraspecific variation between north and south Japan); Kimoto and Hiura 1965: 38 (Japan); Kimoto 1966: 34 (Taiwan); Kimoto and Kawase

1966: 47 (China: Jilin); Kimoto 1969: 68 (Taiwan); Wilcox 1971: 201 (catalogue); Kimoto 1989: 260 (Taiwan); Kimoto 1991: 17 (Taiwan); Kimoto and Chu 1996: 92 (catalogue); Kimoto and Takizawa 1997: 392 (catalogue); Lee and Cheng 2007: 104 (biology); Beenen 2010: 459 (catalogue); Yang et al. 2015: 171 (catalogue).

Galerucida [sic!] *bifasciata*: Weise 1886: 578 (Amur); Heyden 1887: 263 (Korea); Weise 1924: 140 (catalogue); Ogloblin 1936: 354 (redescription); Kimoto 1965b: 488 (Taiwan).

Melospila bifasciata: Baly 1874: 185.

Melospila nigromaculata Baly, 1861: 297; Harold 1876: 3591 (as synonym of *G. bicolor*, synonymy confirmed).

Gallerucida nigromaculata: Chûjô & Kimoto 1961: 163 (host plants); Chûjô 1962: 154 (redescription).

Galerucida [sic!] *nigromaculata*: Weise 1922: 92 (China: Fujian); Chûjô 1935: 169 (Taiwan); Ogloblin, 1936: 356 (redescripton).

Gallerucida bifasciata nigromaculata: Takizawa 1980: 73 (Korea); Takizawa 1985: 10 (as synonym of *G. bifasciata*).

Galerucida [sic!] *nigrofasciata* Baly, 1879: 453 (should be error for *G. nigromaculata* Baly because *G. nigromaculata* is the only one of Baly's species which is treated by Harold (1876) as a synonym of *G. bicolor*) (as synonym of G. bifasciata, synonymy confirmed).

Melospila consociata Baly, 1874: 185; Ogloblin 1936: 354 (as synonym of *G. bifasciata*, synonymy confirmed).

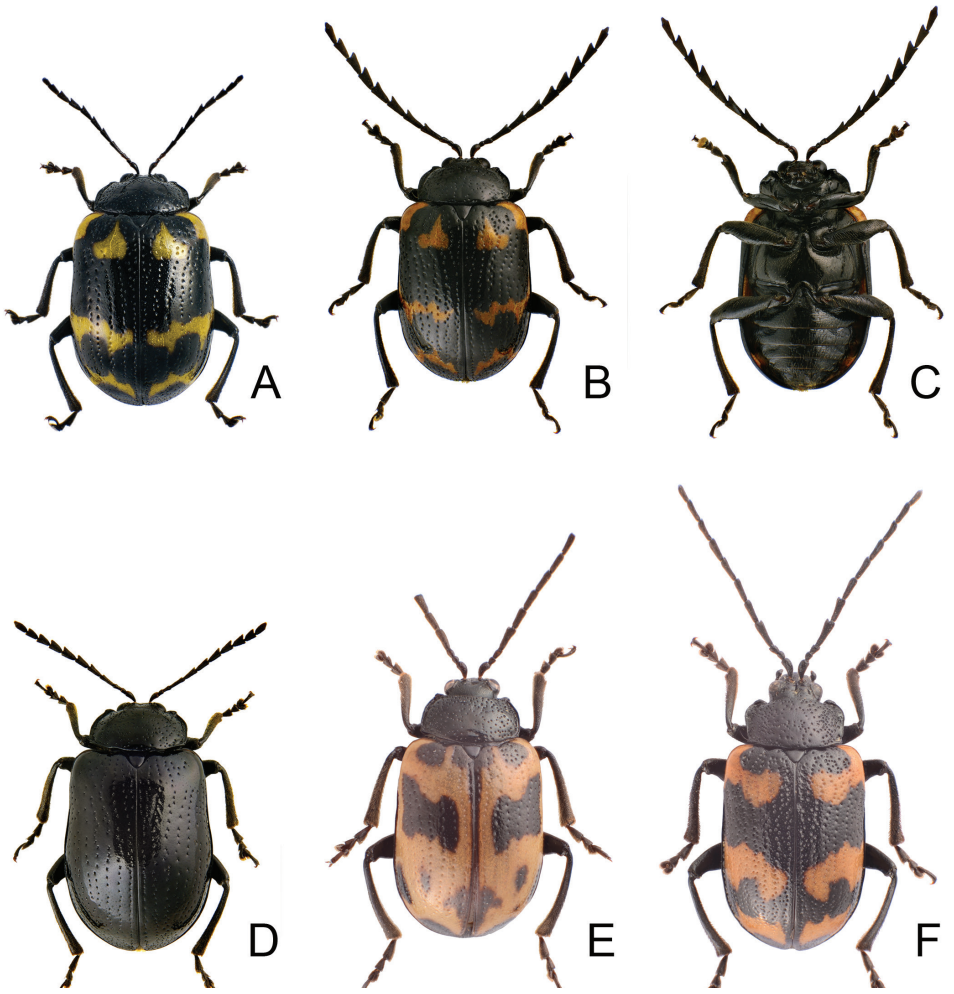
Galerucida [sic!] *nigrita* Chûjô, 1935: 168; Chûjô 1962: 153 (redescription); Kimoto 1966: 34 (as synonym of *G. bifasciata*, synonymy confirmed).

Type material. *Gallerucida bifasciata*. Lectotype ♂ (MNHN), here designated, labeled: "Galerucida / bifasciata / Motch. / Type / Japonia [h, w] // Ex-Musæo / E. Harold [p, w]". Number of paralectotypes is uncertain.

Melospila nigromaculata. Lectotype ♂ (BMNH), here designated, labeled: "Galerucida / nigromaculata / Baly / N. China [h, g] // Type [p, w, circular label with red border] // Type [h, w] // Baly Coll. [p, w]". Number of paralectotypes is uncertain.

Melospila consociata. Lecotype ♀ (BMNH), here designated, labeled: "Hakodate / Mr. Moor [h, w, with pencil written on the back of the label which specimen glue on] // Hakodate [p, w] // Japan. / G. Lewis, / 1910—320. [p, w]". Number of paralectotypes is uncertain.

Glaerucida nigrita. Lectotype ♂ (TARI), here designated, labeled: "Formosa. / Musha [= Wushe, 霧社], 1919. / V 18 – VI 15. / T. Okuni, [p, w] // CO / Types [p, w, yellow letters, circular label with yellow border] // *Galerucida* / *nigrita* Chûjô [h] / DET. M. CHUJO [p, g] // 1928 [p, w]". Paralectotypes. 2♂♂, 1♀ (TARI), same as lectotype but with "2183, or 2184, or 1929; 1♂ (TARI): "Horisha / Apr. 2, 1919 [h, w] // CO / Types [p, w, yellow letters, circular label with yellow border] // *Galerucida* / *nigrita* Chûjô [h] / DET. M. CHUJO [p, g]" // 2182 [p, w]"; 1♂ (SDEI): "Taihorinsho [= Talin, 大林] / Formosa / Sauter [p] VIII. [h] ~~07~~.09 [p, w] // Syntypus [p, r] // *Galerucida* / *nigrita* Chûjô [h] / DET. M. CHUJO [p, g] // DEI Müncheberg / Col-09171 [p, g]".



Figures 1. Habitus of *Gallerucida bifasciata* Motschulsky. **A** Female, dorsal view **B** Male, color variation, ventral view **C** Ditto, ventral view **D** Female, stripes completely reduced, dorsal view **E** Male, stripes well developed, dorsal view **F** Male, from northern Japan.

Diagnosis. *Gallerucida bifasciata* adults are easily recognized by their black bodies, with or without yellowish brown stripes, and strongly serrate antennae. Aedeagi of male endophallic sclerite complex is characterized by its short endophallic sclerite complex, and the median sclerite is similar to the lateral sclerite in length. By contrast, the endophallic sclerite complex is comparatively longer, and the median sclerite is much longer than the lateral sclerite in other species.

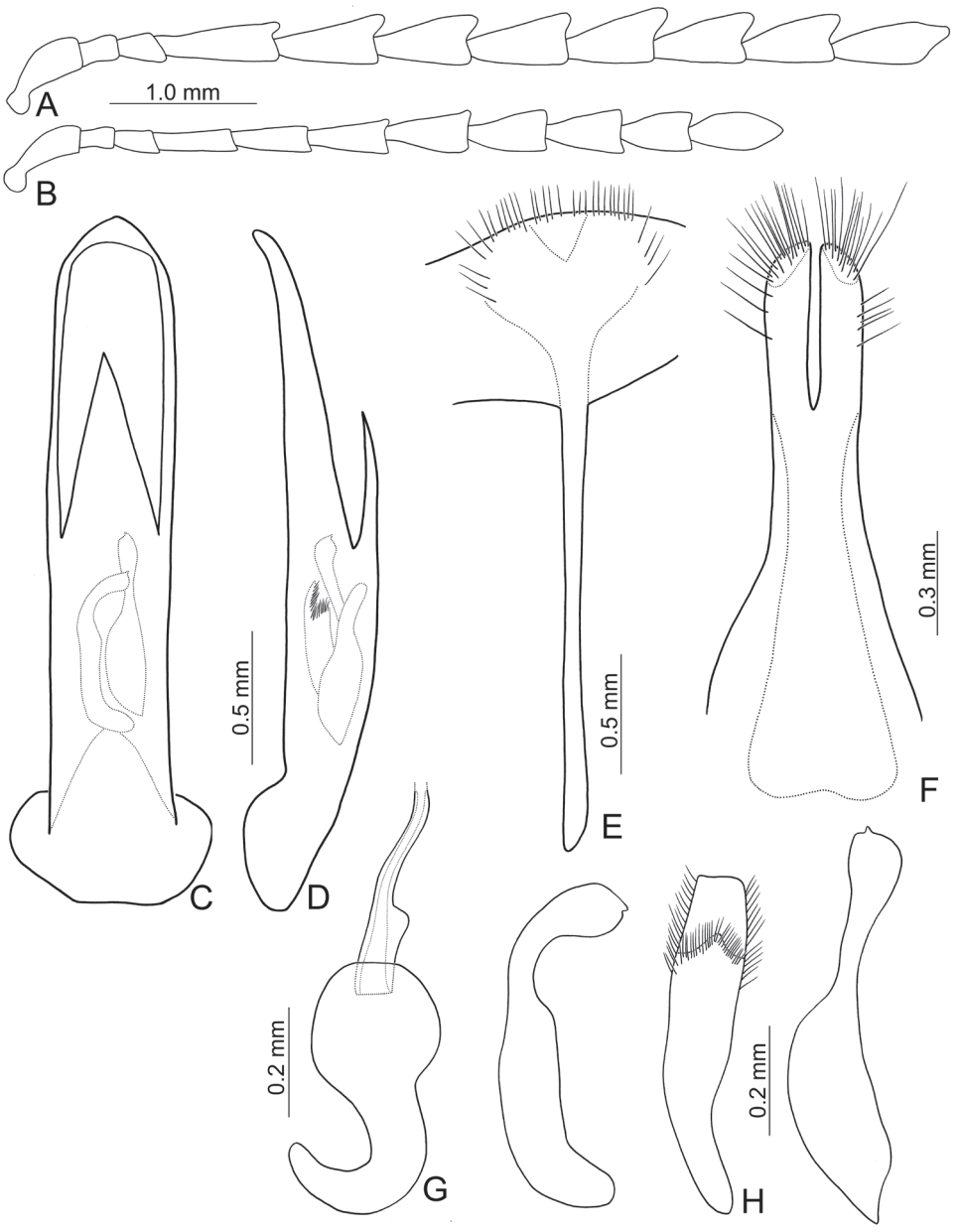
Redescription. Length 7.1–11.2 mm, width 4.2–6.0 mm. General color (Fig. 1A–C) black; elytra with three pairs of transverse, yellowish brown or orange stripes, one pair at baso-lateral angles curved inwards; second pair behind middle sinuate, expanding

posteriorly at 1/3 and 2/3 distance between suture and lateral margins; third pair near apex curved inwards, expanding anteriorly at 1/3 and 2/3 distance between suture and lateral margins; lateral margin of abdomen yellowish brown. Antenna serrate in males (Fig. 2A), length ratios of antennomeres I–XI 1.0 : 0.4 : 0.5 : 1.3 : 1.2 : 1.1 : 1.1 : 1.1 : 1.1 : 1.1 : 1.3, length to width ratios of antennomeres I–IX 2.6 : 1.4 : 1.5 : 3.3 : 2.3 : 2.2 : 2.1 : 1.9 : 2.2 : 2.1 : 2.9; less serrate and shorter in females (Fig. 2B), length ratios of antennomeres I–XI 1.0 : 0.4 : 0.5 : 0.9 : 0.9 : 0.9 : 0.9 : 0.9 : 0.9 : 0.8 : 1.1, length to width ratios of antennomeres I–IX 3.1 : 1.6 : 2.0 : 3.5 : 3.1 : 2.5 : 2.0 : 1.9 : 1.8 : 1.9 : 2.5. Pronotum transverse, 1.9× wider than long, disc convex, with indistinct depressions at sides, disc with microreculation, and extremely coarse, sparse punctures, and minute, sparse punctures between coarse punctures; lateral margin rounded; apical margin concave; basal margin convex. Elytra parallel-sided; 1.4× longer than wide, disc without micro-reticulation but with extremely coarse punctures arranged into striae, with minute punctures between coarse punctures. Penis (Fig. 2C, D) elongate, 5.8× longer than wide; parallel-sided; apex lanceolate; slightly curved in lateral view; ventral surface well sclerotized; endophallic sclerite complex (Fig. 2H) small, about 0.3× as long as penis, composed of one median sclerite and one pair of lateral sclerites, median sclerite longitudinal, with dorsal process at apical 1/4, with dense setae along apical margin of dorsal process; lateral sclerites longitudinal and slightly longer than median, about 1.2× median sclerite, asymmetric, curved near apex, apices circular and with one acute tooth. Gonocoxae (Fig. 2F) elongate, connected from base to apical 1/3, apices rounded, with dense elongate setae; base shallow bifurcate. Ventrite VIII (Fig. 2E) longitudinal, apex transverse, apical margin truncate; with dense short setae along apical margin; spiculum extremely slender. Receptacle of spermatheca (Fig. 2G) strongly swollen; pump short but strongly curved; proximal spermathecal duct wide and deeply inserted into receptacle.

