

The Firefly Genus *Vesta* in Taiwan (Coleoptera: Lampyridae)

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ABSTRACT: The species of the firefly genus *Vesta* occurring in Taiwan are revised. Three species are recognized: *Vesta scutellonigra* Olivier (*nomen emendatum*), *V. impressicollis* Fairmaire, and *V. rufiventris* (Motschulsky). *Vesta chevrolatii* var. *scutello nigro* Olivier is automatically emended to *scutellonigra* under ICZN rules. Okada described as a distinct species *V. scutellonigra*, employing the same name and material as Olivier, thereby automatically rendering his taxon a junior synonym (**n. syn.**). The name *V. scutellonigro*, simultaneously employed by Okada, is considered an incorrect subsequent spelling and therefore unavailable. *Vesta formosana* Pic (**n. syn.**) is a new junior synonym of *V. scutellonigra*. The spelling *chevrolati*, employed by Gemminger and Harold, is determined to be an incorrect subsequent spelling of *chevrolatii* and thus unavailable. Lectotypes are newly designated for *V. scutellonigra* Olivier, *V. impressicollis* Fairmaire, and *V. formosana* Pic. A key to the species of Taiwan is provided. *Vesta flaviventris* (Fairmaire) (**n. comb.**) from China is transferred from *Lucernuta*.

KEY WORDS: *Vesta*, Lampyridae, Taiwan, nomenclature, key

Introduction

Owing to the well-founded and careful work undertaken by earlier European and Japanese researchers, the taxonomy and faunal studies of Lampyridae occurring in Taiwan (Formosa) has been extensively improved during the past 100 years (Olivier, 1910b, 1911a, 1913; Pic, 1911a, 1911b, 1911c, 1916, 1917, 1918, 1944; Matsumura, 1918, 1928; Kano, 1930; Okada, 1931; Miwa, 1931; Nakane, 1967a, 1967b, 1977; Chûjô and Satô, 1970; Satô 1970; Ho, 1997; Ho and Jiang, 1997; Ho and Jong, 1997; Ho *et al.*, 1998a, 1998b; Jeng *et al.*, 1998a, 1998b, 1999a, 1999b, 1999c, 2000, 2001, 2002, 2003a, 2003b, 2003c; Lai *et al.*, 1998; Chen, 1999, 2003; Chang *et al.*, 2000; Ho and Chu, 2002). Some forty species belonging to nine genera (*Curtos* Motschulsky, *Cyphonocerus* Kiesenwetter, *Diaphanes* Motschulsky, *Lamprigera* Motschulsky, *Lucidina* Gorham, *Luciola* Laporte de Castelnau, *Pristolytus* Gorham, *Pyrocoelia* Gorham, and *Vesta* Laporte de Castelnau) were recorded from the island and its accessory islets. A further two genera, *Drilaster* Kiesenwetter and *Stenocladus* Fairmaire, containing ten known species from Taiwan and listed in the checklist of Lai *et al.* (1998), are now considered as doubtful as to their placement within Lampyridae (Branham and Wenzel, 2001).

The genus *Vesta*, based on *V. chevrolatii* Laporte de Castelnau from Java, is widespread in East and Southeast Asia as well as the Neotropical region (McDermott, 1966). Such a pattern of distribution is unique within the family Lampyridae. It is possible that many of the western species were erroneously transferred to (mostly from *Ethra* Laporte de Castelnau) or assigned to *Vesta* by

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Olivier (1907) owing to their pectinate antennae, a feature today understood to be of little diagnostic value. A thorough revision of the genus is certainly needed.

In regard to the Taiwanese fauna, Olivier (1911a) recorded three species of *Vesta* – *Vesta chevrolatii*, *V. impressicollis* Fairmaire, and *V. rufiventris* (Motschulsky) – based on material collected by Hans Sauter in the early 20th Century. Later he described the Taiwanese population of *V. chevrolatii* as a variety under the name *scutello nigro* (Olivier, 1913). Subsequently, Kano (1930) redundantly recorded *V. impressicollis* as new to Taiwan, and these three species were cited by Miwa (1931) for Taiwan. Okada (1931) described the variety *scutello nigro* as a new species and named it *V. scutellonigra* Okada and *V. scutellonigro* Okada simultaneously. Pic (1944) described a putative fourth species, *V. formosana*, from southern Taiwan, the status of which is revised herein. Most recently, Lai *et al.* (1998) listed all of the aforementioned four species [except *V. scutellonigra* Okada] for the fauna of Taiwan. During examination of type collections for related species in the Muséum national d'Histoire naturelle, Paris (MNHN), we noted some taxonomic corrections needed for those species occurring in Taiwan. Accordingly, we herein present a revision of the Taiwanese fauna.