Variations. Kimoto (1965a) noted that specimens (Fig. 1F) collected from Hokkaido and Northeast Honshu possess coarser punctures on the pronotum and elytra, and reticulate microsculpture on the pronotum, and treated them as *G. bifasciata* and *G. consociata*. Some individuals from North China possess the well-developed yellowish brown stripes on the elytra with several black spots (Fig. 1E). By contrast, some specimens from Taiwan have the yellowish brown stripes completely reduced (Fig. 1D) and were identified as *G. nigrita*.

Host plants. Polygonaceae: *Fallopia multiflora* var. *hypoleucum* (Ohwi) Yonek. et H. Ohashi (present study); *F. sachaliensis* (F. Schmidt) Ronse Decr. (=*Polygonum sachaliense* and *Reynoutria sachalinensis*) (Chûjô and Kimoto 1961); *Persicaria perfoliata* (L.) H. Gross (Lee and Cho 2006)*; Polygonum cuspidatum* Sieb. & Zucc. (= *Reynoutria japonica* and *Fallopia japonica*) (Chûjô and Kimoto 1961); *Rheum undulatum* Linn. (Lee and Cho 2006); *Rumex acetosa* Linn.; *Ru. japonicus* Houtt. (Chûjô and Kimoto 1961); *Ru. aquaticus* Linn.; *Ru. crispus* Linn. (Lee and Cho 2006). Its host specificity was examined by Wang et al. (2008). Adults strongly preferred *Fallopia japonica* (=*Polygonum cuspidatum*), *Persicaria perfoliata,* and *Polygonum multiflorum* (=*Fallopia multiflora*).

Biology. *Gallerucida bifasciata* populations are presumably multivoltine. The following life cycle information is based on our (TCRT) observations (Lee and Cheng

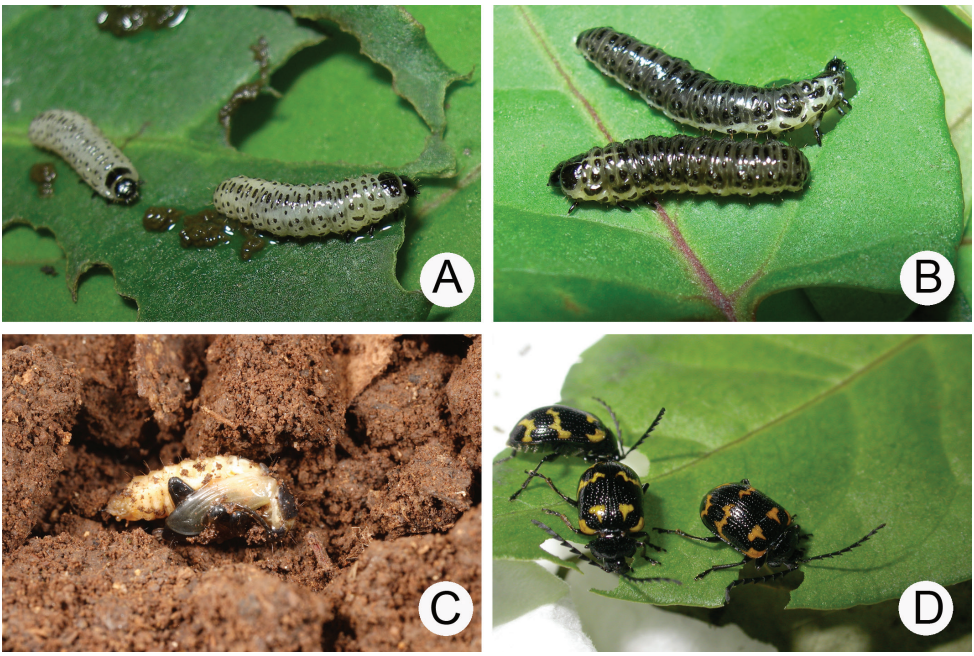


Figures 2. Diagnostic characters of *Gallerucida bifasciata* Motschulsky. **A** Antenna, male **B** Antenna, female **C** Penis, dorsal view **D** Penis, lateral view **E** Abdominal ventrite VIII **F** Gonocoxae **G** Spermatheca **H** Endophallic sclerites.

2007). Females began to deposit an average of 20 eggs in single egg masses during mid-January. Eggs hatched in 11–14 days. The larvae (Fig. 3A) fed on leaves and the larval duration was 14–15 days. Mature larvae (Fig. 3B) burrowed into the soil and

built underground chambers for pupation. Duration of the pupal stage (Fig. 3C) was 14–19 days. Newly emerged adults appeared during spring and were active (Fig. 3D) during summer and autumn.

Other material examined. CHINA. Anhui: 2♂♂, 1♀ (NHMB), Dabieshan [大別山], 21-24.VI.1998, leg. Bolm; Fujian: 1♀ (BMNH), Wuyishan [武夷山], Jianyang [建陽], 27.III.1980, leg. S. Q. Jiang; 2♂♂ (BPBM), Shui-Pei-Kai, Shaowu, 26.III.1942, leg. T. C. Maa; Guanxi: 1♂ (TARI), Dayaoshan [大瑤山], 14.V.2016; Hebei: 2♂♂, 3♀♀ (NHMB), Wudanshan [武當山], 5-7.VII.1998, leg. Bolm; 1♂, 1♀ (JBCB), Xintai [邢台], Taihang mts. [太行山], Neiqiu [内丘], 8-11.VI.2004, leg. M. Knížek; 2♂♂ (JBCB), border between Hebei and Inner Mongolian, road Chengda-Chifeng, pass 1600 m, 1-2.VI.2000; Heilongjiang: 1♂ (BMNH), Erlungshan [二龍山], 29.V.1966, leg. P. M. Hammond; 1♀ (BMNH), Harbin [哈爾濱], 29.VI.1952; Hubei: 1♀ (BMNH), Ichang [= Yichang, 宜昌], B.M. 1922-212, leg. C. T. Bowring; 1♂ (BPBM), Trail between Mo-Tai-Chi and Sang-Hou-Ken, 19.VII.1948, leg. Gressitt & Djou; Jiangsu: 1♂ (BMNH), Nanjing [南京], 1935, coll. IZAS; Shaanxi: 1♂ (BPBM), Mts. Chin-Ling [秦嶺山], IV.-V.1904; 1♀ (BMNH), Cuihuashan [翠華山], 19.IX.1980, leg. P. M. Hammond; 1♂ (BMNH), Huashan [華山], 30.VII.1966, leg. P. M. Hammond; 3♂♂, 1♀ (JBCB), same locality, 17-22.VI.1991, leg. Z. Kejval; Sichuan: 2♂♂ (TARI), Bayueshan [巴岳山], 21.IV.2013; 1♂ (TARI), Fenghuang [鳳凰鎮], 30.III.2013; 1♂ (NHMB), Guanxian [灌縣], 27.VI.1990, leg. L. & M. Bocák; Zhejiang: 1♂ (BPBM), Hangchow [=Hangzhou, 杭州], 11.VI.1924, leg. J. F. Illingworth; 1♀ (BMNH), same locality, 8.IV.1930, leg. P. H. Tsai; **JAPAN.** Hokkaido: 3♂♂, 1♀ (JBCB), Sapporo, Oshoro, 15.VI.1997, leg. V. Košťál; Honshu: 2♀♀ (JBCB), Aomori, Fukaura, 11-13.VI.1999, leg. M. Hayashi; 1♂ (BMNH), Fukushima, 26-29.VII.1881, coll. G. Lewis; 1♂, 1♀ (NHMB), Mt. Fuji, 200 m, 4-13.VIII.1985, leg. G. J. Minet; 1♂ (NMNS), Gifu, Kamagatani, 7.VII.1946, leg. T. Takahashi; 1♀ (NMNS), Gifu, Suhara, 3.VI.1956, leg. K. Ohbayashi; 1♀ (NMNS), same but with "26.V.1957"; 16♂♂, 2♀♀ (NMNS), Hyogo, Mt. Oginosen, 4.V.1964, leg. M. H. Chûjô; 27♂♂, 2♀♀ (NMNS), same locality, 1-5.V.1965, leg. Y. Ohira; 1♂, 1♀ (BMNH), Kyoto, Kibune, V.1951, leg. A. Nobuchi; 3♂♂ (BMNH), Nikko, 3-21.VI.1880, coll. G. Lewis; 2♂♂, 1♀ (BMNH), Nikko dist., Kozawa, 15.VIII.1980, leg. P. M. Hammond; Kyushu: 1♂ (TARI), Fukuoka, Mt. Inunaki, 5.V.1939, leg. S. Nisiguti; 2♀♀ (TARI), same but with "19.V.1940"; 1♀ (TARI), same but with "26.V.1940"; 1♂ (BMNH), Nagasaki, coll. G. Lewis, 1910—320; **SOUTH KOREA**. 2♀♀ (JBCB), Chungcheongbuk-do, Daegang-myeon, Danyang-gun, 12.VI.2008, leg. J. M. Kwon; 1♂ (JBCB), Gyeongsangbuk-do, Cheongsong-gun, Hyeonseo-myeon, Sachon-ri, 5.VI.2010, leg. H. W. Cho; 1♂ (NHMB), Kyongju National Park, VIII.1979, leg. G. M. Récolt; **RUSSIA**. 2♂♂, 1♀ (JBCB), Primorskij kraj, Arsenev, VI.1991, leg. Štrba; 1♂ (JBCB), Primor'ye, Lazo, VII.1990, leg. S. Pokorný; **TAIWAN**. Hsinchu: 5♀♀ (TARI), Kuanhsi [關西], 9.II.2007, leg. H.-H. Han; Hualien: 3♂♂, 2♀♀ (TARI), Fuli [富里] – Tungho [東河] (in Taitung), 9-11.XI.1982, leg. K. C. Chou & S. P. Huang; Kaoshiang: 1♀ (TARI), Hsiaokuanshan [小關山], 15.V.2016, leg. B.-X. Guo; 1♀ (TARI), Shanping [扇平], 7.VI.2014, leg. W.-C. Liao; 1♀ (TARI), Taoyuan [桃源], 15.IV.2013, leg. L.-P. Hsu;



Figures 3. Field photographs of *Gallerucida bifasciata* Motschulsky. **A** Early instar larvae **B** Mature larvae **C** Pupa **D** Adults.

1♂ (NMNS), Tengchih [藤枝], 22.VIII.1996, leg. M.-L. Chan; 2♂♂ (TARI), same locality 28.III.2015, leg. W.-C. Liao; 1♂ (TARI), Tona trail [多納林道], 20.III.2010, leg. U. Ong; Miaoli: 1♀ (NMNS), Hsueshanken [雪山坑], 16-17.III.1995, leg. W. T. Yang; Nantou: 1♀ (NMNS), Howangshan [合望山], 1997, leg. C. C. Lo; 1♀ (NMNS), Huisun Forest Rec. Area [惠蓀林場], 22.V.1997, leg. C.W. & L.B. O'Brien; 2♀♀ (NMNS), Lushan [盧山], 18.V.1997, leg. C. W. & L. B. O'Brien; 1♂ (NMNS), Meifeng [梅峰], 9-10.II.1999, leg. C. S. Lin & W. T. Yang; 2♂♂ (NMNS), Meihsi [眉溪], 16.VI.1965, leg. B. S. Chang; 8♂♂, 4♀♀ (NMNS), Nanshanhsi [南山溪], 21.V.-17.VI.1965, leg. B. S. Chang; 1♂ (NMNS), same locality 11.II.1999, leg. C.-S. Lin; 1♀ (TARI), same locality, 7.IV.2010, leg. Y.-T. Wang; 1♀ (NMNS), Penpuhsi [本部溪], 29.V.1965, leg. B. S. Chang; 2♀♀ (NMNS), same but with "17.V.1970"; 1♀ (NMNS), Shihtzutou [獅子頭], 21.II.1998, leg. C.-C. Lo; 1♂ (TARI), Tungpu [東埔], 19-23. VII.1982, leg. L. Y. Chou & T. Lin; 1♂ (TARI), same locality, 10-14.I.1983, leg. K. C. Chou & S. P. Huang; 4♂♂ (BMNH), Musha [=Wushe, 霧社], 18.V.-15.VI.1919, leg. T. Okuni, J. Sonan, K. Miy., M. Yosh.; 1♂ (TARI), same locality, 19-22.IV.1983, leg. K. C. Chou & S. P. Huang; 1♂, 1♀ (TARI), Yuanfeng [鳶峰], 2.VI.2012, leg. J.-F. Tsai; Pingtung: 1♂ (TARI), Ali [阿禮], 17.II.2016, leg. Y.-T. Chung; 1♂ (TARI), Peitawushan [北大武山], 17.II.2010, leg. S.-F. Yu; 1♂ (TARI), Tahanshan [大漢山], 16.IV.2007, leg. Y.-L. Lin; 1♂ (TARI), same locality, 21.V.2007, leg. Y.-L. Lin; 10♂♂, 2♀♀ (TARI), same locality, 18.VII.2007, leg. C.-F. Lee; 1♂ (TARI), Wutain [霧台], 11.IV.2007, leg. Y.-L. Lin; 1♀ (TARI), same locality, 12.V.2009, leg. U. Ong; Taichung: 2♂♂ (TARI),

Kukuan [谷關], 20-22.VI.1978, leg. K. S. Lin & K. C. Chou; Tainan: 1♂ (TARI), Meiling [梅嶺], 4.VI.2010, leg. U. Ong; 1♀ (TARI), same locality, 6.VII.2012, leg. Y.-L. Lin; Taipei: 2♂♂, 2♀♀, Wulai [烏來], 23.I.2008, leg. S.-F. Yu; Taitung: 1♂ (TARI), Chipen [知本], 15-17.II.1981, leg. L. Y. Chou & T. Lin; 1♂ (TARI), Tulanshan [都蘭山], 4.VII.2016, leg. S.-P. Wu; 1♀ (TARI), Yanping trail [延平林道], 5.III.2016, leg. S.-P. Wu; Taoyuan: 1♀ (NMNS), Junghua [榮華], 15.V.1971, leg. B. S. Chang; 2♀♀ (TARI), Paling [巴陵], 3-5.V.1983, leg. K. C. Chou & C. C. Pan.

Distribution. China, Japan, Korea, Russia, Taiwan.

Gallerucida flaviventris (Baly)

Figs 4A–C, 5

Eustetha flaviventris Baly, 1861: 296.
Galerucida [sic!] (*Eusthetha*) *flaviventris*: Weise 1924: 142 (catalogue).
Galerucida [sic!] *flaviventris*: Ogloblin 1936: 365 (redescription).
Gallerucida flaviventris: Gressitt and Kimoto 1963: 723 (China: Anhui, Jiangsu, Jiangxi, Sichuan, Zhejiang); Kimoto 1969: 68 (Taiwan); Wilcox 1971: 203 (catalogue); Kimoto 1989: 260 (Taiwan); Kimoto 1991: 17 (Taiwan); Kimoto and Chu 1996: 91 (catalogue); Kimoto and Takizawa 1997: 392 (catalogue); Beenen 2010: 459 (catalogue); Yang et al. 2015: 172 (catalogue); Lee et al. 2016: 96 (biology).
Sphenoraia chujoi Lee, 2014: 143. **syn. n.**

Type material. *Eustetha flaviventris*. Lectotype ♀ (BMNH), here designated, labeled: "Type [p, w, circular label with red border] // Baly Coll. [p, w] // Eustetha / flaviventris / Baly / N. China [h, g]". Number of paralectotypes is uncertain.

Sphenoraia chujoi. Holotype ♂ (TARI): "Sôzan [h] [= Yangmingshan, 陽明山] / FORMOSA [p] / 25.X.1936 [h] / COL. M. CHUJO[p, w] // **Holotypus** / *Sphenoraia chujoi* / Lee, sp. nov. / det. C.-F. Lee, 2014 [p, r]". Paratypes: 3♀♀ (TARI): "Sôzan [h] / FORMOSA [p] / 25.X.1936 [h] / COL. M. CHUJO[p, w] // **Paratypus** / *Sphenoraia chujoi* / Lee, sp. nov. / det. C.-F. Lee, 2014 [p, pink label]"

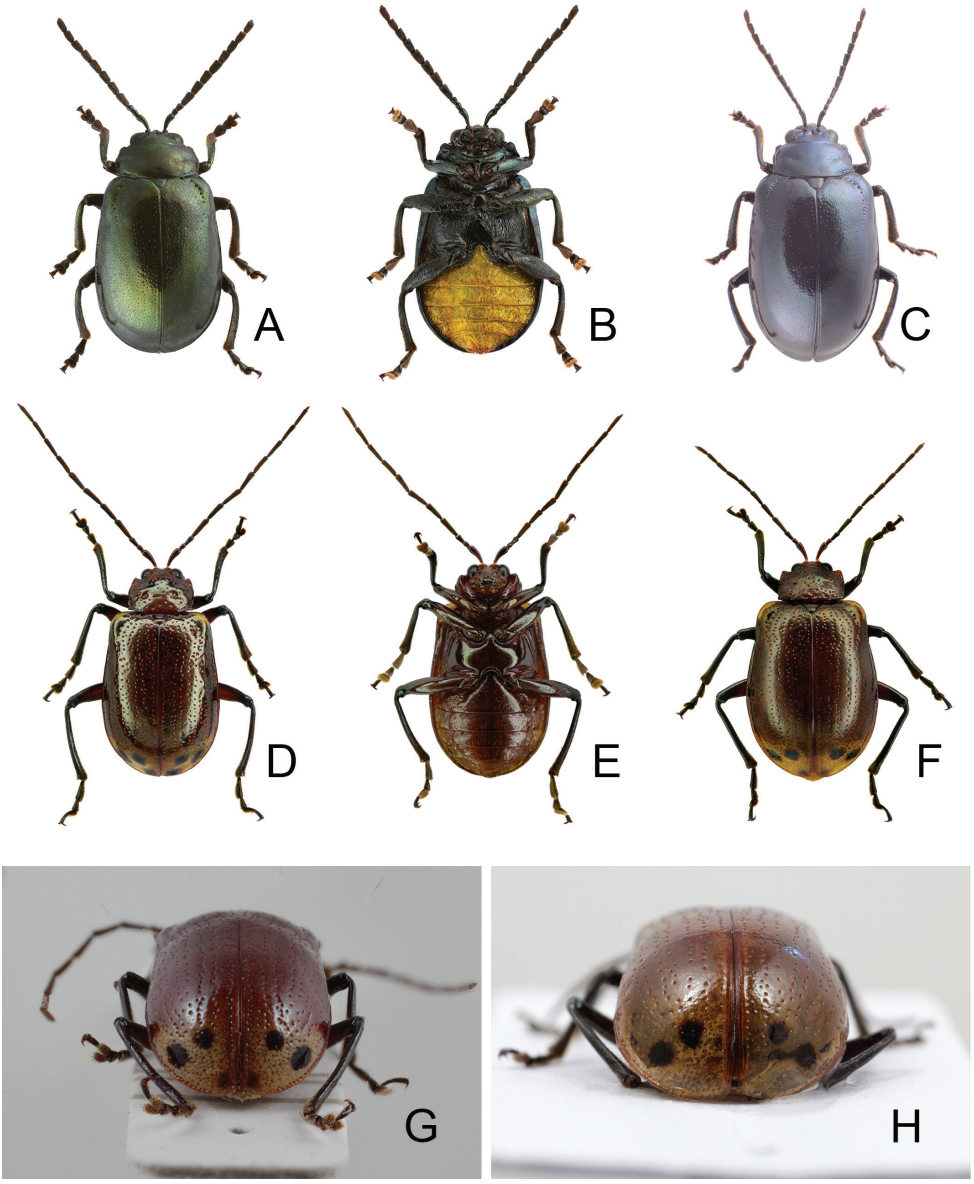
Diagnosis. *Gallerucida flaviventris* adults are similar to those of *G. shirozui* Chûjô and *G. thoracica* Jacoby in possessing metallic elytra, but are easily recognized by their metallic pronota (yellow brown pronota with black spots in other species).

Redescription. See description of *Sphenoraia chujoi* Lee (2014).

Variation. Specimens from China are uniformly metallic blue (Fig. 4C) but those from Taiwan are metallic green, bronze, or purple (Figs 4A, B, 5E, F).

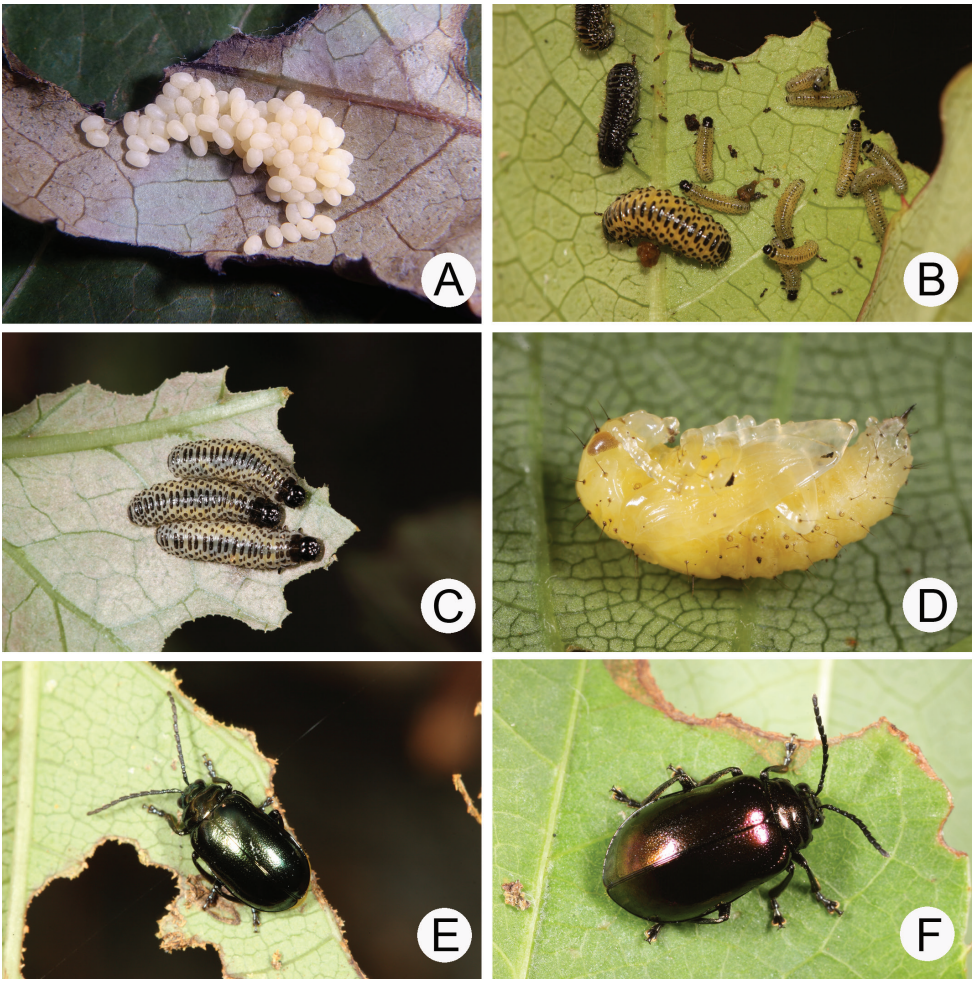
Host plants. Polygonaceae: *Polygonatum odoratum* Docuce var. *pluriflorum* Ohwi (Yu et al. 1996); Vitaceae: *Cayratia* sp. (Yu et al. 1996); *Parthenocissus tricuspidata* (Sieb. & Zucc.) Planch. (Lee et al. 2016).

Biology. *Gallerucida flaviventris* populations are presumably univoltine. The following life cycle information is based on our (TCRT) observations (Lee et al. 2016). Females began to deposit an average of 80 eggs in single egg mass (Fig. 5A) during late March.



Figures 4. Habitus of *Gallerucida* species. **A** *G. flaviventris* (Baly), male from Taiwan, dorsal view **B** Ditto, ventral view **C** *G. flaviventris* (Baly), female from China, dorsal view **D** *G. singularis* Harold, male, dorsal view **E** Ditto, ventral view **F** *G. singularis* Harold, female, dorsal view **G** *G. singularis* Harold, posterior view **H** *G. gebieni* Weise, posterior view.

Eggs hatched in 11 days. The larvae (Fig. 5B) fed on leaves and the larval duration was 14 days. Mature larvae (Fig. 5C) burrowed into soil and built underground chambers for pupation. Duration of the pupal stage (Fig. 5D) was 15–18 days. Newly emerged adults appeared during spring and were active (Fig. 5E–5F) during summer and autumn.