Material and Methods

Specimens were collected by the first author if not otherwise specified. Male genital segments were dissected for examination and illustration, and then glued on cardboard together with the source specimens. The abbreviations “BL”, “BW”, “EL”, “EW”, “PL”, and “PW” are employed for “body length”, “body width”, “elytral length”, “elytral width”, “pronotal width”, and “pronotal width”, respectively. Body length is the sum of pronotal and elytral lengths (BL = PL+EL), while body width is the greatest distance across the elytra or twice the width of an elytron (BW = 2EW). “T#” and “S#” refer to the #th tergite/sternite of the abdomen, respectively (the last abdominal tergite is T8). The term “ventrite” is used for visible abdominal sternite, the first ventrite is the 2nd sternite in true segmentation [V1 = S2]; “aedeagal sheath” is composed of a syntergite (T9+10) and the ninth sternite [S9, counted as a ventrite (V8) since it is exposed externally]; “/” separates data from separate labels in the sections of material examined.

Systematics

Genus *Vesta* Laporte de Castelnau

Vesta Laporte de Castelnau, 1833: 133. Type species: *Vesta chevrolatii* Laporte de Castelnau, 1833, monobasic. [Java]. Motschulsky, 1853a: 42; Lacordaire, 1857: 316 (synonymy with *Ethra* Laporte de Castelnau); Gemminger and Harold, 1869: 1638 (synonymy with *Aethra* Aggasiz, an unjustified emendation of *Ethra*); Gorham, 1880: 13 (limited to Asian species); Gorham, 1882: 102 (diagnosis); Gorham, 1887: 29 (in Lucidotinae); Olivier, 1885: 334 (in Lucidotinae); Olivier, 1888: 43 (key to Asian species); Olivier, 1907: 16 (in Lamprocerinae, including many South American species); Olivier, 1910a: 13 (catalogue); Olivier, 1911b: 55 (key to some Asian species); Winkler, 1924–1932: 491 (in Lamprocerinae); Okada, 1931: 142; Wu, 1937: 377 (in Lamprocerinae, Chinese species); Green, 1959: 93; McDermott, 1964: 37 (in Lampyrinae, Amydetini, Vestina); 1966: 79 (in Amydetinae, Vestini, catalog);

Nakane, 1991: 8 (in Lampyrinae); Lawrence and Newton, 1995: 859 (in Amydetinae); Lai *et al.* 1998: 213 (in Lampyrinae, Taiwanese species); Branham and Wenzel, 2001: 567 (phylogeny of Lampyridae, collapse of Lampyrinae, Amydetinae, and Lamprocerinae); Branham and Wenzel, 2003: 5 (evolution of bioluminescence in Lampyridae); Li *et al.*, 2006: 821 (molecular phylogeny of represented Asian genera, showing affinity with *Lamprigera* Motschulsky).

Cratolampis Motschulsky, 1853a: 43. Type species: *Cratolampis flavicollis* Motschulsky, 1853a, originally designated. [Java, erroneously cited as Philippines by McDermott (1966)]. Motschulsky, 1853b: 43; Gemminger and Harold, 1869: 1654; Fairmaire, 1891: 15 (synonymy with *Vesta*); Olivier, 1907: 24 (synonymy with *Lucernuta* Laporte de Castelnau *sensu* Olivier); Olivier, 1910a: 13 (synonymy with *Vesta*); McDermott, 1966: 80 (synonymy with *Vesta*).