Figures 5. Field photographs of *Gallerucida flaviventris* (Baly). **A** Egg mass **B** Early instar larvae **C** Mature larvae **D** Pupa **E** Adult, typical form **F** Adult, color variation.

Remarks. When Lee (2014) described *Sphenoraia chujoi*, the character of the metasternum was overlooked. This species is certainly attributed to *Gallerucida flaviventris*.

Other material examined. CHINA. Anhui: 1♂ (CAS), Tung-Lu, 30.III.1926, leg. D. E. Wright; Fujian: 3♂♂ (TARI), Jiuxianshan [九仙山], 22.VI.2014; 1♂, 2♀♀ (TARI), same locality, 14.VI.2015; Guanxi: 1♂ (TARI), Dayaoshan [大瑤山], 16.IV.2016; Hong Kong: 1♀ (BMNH); Sichuan: 1♂ (CAS), Chang-Tau-Ching, 18.VII.1948, leg. Gressitt & Djou; Zhejiang: 1♂ (BPBM), Hangchow [= Hangzhou, 杭州], 2.VII.1924, leg. J. F. Illingworth; 2♂♂ (1♂: BPBM; 1♂: KMNH), same but with "3.IV.1924; **TAIWAN**. Taipei: 1♂, 2♀♀ (TARI), Lengshuikeng [冷水坑], 4–5.VII.2009, leg. J.-C. Chen; 1♀ (TARI), Mientienshan [面天山], 22.X.2011, leg. M.-H. Tsou; 31 exs., (TARI), Neishuanghsi [內雙溪], reared from

eggs, 12-17.V.2010, leg. M.-H. Tsou; 3♂♂, 2♀♀ (TARI), Tatunhsi trail [大屯溪古道], 28.V.2013, leg. H. Lee; 1♀ (TARI), Tatunshan [大屯山], 26.V.2010, leg. S.-F. Yu; 1♂ (TARI), Tienhsiyuan [=天溪園], 8.V.2015, leg. H. Lee; 1♂ (TARI), Yangmingshan [陽明山], 6.X.2008, leg. J.-C. Chen; Taitung: 1♂, 3♀♀ (EUMJ), Luye (鹿野), 8.IV.2012, leg. Yamasako; Taoyuan: 1♂ (TARI), Hsuanhuan [萱源], 13.V.2010, leg. S.-F. Yu.

Distribution. China, Taiwan.

***Gallerucida gebieni* Weise**

Fig. 4H

Galerucida [sic!] *gebieni* Weise, 1922: 92; see Lee and Bezděk 2013: 367 for complete list.

Diagnosis. *Gallerucida gebieni* and *G. singularis* Harold adults are easily recognized by their reddish brown bodies and black spots behind humeral calli and elytral apices, but adults of *G. gebieni* possess only two black spots on the elytral apices (Fig. 4H) (three spots in *G. singularis* (Fig. 4G)).

Redescription. See Lee and Bezděk (2013).

Host plant. Polygonaceae: *Polygonum chinense* L. (Aston 2009).

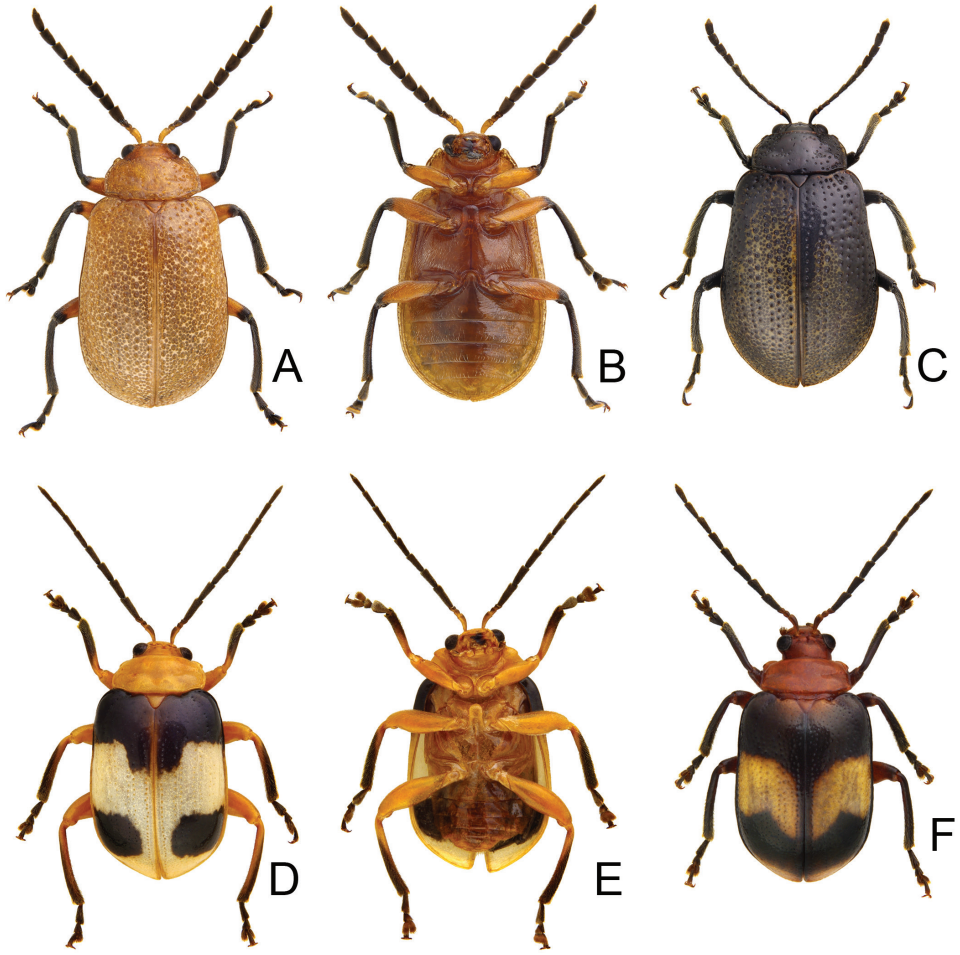
Distribution. China, Taiwan (only in Kinmen and Nankan islands).

***Gallerucida lutea* Gressitt & Kimoto**

Figs 6A–C, 7, 8

Gallerucida lutea Gressitt & Kimoto, 1963: 124 (China: Guangdong, Hubei); Kimoto 1969: 68 (Taiwan); Wilcox 1971: 204 (catalogue); Kimoto and Chu 1996: 92 (catalogue); Kimoto and Takizawa 1997: 392 (catalogue); Lee and An 2001: 127 (Korea); Beenen 2010: 459 (catalogue); Lee and Cheng 2010: 90 (biology); Yang et al. 2015: 173 (catalogue).

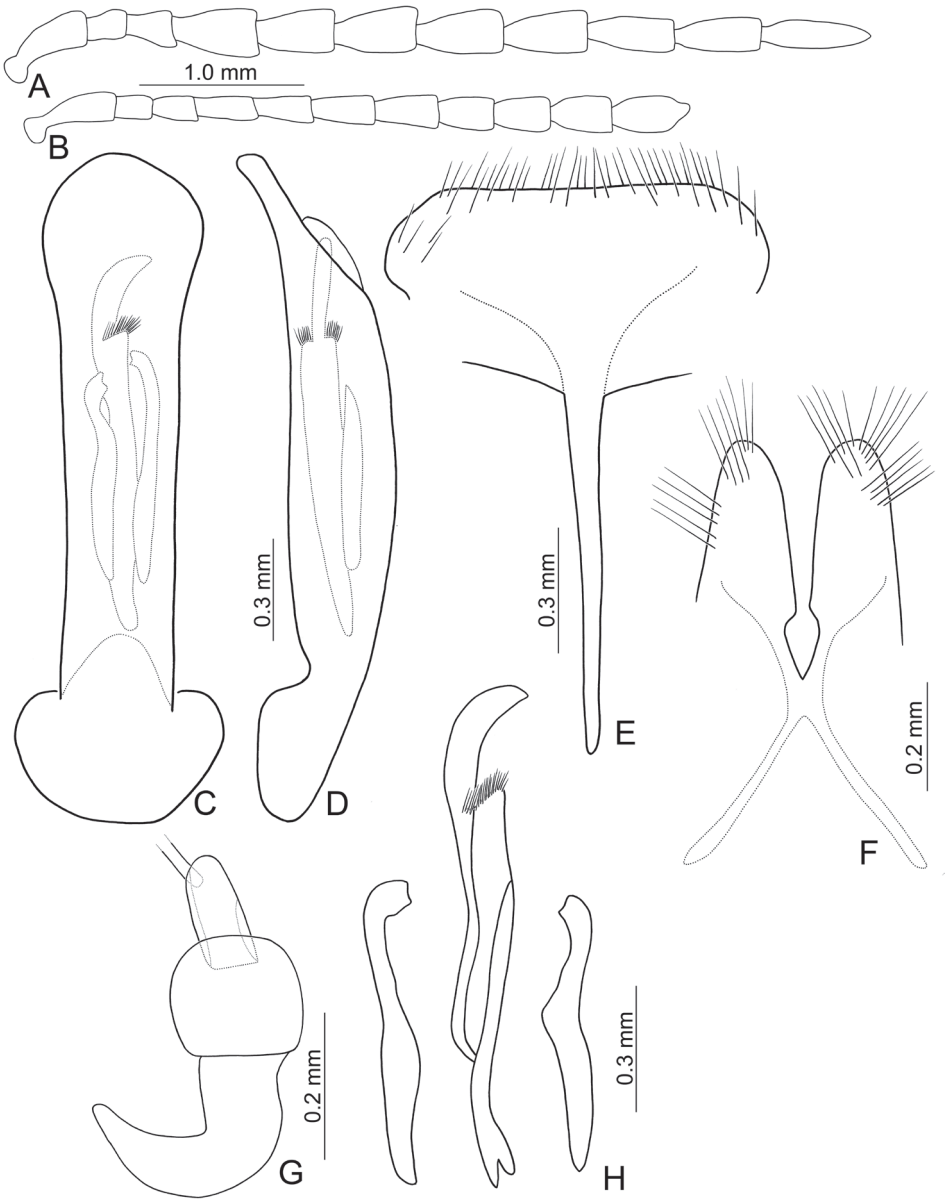
Type material. Holotype ♂ (CAS), labeled: "N. KWANGTUNG / China, Lochang, [p,w] // 1947 [h, w] // L. Gressitt / Collection [p, w] // HOLOTYPE [p] ♂ / Gallerucida / lutea [h] / Gressitt & Kimoto [p, r] // Gallerucida / lutea / Holo G & K [h] / J. L. Gressitt det. [p, w] // California Academy / of Sciences / Type / No. [p] 13271 [h, w]". Paratypes: 1♂ (BPBM): "N. KWANGTUNG / China, Lochang, [p,w] // 1947 [h, w] // L. Gressitt / Collection [p, w] // ALLOTYPE [p] / Gallerucida / lutea ♀ [h] / Gressitt & Kimoto [p, r] // 3321 [h, w] // Gallerucida / sp. nov. 6 / lutea. Allo [h] / Det. S. Kimoto [p] 61 [h, w]"; 1♀ (CAS), labeled: "Suisapa, 1000 M. / Lichuen Distr. / W. Hupeh, China / VII-30-48 [p, w] // Gressitt & / Djou Collrs. [p, w] // PARATYPE [p] / Gallerucida / lutea [h] / Gressitt & Kimoto [p, y] // Galerucida / s. p. lutea / (nr. sp.6) [h] / Det. Kimoto [p] '61 [h, w]".



Figures 6. Habitus of *Gallerucida* species. **A** *G. lutea* Gressitt & Kimoto, male, dorsal view **B** Ditto, ventral view **C** *G. lutea* Gressitt & Kimoto, female, color variation, dorsal view **D** *G. sauteri* Chûjô, male, dorsal view **E** Ditto, ventral view **F** *G. sauteri* Chûjô, male, color variation, dorsal view.

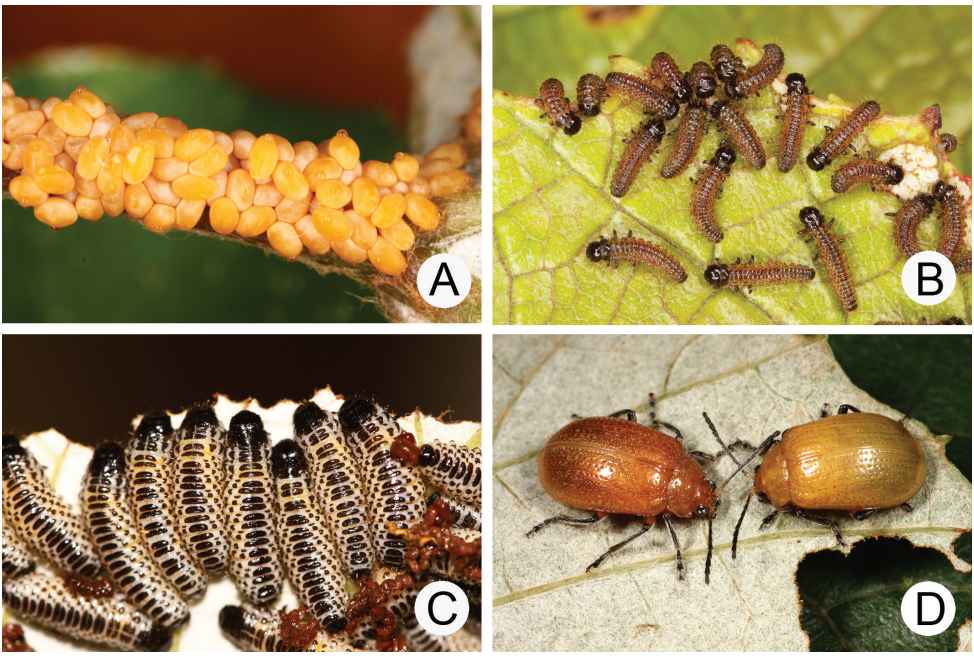
Diagnosis. *Gallerucida lutea* adults can be recognized by their yellowish brown bodies. Darker individuals of *G. lutea* may look like entirely black individuals of *G. bifasciata*, but the elytra of *G. lutea* possess extremely coarse punctures and minute punctures between coarse punctures and filiform antenna.

Redescription. Length 8.4–9.8 mm, width 4.7–5.9 mm. General color (Fig. 6A–B) yellowish or reddish brown; antenna black except three basal antennomeres; tibiae and tarsi entirely black. Antenna serrate in male (Fig. 7A), length ratios of antennomeres I–XI 1.0 : 0.4 : 0.6 : 0.9 : 0.8 : 0.9 : 0.9 : 0.9 : 0.9 : 0.9 : 1.2, length to width ratios of antennomeres I–IX 2.5 : 1.4 : 1.5 : 1.8 : 1.8 : 1.9 : 2.0 : 2.0 : 2.5 : 2.6 : 4.0; antennomeres IV-VII filiform and VIII-X serrate in female (Fig. 7B), length ratios of antennomeres I–XI 1.0 : 0.4 : 0.5 : 0.7 : 0.6 : 0.7 : 0.7 : 0.6 : 0.6 : 0.6 : 0.8, length to



Figures 7. Diagnostic characters of *Gallerucida lutea* Gressitt & Kimoto. **A** Antenna, male **B** Antenna, female **C** Penis, dorsal view **D** Penis, lateral view **E** Abdominal ventrite VIII **F** Gonocoxae **G** Spermatheca **H** Endophallic sclerites.

width ratios of antennomeres I–IX 3.1 : 1.5 : 2.0 : 2.6 : 2.2 : 2.1 : 1.8 : 1.6 : 1.6 : 1.7 : 2.2. Pronotum transverse, 1.9× wider than long, disc convex, with oblique depressions at sides, medially abbreviated, disc without microreticulation, with extremely coarse, sparse punctures; lateral margin slightly rounded; apical margin concave; basal margin



Figures 8. Field photographs of *Gallerucida lutea* Gressitt & Kimoto. **A** Egg mass **B** Early instar larvae **C** Mature larvae **D** Adults.

convex. Elytra parallel from base to basal 1/3, gradually widened towards basal 1/3, lateral margin serrate subapically; 1.4× longer than wide, disc without microreticulation but with extremely coarse punctures arranged into striae, with tiny punctures between strial punctures; dorso-ventrally flattened. Penis (Fig. 7C–D) elongate, 6.4× longer than wide; parallel-sided; abruptly widened from apical 1/3 to 1/6, apex circular; slightly curved at lateral view; ventral surface well sclerotized; endophallic sclerite complex (Fig. 7H) large, about 0.6× as long as penis, composed of one median sclerite and one pair of lateral sclerites, median sclerite longitudinal, strongly curved near apex, with lateral process at apical 1/4, with dense setae along apical margin of lateral process; lateral sclerites longitudinal but much shorter, about 0.5× as long as median one, curved near apex, apices truncate or concave. Gonocoxae (Fig. 7F) wide, connected from base to middle, apices rounded, with dense elongate setae. Ventrite VIII (Fig. 7E) longitudinal, apex transverse, apical margin truncate; with dense short setae along lateral and apical margin; spiculum slender. Receptacle of spermatheca (Fig. 7G) strongly swollen; pump short but strongly curved; proximal spermathecal duct wide and deeply inserted into receptacle.

Variation. Some individuals have black legs and bodies darker than usual (Fig. 6C).

Host plant. Vitaceae: *Vitis kelungensis* Moriyama (Lee and Cheng 2010).

Biology. *Gallerucida lutea* populations are presumably univoltine. The following life cycle information is based on our (TCRT) observations (Lee and Cheng 2010). Females began to deposit an average of 140 eggs in single egg masses (Fig. 8A) during April or May.

Eggs hatched in 9 days. The larvae (Fig. 8B) fed on leaves and the larval duration was 11 days. Mature larvae (Fig. 8C) burrowed into the soil and built underground chambers for pupation (fig. 33E). Duration of the pupal stage was 15–17 days. Newly emerged adults appeared during spring and were active (Fig. 8D) during summer and autumn.

Other material examined. CHINA. 3♂♂, 3♀♀ (BMNH); **TAIWAN**. Kaoshiang: 1♀ (TARI), Tona trail [多納林道], 3.XII.2012, leg. W.-C. Liao; 1♂ (TARI), same locality, 10.IX.2014, leg. B.-X. Guo; Keelung: 1♀ (TARI), Kangtzuliao [槓子寮], 28.IX.2011, leg. H. Lee; Taipei: 1♂ (TARI), Yangmingshan [陽明山], 15.III.1998, leg. C.-F. Lee; 7♂♂, 11♀♀ (TARI), same locality, reared from eggs, 6.VII.2008, leg. M.-H. Tsou; 11♂♂, 10♀♀ (TARI), same locality, reared from eggs, 26.V.2009, leg. M.-H. Tsou; 1♂ (TARI), Yulu trail [魚路古道], 6.VII.2008, leg. M.-H. Tsou; 1♀ (TARI), same but with "3.V.2009".

Distribution. China, Korea, Taiwan.

Gallerucida sauteri Chûjô

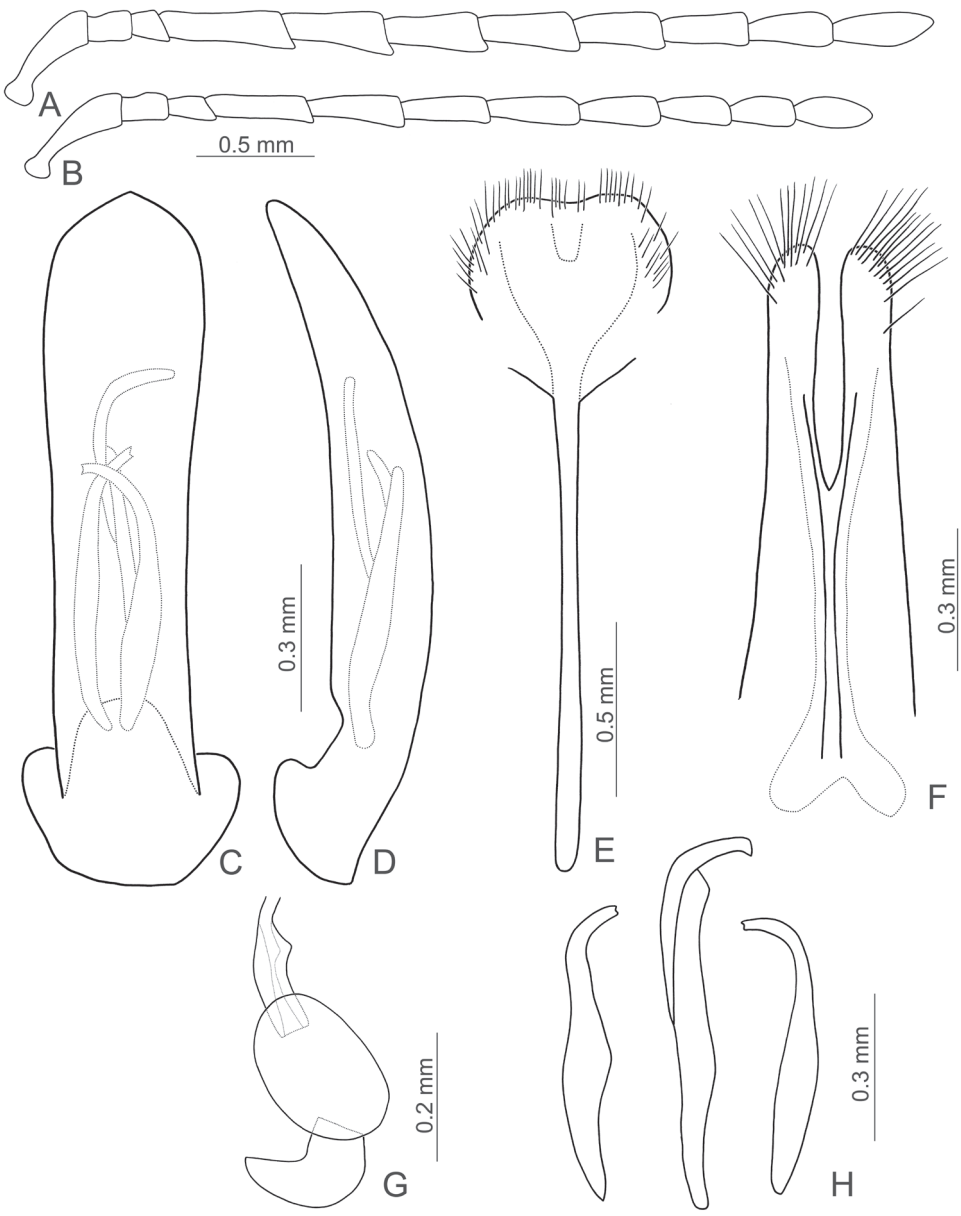
Figs 6D–F, 9–11

Gallerucida sauteri Chûjô, 1938: 141; Chûjô 1962: 152 (redescription); Kimoto 1966: 35 (Taiwan); Wilcox 1971: 206 (catalogue); Kimoto and Chu 1996: 92 (catalogue); Kimoto and Takizawa 1997: 392 (catalogue); Beenen 2010: 460 (catalogue); Lee and Cheng 2010, 92 (biology); Yang et al. 2015: 176 (catalogue).

Gallerucida quadraticollis Takizawa, 1978: 127; Kimoto and Chu 1996: 92 (as synonym of *G. sauteri*, synonym confirmed).

Type material. *Gallerucida sauteri*. Lectotype ♂ (TARI), here designated, labeled: "Kankau (Koshun [= Henchu, 恆春]) / Formosa / H. Sauter V. 1912 [p, w] // CO / Type [p, w, yellow letters, circular label with yellow border] // Galerucida / sauteri / Chûjô [h] / M. CHUJO [p, g] // 1936 [p, w]". Paralectotypes. 1♂ (TARI), same as lectotype but with "1368"; 1♂ (SDEI): "Kankau (Koshun) / Formosa / H. Sauter V. 1912 [p, w] // Syntypus [p, r] // Galerucida / sauteri / Chûjô [h] / M. CHUJO [p, g] // DEI Müncheberg / Col-09173 [p, g]"; 1♂ (SDEI): "VIII [h] Koshun / Formosa / H. Sauter [p] 18 [h, w] // Syntypus [p, r] // Galerucida / sauteri / Chûjô [h] / M. CHUJO [p, g] // DEI Müncheberg / Col-09172[p, g]"; 1♀ (TARI): "Formosa. / Taito [= Taitung, 台東], 1919. / II 25-III 27. / S. Inamura [p, w] // CO / Type [p, w, yellow letters, circular label with yellow border] // Galerucida / sauteri / Chûjô [h] / M. CHUJO [p, g]"; 1♀ (TARI): "CHIPON [h] [= Chihpen, 知本] / FORMOSA [p] / 25.III.1935 [h] / COL. M. CHUJO [p, w] // CO / Type [p, w, yellow letters, circular label with yellow border] // Galerucida / sauteri / Chûjô [h] / M. CHUJO [p, g] // No. 1358 [p, w]".

Gallerucida quadraticollis. Holotype ♂ (EIHU): "Tungpu [東埔] / Chiayi Taiwan / 14-17.VII.1976 / H. Takizawa [p, w] // Holo [h] type [p] / Gallerucida / quadraticollis / Takizawa [h, r] // HOLOTYPE / Appended label by ÔHARA, IMRAI, KANBE



Figures 9. Diagnostic characters of *Gallerucida sauteri* Chûjô. **A** Antenna, male **B** Antenna, female **C** Penis, dorsal view **D** Penis, lateral view **E** Abdominal ventrite VIII **F** Gonocoxae **G** Spermatheca **H** Endophallic sclerites.

/ SUZUKI and HIRONAGA / 2007 [p, w, with red band along right margin] // 0000003056 / Sys. Ent / Hokkaido Univ. / Japan [SEHU] [p, w]".

Diagnosis. *Gallerucida sauteri* adults may be recognized by the white elytra possessing black transverse stripes.