MORPHOLOGY (based on Asian species): Medium to large, 8–20 mm in total length. Where known, both sexes alate and similar to each other. Head fully covered by pronotum when retracted, hypognathous; compound eyes moderate in size, with posterior margin somewhat straight, widely separated from each other; vertex to fastigium more or less flat, smoothly transitioning; frons slightly protruding forward, narrow; antennal sockets large, with sharp antennifer in inner lateral margin of sockets; antennae 11-articled, about one-third to one-half body length in male and shorter in female, unipectinate or serrate in antennomeres 3–10 in male, branches broad at base, occupying whole respective articles, without clear differentiation between stem and branch; branches thick and flat, 1–2.5 times as long as their respective antennal articles when pectinate; antennae serrate in female; third antennal article (= first flagellar article) always about as long as first antennal article (= scape), longer than second antennal article (= pedicel); mandibles well developed, strongly curved and pointed apically; terminal maxillary palpomere dilated, with opening on inner margin; terminal labial palpomere compressed and subtriangular; gena behind compound eyes exposed and subgena barely visible. Pronotum transversely semielliptic, with more or less prominent hind angles; surface punctate and pubescent throughout; opaque throughout or translucent on apical and lateral margins; central disc distinctly convex, with longitudinal, median sulcus either clearly or weakly expressed; lateral explanate margins broad. Pronotal pleurite elongate, with ventral margin slightly emarginate or bisinuate. Elytra elongate, subparallel-sided or slightly oval, fully covering abdomen in length, usually with three noticeable carinae on disc, occasionally four; marginal costa nearly reaching elytral base, only very base of humeri barely visible ventrally; epipleuron at humeral area moderately folded, broad in basal one-fifth and narrowly extended to apex; lateral explanate margins moderate in width. Legs slender and long; tibia straight, apical spurs present, spur formula 2-2-2; first tarsomere elongate, subequal in length with fourth tarsomere, always longer than second and third tarsomeres which are about same length; fourth tarsomere lobed, widely open dorsally; pretarsal claws simple. Pleurosternal suture of mesothorax clear. Males with eight ventrites (including exposed sternite of aedeagal sheath) and females with seven, both ventrites and tergites strongly lobed, with more or less sharp posterolateral angles; tergite as broad as or broader than corresponding ventrites; V2–6 each with a visible pair of sublateral impressions for muscle attachment; spiracles on dorsal folded portion of sternites, not visible ventrally; a pair of dotted photogenic organs

occurring on V7; V7 with a slender, finger-like projection along central apex in male, broadly rounded and notched along central apex in female. Aedeagal sheath elongate, asymmetric, with syntergite shorter than sternite. Male genitalia modified and trilobed; parameres fused at dorsal base, more or less hooked at apices, and each with a slender and elongate, subapical extension; median lobe well sclerotized dorsally and laterally, usually robust, with a largely membranous, partially and weakly sclerotized ventral sac; basal piece broadly U- or V-shaped, about one-third total length of genitalia.

DIAGNOSIS: Most of the *Vesta* species have pectinate antennae which are more significant in males than in females. Species of *Ledocas* Olivier (*s. str.*) from the Neotropical region resemble *Vesta* but have abbreviated antennomeres and very long antennal branches. Among the Oriental fauna, *Lucidina* Gorham shares a very similar appearance with *Vesta*. Usually the antennae of *Lucidina* species are compressed and serrate, either strongly or weakly. Some *Lucidina* species also have pectinate antennae but their male genitalia never have a pair of slender appendages on the apices of the parameres as in *Vesta*. Some *Vesta* species, especially those with serrate antennae, were sometimes misidentified as *Pyrocoelia*. The latter genus has V7 of the males more or less rounded apically and lacks a finger-like, apical projection on V7, and its females have shortened or rudimentary elytra.

SUBFAMILIAL ASSIGNMENT: The genus was placed in Lucidotinae by Gorham (1897), in Lamprocerinae by Olivier (1907), in Amydetinae by McDermott (1966), and in Lampyrinae by Nakane (1991). Each assignment has several proponents (*vide supra*). Li *et al.* (2006) demonstrated an affinity between *Vesta* and *Lamprigera* Motschulsky in their 50% majority consensus tree based on sequences of mitochondrial 16S ribosomal DNA for representative Asian species. A definitive placement of the genus remains undetermined but is likely closely related with *Lucidota* LeConte – *Lucidina* Gorham as evidenced by adult morphology.

DIVERSITY: Presently there are 21 species documented from Asia and 10 from Central and South America.