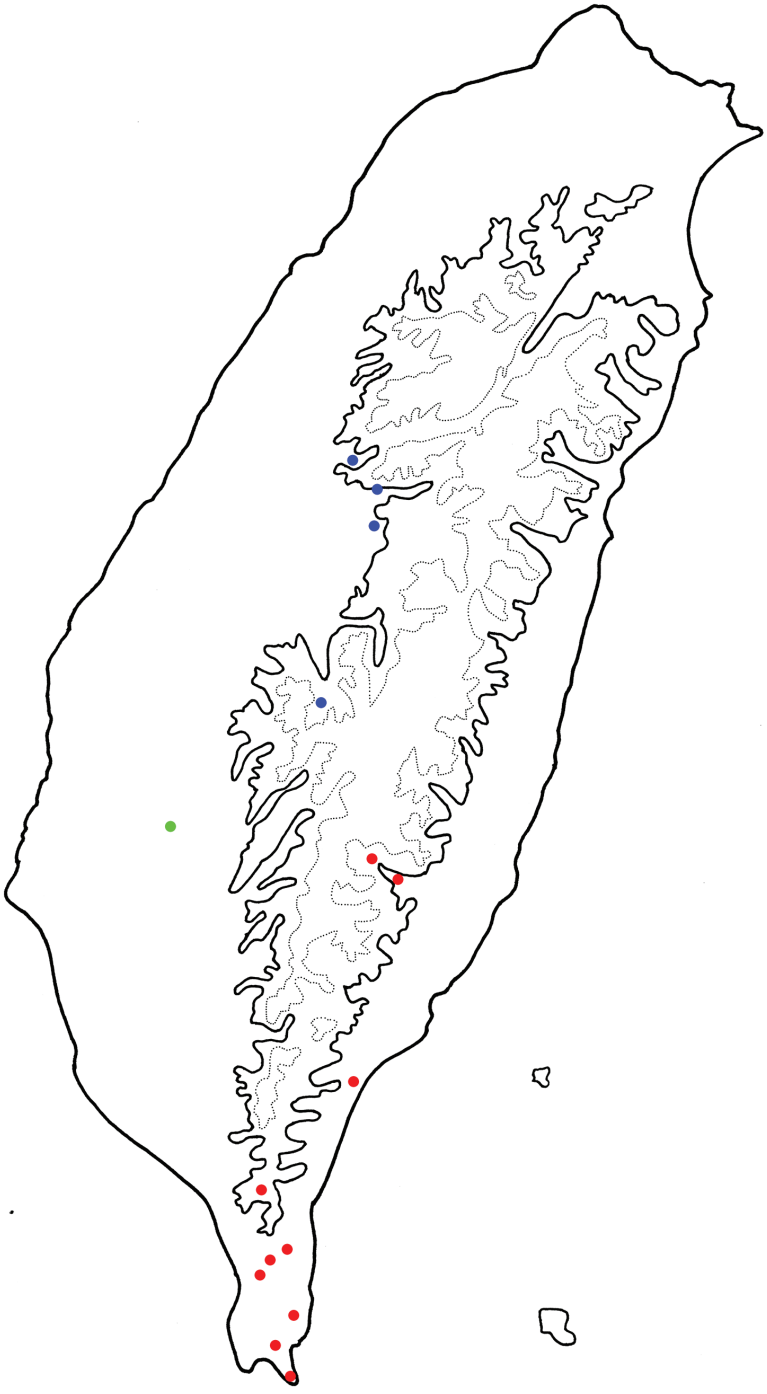


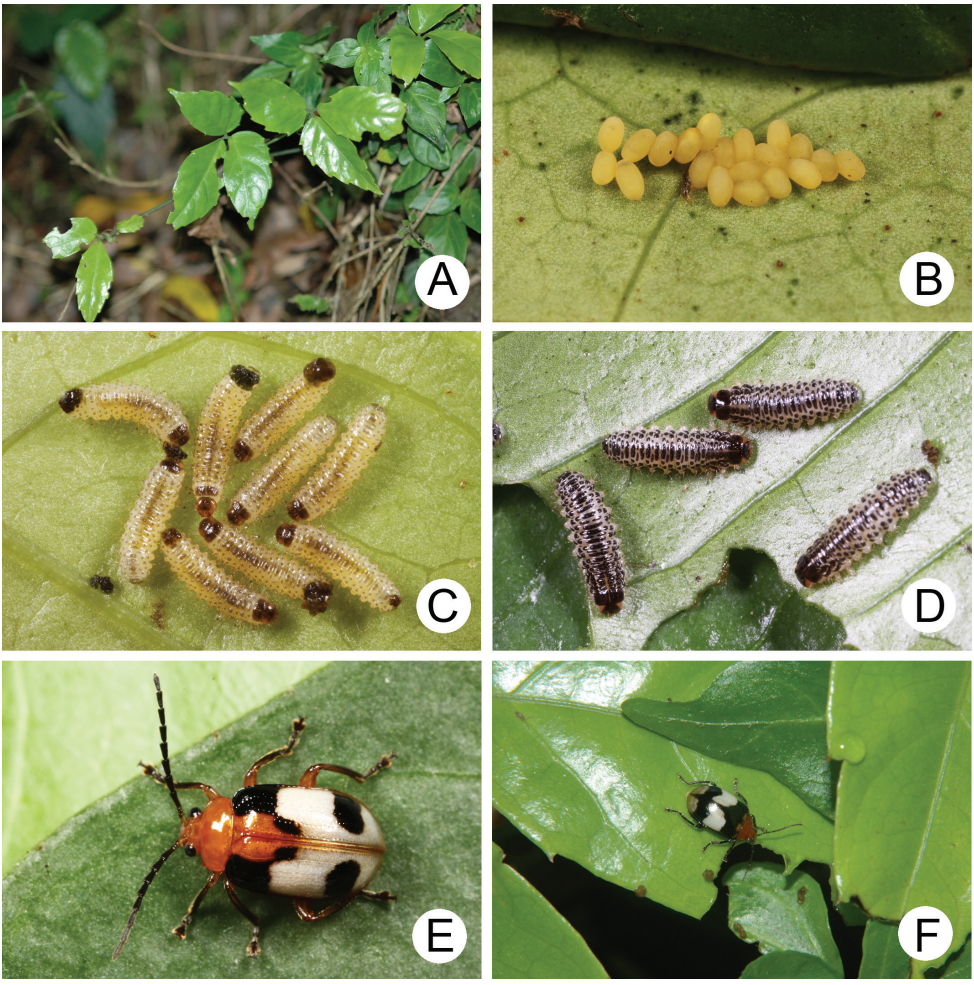
Figure 10. Distribution map of *Gallerucida sauteri* Chûjô, solid line: 1000 m, broken line: 2000m. **Red dots** Typical form **Blue dots** Color variation as *G. quadraticollis* **Green dot** Intermediate form.

Redescription. Length 5.8–7.8 mm, width 3.3–4.3 mm. General color (Fig. 6D–E) yellowish brown; antenna black except three basal antennomeres; elytra pale yellow or white, with wide transverse black band from base to basal 1/4, extending posterior at middle and truncate; sometimes median area of base reddish brown (Fig. 11E), with one pair of transverse black bands at apical 1/3, interrupted by suture; legs yellow but tibiae and tarsi partly or entirely dark brown to black. Antenna slightly serrate in male (Fig. 9A), length ratios of antennomeres I–XI 1.0 : 0.4 : 0.3 : 1.2 : 1.0 : 1.0 : 0.9 : 0.8 : 0.8 : 0.8 : 1.0, length to width ratios of antennomeres I–IX 3.2 : 1.4 : 1.2 : 3.5 : 2.4 : 2.6 : 2.5 : 2.2 : 2.5 : 2.5 : 3.3; filiform and shorter in female (Fig. 9B), length ratios of antennomeres I–XI 1.0 : 0.4 : 0.4 : 0.9 : 0.8 : 0.8 : 0.8 : 0.7 : 0.6 : 0.6 : 0.7, length to width ratios of antennomeres I–IX 3.3 : 1.6 : 2.1 : 3.1 : 3.2 : 3.1 : 3.2 : 2.8 : 2.6 : 2.3 : 2.6. Pronotum transverse, 2.1× wider than long, disc convex, with oblique depressions at sides, medially abbreviated, disc with micro-reticulation but lacking punctures; lateral margin straight or slightly rounded; apical margin concave; basal margin convex. Elytra parallel from base to basal 1/3, gradually widened towards basal 1/3; 1.4× longer than wide, disc without micro-reticulation but with coarse punctures; dorso-ventrally flattened. Penis (Fig. 9C–D) elongate, 5.2× longer than wide; parallel-sided; apex widely lanceolate; curved at lateral view; ventral surface well sclerotized; endophallic sclerite complex (Fig. 9H) large, about 0.5× as long as penis, composed of one median sclerite and one pair of lateral sclerites, median sclerite longitudinal, strongly curved near apex, lateral sclerites longitudinal but slightly shorter, about 0.8× as long as median sclerite, strongly and apically curved, apices truncate or concave. Gonocoxae (Fig. 9F) elongate, connected from near base to basal 3/5, apices rounded, with dense long setae; base wide. Ventrite VIII (Fig. 9E) longitudinal, apical margin truncate but medially depressed; with dense short setae along lateral and apical margin; spiculum extremely slender. Receptacle of spermatheca (Fig. 9G) strongly swollen; pump short but strongly curved; proximal spermathecal duct slender and deeply inserted into receptacle.

Variation. The typical adult color pattern occurs in southern Taiwan (Fig. 10). Populations in central Taiwan have a black band at the elytral base extending posterior and acute apically; black spots at apices well developed, widened and connected with each other. The latter forms were described as *G. quadraticollis* by Takizawa (1978) (Figs 6F, 11F). Intermediate individuals were collected from Meiling [梅嶺] having anterior spots at the elytra similar to the typical form but posterior ones similar those of *G. quadraticollis*.

Host plants. Vitaceae: *Tetrastigma formosanum* (Hemsl.) Gagnep (Fig. 11A) (Lee and Cheng 2010).

Biology. *Gallerucida sauteri* populations are presumably multivoltine. The following life cycle information is based on our (TCRT) observations (Lee and Cheng 2010). Females began to deposit an average of 20 eggs in single egg masses (Fig. 11B) during late March. Eggs hatched in seven days. The larvae (Fig. 11C) fed on leaves and the larval duration was 13 days. Mature larvae (Fig. 11D) burrowed into soil and built underground chambers for pupation. Duration of the pupal stage was 10–11 days.



Figures 11. Field photographs of *Gallerucida sauteri* Chûjô. **A** Host plant: *Tetrastigma formosanum* **B** Egg mass **C** Early instar larvae **D** Mature larvae **E** Adult, typical form **F** Adult, color variation.

Newly emerged adults appeared during spring and were active (Fig. 11E, 11F) during summer and autumn.

Other material examined. TAIWAN. Nantou: 1♀ (NMNS), Lienhuachih [蓮華池], 9.IV.-2.V.2001, leg. C, S, Lin & W. T. Yang; 1♀ (NMNS), same but with "12.VI.-19.VII.2001"; 1♀ (NMNS), same but with "17.X.-14.XI.2001"; 1♀ (NMNS), same but with "1.VIII.-7.IX.2005"; 1♂ (TARI), Tungpu [東埔], 23-27.VII.1984, leg. K. C. Chou & C. H. Yang; Pingtung: 1♀ (TARI), Lilungshan [里龍山], 5.XI.2009, leg. M.-H. Tsou; 1♀ (TARI), Nanjenshan [南仁山], 1.III.2010, leg. J.-L. Jeng; 1♀ (TARI), Ouluanpi [鵝鑾鼻], 24.II.1982, leg. T. Lin & S. C. Lin; 2♂♂, 1♀ (TARI), Sheting [社頂], 15.VIII.2009, leg. M.-H. Tsou; 1♂ (TARI), same locality, 17.VIII.2010, leg. J.-C. Chen; 1♀ (TARI), Shouka [壽卡], 23.II.2013, leg. W.-C. Liao; 1♂, 3♀♀

(TARI), Tahanshan [大漢山], 20.VII.2007, leg. S.-F. Yu; 3♂♂, 3♀♀ (TARI), same but with "leg. C.-F. Lee"; 2♂♂ (TARI), same locality, 15.XII.2015, leg. W.-C. Liao; Taichung: 1♂ (TARI), Wushihkeng [烏石坑], 13.VII.2008, leg. C.-F. Lee; 98 exs. (TARI), same locality, 15-19.V.2013, leg. C.-F. Lee; Tainan: 3♂♂ (TARI), Meiling [梅嶺], 12.III.2011, leg. M. L. Jeng; Taitung: 2♂♂ (TARI), Chinlun trail [金崙林道], 11.I.2016, leg. J.-C. Chen; 1♂ (TARI), Liyuan [栗園], 19.VI.2013, leg. B.-X. Guo; 1♀ (TARI), Tienlung trail [天龍古道], 20.III.2015, leg. J.-C. Chen.

Distribution. Endemic to Taiwan.

Gallerucida shirozui Kimoto

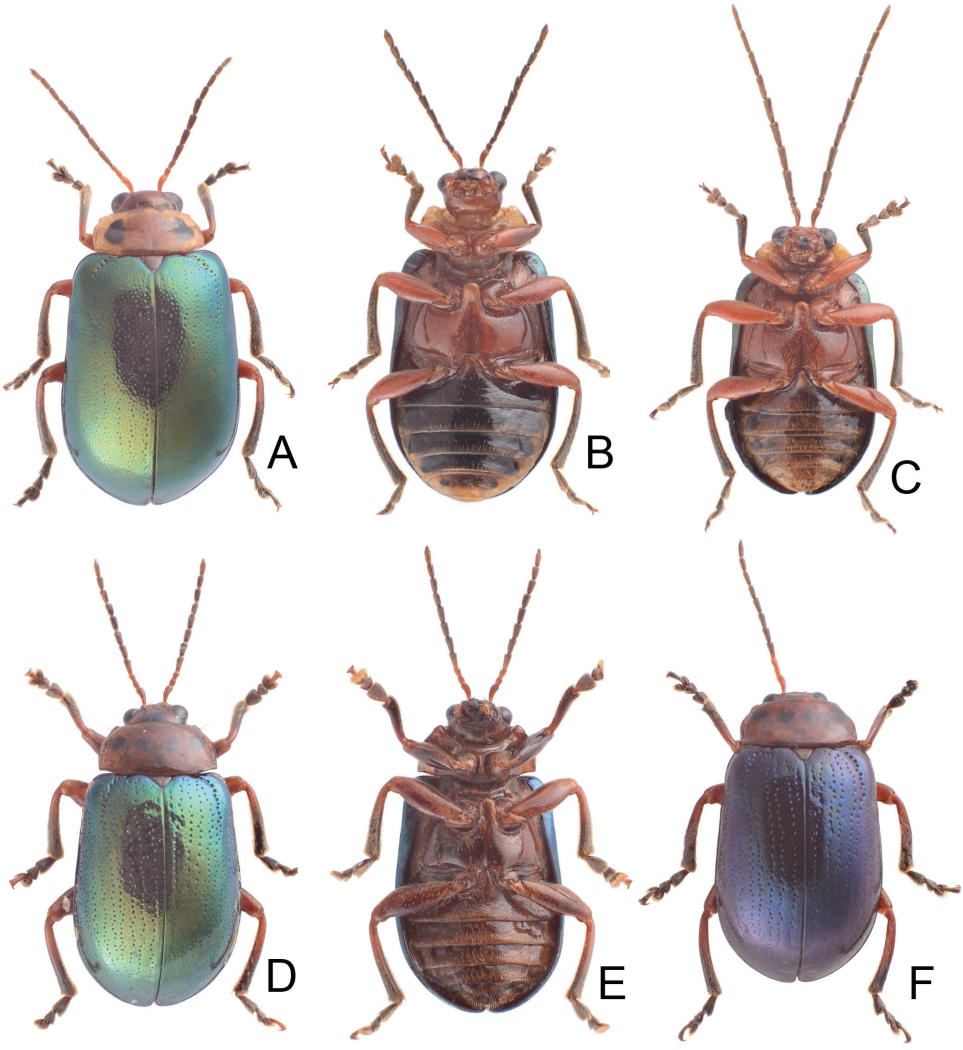
Figs 12A–C, 13

Gallerucida shirozui Kimoto, 1969: 67 (Taiwan); Wilcox 1971: 206 (catalogue); Kimoto and Chu 1996: 92 (catalogue); Kimoto and Takizawa 1997: 392 (catalogue); Beenen 2010: 460 (catalogue); Yang et al. 2015: 176 (catalogue).

Type material. Holotype ♂ (KUEC): "(Taiwan) / Sungkang / Nantou Hsien [p, w] // 1.VI. [h] 1965 / T. Shirôzu [p, w] // Gallerucida / shirozui / Kimoto, n. sp. [h, w] // HOLOTYPE [p, r]".

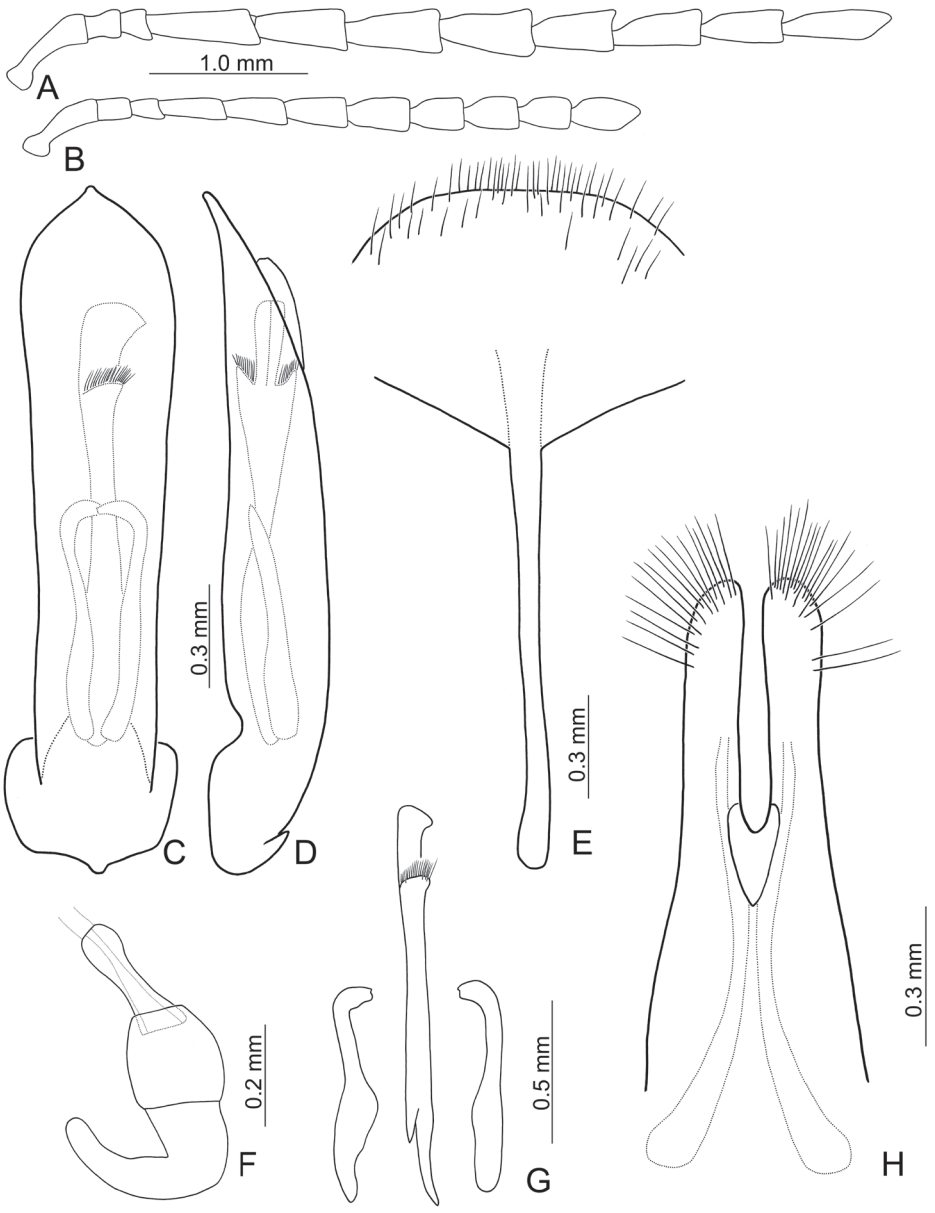
Diagnosis. *Gallerucida shirozui* and *G. thoracica* Jacoby adults are easily recognized by their metallic elytra and reddish or yellowish brown pronota. Adults of *Gallerucida shirozui* differ from those of *G. thoracica* by possessing only one pair of black spots on the pronotum (two pairs in *G. thoracica*) and longer and more serrate antennae (shorter and filiform antennae in *G. thoracica*).

Redescription. Length 7.2–8.2 mm, width 3.8–5.2 mm. General color (Fig. 12A–C) reddish brown; antenna black except three basal antennomeres; pronotum yellowish brown with one pair of black spots at sides, brown between black spots; elytra entirely metallic green; tibiae, and tarsi black; each abdominal ventrite with one pair of black spots at sides, sometimes expanding inwards and connected medially. Antenna serrate in males (Fig. 13A), length ratios of antennomeres I–XI 1.0 : 0.4 : 0.4 : 1.2 : 1.0 : 1.0 : 1.0 : 0.9 : 0.9 : 0.9 : 1.1, length to width ratios of antennomeres I–IX 3.2 : 1.2 : 1.1 : 3.3 : 2.2 : 2.2 : 1.9 : 1.9 : 2.4 : 2.4 : 3.9; filiform and much shorter in females (Fig. 13B), length ratios of antennomeres I–XI 1.0 : 0.4 : 0.4 : 0.8 : 0.8 : 0.7 : 0.7 : 0.7 : 0.6 : 0.6 : 0.8, length to width ratios of antennomeres I–IX 3.4 : 1.5 : 1.6 : 3.2 : 2.6 : 2.0 : 1.8 : 1.9 : 1.7 : 1.7 : 2.0. Pronotum transverse, 2.0× wider than long, disc convex, with oblique depressions at sides, medially abbreviated, disc with micro-reticulation and dense, coarse punctures; lateral margin straight or slightly rounded; apical margin concave; basal margin convex. Elytra parallel-sided; 1.4-1.6× longer than wide, disc without micro-reticulation but with dense, coarse punctures arranged randomly; dorso-ventrally flattened. Penis (Fig. 13C–D) elongate, 5.2× longer than wide; parallel-sided; apex widely lanceolate; straight but apically curved in lateral view; ventral surface well sclerotized; endophallic sclerite complex



Figures 12. Habitus of *Gallerucida* species. **A** *G. shirozui* Kimoto, female, dorsal view **B** Ditto, ventral view **C** *G. shirozui* Kimoto, male, color variation, ventral view **D** *G. thoracica* (Jacoby), male, dorsal view **E** Ditto, ventral view **F** *G. thoracica* (Jacoby), male, color variation, dorsal view.

(Fig. 13G) large, about 0.6× as long as penis, composed of one median sclerite and one pair of lateral sclerites, median sclerite longitudinal, straight in lateral view, with dorsal processes at apical 1/5, with dense setae along apical margin of process, lateral sclerites longitudinal but much shorter, about 0.5× as long as median sclerite, strongly curved near apex, apices concave. Gonocoxae (Fig. 13H) elongate, connected from base to basal 3/5, apices rounded, with dense elongate setae; base wide. Ventrite VIII (Fig. 13E) longitudinal, apical margin truncate but laterally membranous; with sparse short setae along and inside apical margin; spiculum extremely slender. Receptacle of



Figures 13. Diagnostic characters of *Gallerucida shirozui* Kimoto. **A** Antenna, male **B** Antenna, female **C** Penis, dorsal view **D** Penis, lateral view **E** Abdominal ventrite VIII **F** Spermatheca **G** Endophallic sclerites **H** Gonocoxae.

spermatheca (Fig. 13F) strongly swollen; pump short but strongly curved; proximal spermathecal duct slender and shallowly inserted into receptacle.

Variation. Females from southern Taiwan possess narrower antennae (length to width ratios of antennomeres I–IX 3.4 : 1.4 : 1.7 : 3.3 : 3.1 : 2.3 : 1.9 : 2.0 : 2.0 : 2.0 : 2.7) and reduced punctures on the pronota.

Host plant. Vitaceae: *Vitis flexuosa* Thunb. (present study).

Biology. Two mature larvae were collected on leaves of *Vitis flexuosa* in Meifeng during late June 2012. They burrowed into the soil shortly after collection and built underground chambers for pupation. Duration of the pupal stage was 25–28 days. Newly emerged adults were entirely yellow, and required three weeks to change color.

Other material examined. TAIWAN. Kaoshiung: 1♂ (TARI), Shihshan trail [石山林道], 19-24.XI.2008, leg. C.-T. Yao; 1♀ (TARI), Tengchih [藤枝], 30.III.2009, leg. C.-T. Yao; 3♂♂ (BMNH), Tona trail [多納林道], 25.VII.2017, leg. B.-X. Guo; 1♂, 3♀♀ (TARI), same but with "2.VIII.2017"; Nantou: 1♂ (TARI), Meifeng [梅峰], 20.IV.2011, leg. T.-H. Lee; 1♂, 1♀ (TARI), same locality, reared from larvae, 29.VII.2012, leg. C.-F. Lee; Pingtung: 1♀ (TARI), Wutai [霧台], 18.III.2010, leg. J.-C. Chen.

Distribution. Endemic to Taiwan.

***Gallerucida singularis* Harold**

Fig. 4D–G

Galerucida [sic!] *singularis* Harold, 1880: 146; see Lee and Bezděk 2013: 359 for complete list.

Diagnosis. *Gallerucida gebieni* and *G. singularis* Harold adults are easily recognized by their reddish brown bodies and black spots behind the humeral calli and at the elytral apices (Fig. 4D–F) but those of *G. singularis* possess three black spots on the elytra apices (Fig. 4G) (two spots in *G. gebieni* (Fig. 4H)).

Redescription. See Lee and Bezděk (2013).

Host plant. Polygonaceae: *Polygonum chinense* L. and *Fallopia multiflora* var. *hypoleucum* (Ohwi) Yonek. et H. Ohashi (Lee and Bezděk 2013).

Biology. *Gallerucida singularis* populations are presumably multivoltine. Adults are found throughout the year. The natural history was described by Lee and Bezděk (2013).

Distribution. China, Taiwan (only in Kinmen and Nankan islands).

***Gallerucida thoracica* (Jacoby)**

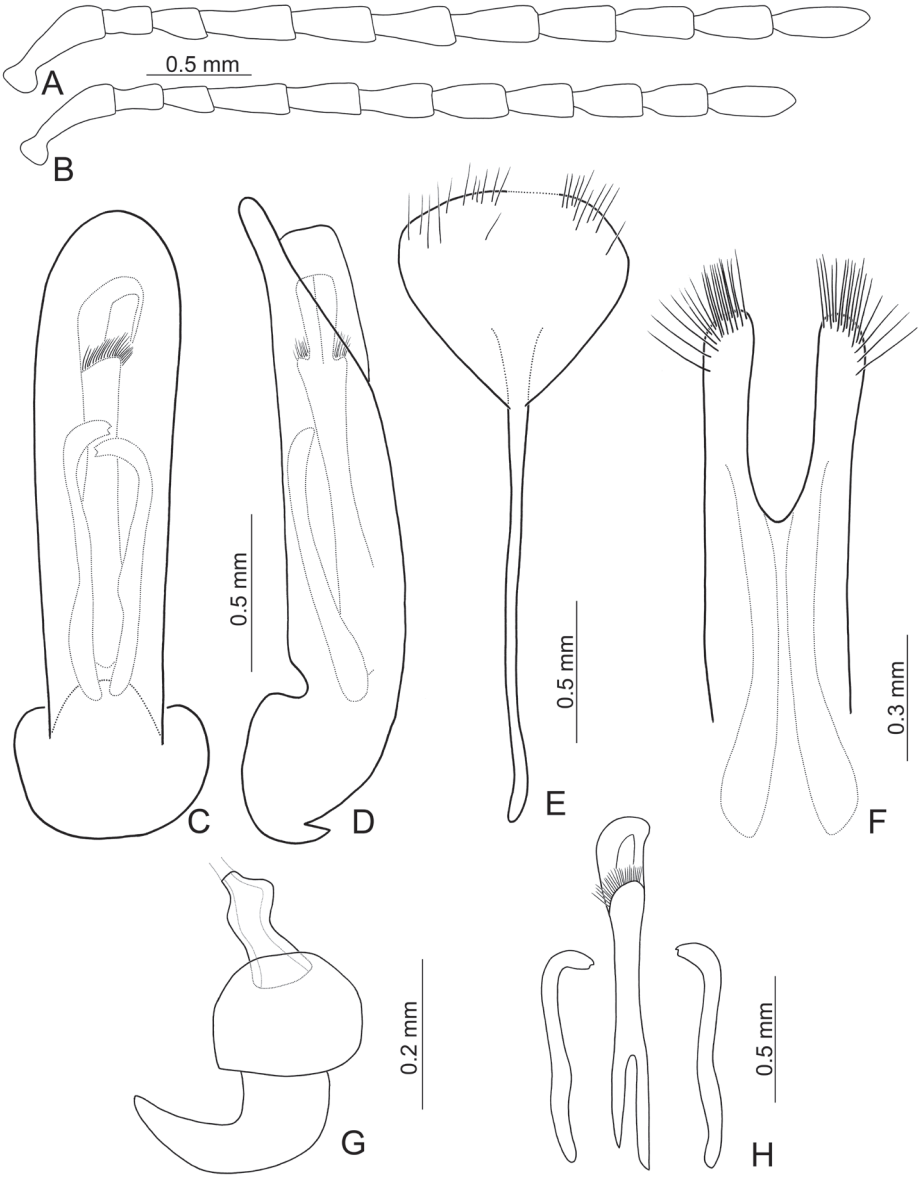
Figs 12D–F, 14, 15

Eustetha thoracica Jacoby, 1888: 348 (China: Jiangxi); Jacoby 1890: 193 (China: Chang-Yang).

Galerucida [sic!] (*Eusthetha*) *thoracica*: Weise 1924: 142 (catalogue).

Galerucida [sic!] *thoracica*: Ogloblin 1936: 362 (redescription).

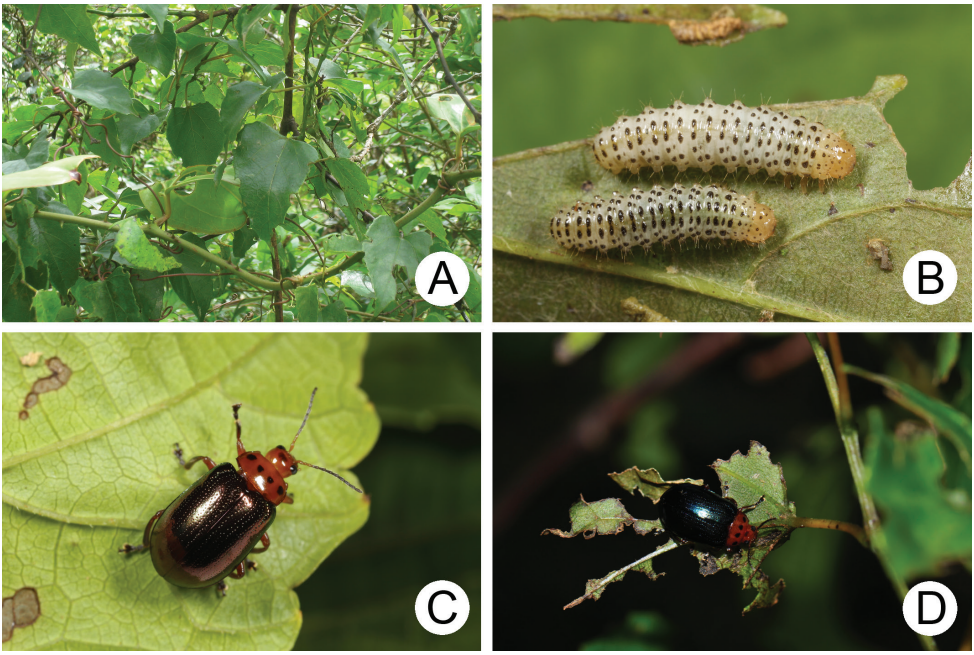
Gallerucida thoracica: Gressitt and Kimoto 1963: 734 (China); Wilcox 1971: 207 (catalogue); Beenen 2010: 460 (catalogue); Yang et al. 2015: 177 (catalogue).



Figures 14. Diagnostic characters of *Gallerucida thoracica* (Jacoby). **A** Antenna, male **B** Antenna, female **C** Penis, dorsal view **D** Penis, lateral view **E** Abdominal ventrite VIII **F** Gonocoxae **G** Spermatheca **H** Endophallic sclerites.

Type material. Lectotype ♂ (MCZC), here designated, labeled: "Kiukiang / China [h, w] // 1st Jacoby / Coll. [p, w] // *Eustetha* / *thoracica* / Jac. [h, b] // Type [p] / 18241 [h, r]". Number of paralectotypes is uncertain.

Diagnosis. See diagnosis of *G. shirozui*.



Figures 15. Field photographs of *Gallerucida thoracica* (Jacoby). **A** Host plant: *Vitis flexuosa* **B** Larvae **C** Adult, metallic bronze form **D** Adult, metallic blue form.

Redescription. Length 7.0–8.9 mm, width 3.8–5.0 mm. General color (Figs 12D–F, 15C, 15D) yellowish brown or reddish brown; antenna black except three basal antennomeres; vertex with one black spot; pronotum with two pairs of black spots at one transverse line; elytra entirely metallic green, or blue, or purple, apical halves of tibiae, and tarsi darker. Antenna filiform in males (Fig. 14A), length ratios of antennomeres I–XI 1.0 : 0.4 : 0.5 : 0.8 : 0.7 : 0.7 : 0.7 : 0.6 : 0.7 : 0.7 : 0.6, length to width ratios of antennomeres I–IX 3.3 : 1.7 : 1.8 : 2.6 : 2.3 : 2.1 : 2.4 : 2.1 : 2.4 : 2.4 : 3.2; shorter in females (Fig. 14B), length ratios of antennomeres I–XI 1.0 : 0.4 : 0.5 : 0.7 : 0.6 : 0.6 : 0.6 : 0.6 : 0.6 : 0.6 : 0.8, length to width ratios of antennomeres I–IX 3.5 : 1.8 : 2.0 : 2.6 : 2.3 : 2.2 : 2.2 : 2.0 : 2.1 : 2.0 : 2.9. Pronotum transverse, 2.1× wider than long, disc convex, with oblique depressions at sides, medially abbreviated, disc with micro-reticulation but lacking punctures; lateral margin straight or slightly rounded; apical margin concave; basal margin convex. Elytra parallel-sided; 1.5× longer than wide, disc without micro-reticulation but with coarse punctures arranged into longitudinal striae, and minute punctures between strial punctures; dorso-ventrally flattened. Penis (Fig. 14C–D) elongate, 5.0× longer than wide; parallel-sided; apex rounded; subapically curved in lateral view; ventral surface well sclerotized; endophallic sclerite complex (Fig. 14H) large, about 0.7× as long as penis, composed of one median sclerite and one pair of lateral sclerites, median sclerite longitudinal, straight in lateral view, with dorsal processes at apical

1/5, with dense setae along apical margin of process, lateral sclerites longitudinal but much shorter, about 0.6× as long as median sclerite, curved near apex, apices concave. Gonocoxae (Fig. 14F) elongate, connected from base to basal 3/5, apices rounded, with dense elongate setae; base wide. Ventrite VIII (Fig. 14E) longitudinal, apical margin truncate but medially membranous; with dense short setae along apical margin, medially abrreviated; spiculum extremely slender. Receptacle of spermatheca (Fig. 14G) strongly swollen; pump short but strongly curved; proximal spermathecal duct slender and deeply inserted into receptacle.

Variation. Chinese specimens possess metallic blue meso- and metathoracic ventrites and legs, and the punctures on the elytra are confused.

Host plant. Vitaceae: *Vitis flexuosa* Thunb. (Fig. 15A) (present study).

Biology. Larvae and adults (Fig. 15B–D) were found on leaves of *Vitis flexuosa* by Ms. Yi-Xuan Hsieh in Tahanshan during early June, 2013. The larvae were transferred to the laboratory for rearing and proved to be *G. thoracica*.

Other material examined. CHINA. 1♂ (BPBM), leg. S. V. Mell. **TAIWAN**. Pingtung: 1♀ (TARI), Lilungshan [里龍山], 11.XI.2014, leg. J.-C. Chen; 1♂, 1♀ (TARI), Tahanshan [大漢山], 3.VI.2012, leg. W.-C. Liao; 3♂♂ (TARI), same locality, 6.VII.2012, leg. C.-F. Lee; 1♀ (TARI), same locality, 17.VI.2012, leg. Y.-X. Hsieh; 5♂♂, 3♀♂ (TARI), 4♂♂ (BMNH), same locality, reared from larvae, 26.VI.-8.VII.2012, leg. C.-F. Lee; 2♀♀ (TARI), same locality, 4.VII.2012, leg. M.-H. Tsou; 2♂♂ (TARI), same locality, 20.VII.2013, leg. S.-F. Yu.

Distribution. China, southern Taiwan (new record).

Key to Taiwanese species of genus *Gallerucida* Motschulsky

1	Elytra metallic blue, green or purple	**2**
–	Elytra black, yellowish or reddish brown, or white, sometimes with irregular transverse bands	**4**
2	Pronotum entirely metallic blue, green, or purple (Fig. 4A)	***G. flaviventris***
–	Pronotum yellowish brown, with one or two pairs of black spots	**3**
3	Pronotum with one pair of black spots (Fig. 14A)	***G. shirozui***
–	Pronotum with two pairs of black spots (Fig. 12D, F)	***G. thoracica***
4	Elytra reddish brown, with black spots behind humeral calli and at apices	**5**
–	Elytra black, yellowish brown, or white; sometime with transverse stripes	**6**
5	Two pairs of black spots at elytral apices (Fig. 4H)	***G. gebieni***
–	Three pairs of black spots at elytral apices (Fig. 4G)	***G. singularis***
6	General color yellowish brown, elytra with extremely coarse punctures (Fig. 6A)	***G. lutea***
–	General color black or white, with transverse stripes; elytra with moderately coarse punctures	**7**
7	Elytra black, with three transverse orange stripes, sometimes extremely well developed or completely reduced (Fig. 1)	***G. bifasciata***
–	Elytra white, with two transverse black stripes (Fig. 6D, F)	***G. sauteri***

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