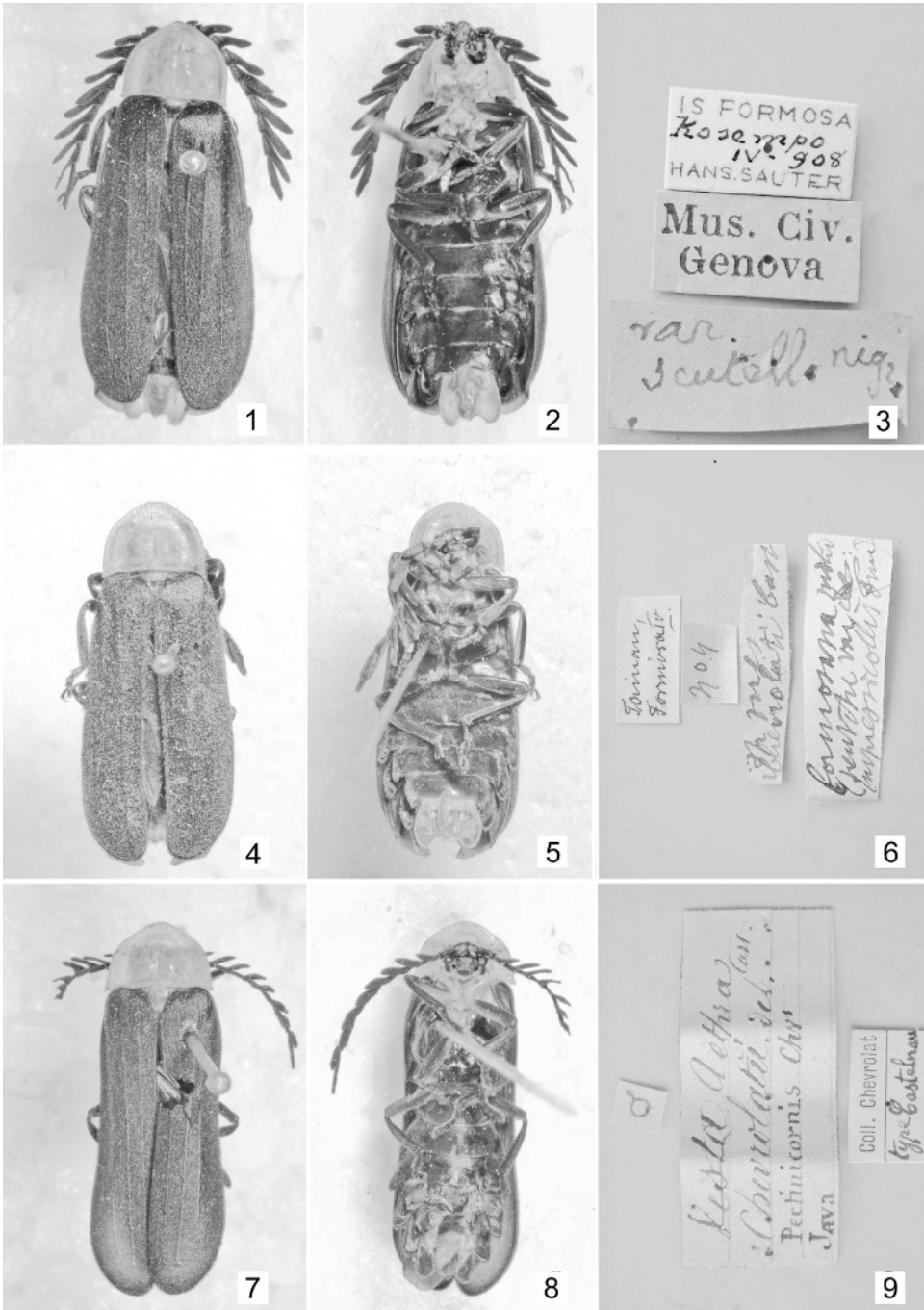
Key to Species of *Vesta* from Taiwan

1. Abdomen ventrites 1–6 dark brown to black (Figs. 2, 5, 8) (Taiwan)
 *V. scutellonigra* Olivier
- Abdominal ventrites vivid red (Figs. 17, 20) 2
2. Antennae pectinate in male (Fig. 22) and serrate in female (Fig. 23);
 scutellum red; elytra subparallel-sided; body length 16–19 mm (China,
 Taiwan, Vietnam) *V. impressicollis* Fairmaire
- Antennae serrate in both sexes (Figs. 28–29); scutellum black; elytra
 elongate oval; body length 12–15 mm (China, Taiwan).
 *V. rufiventris* (Motschulsky)

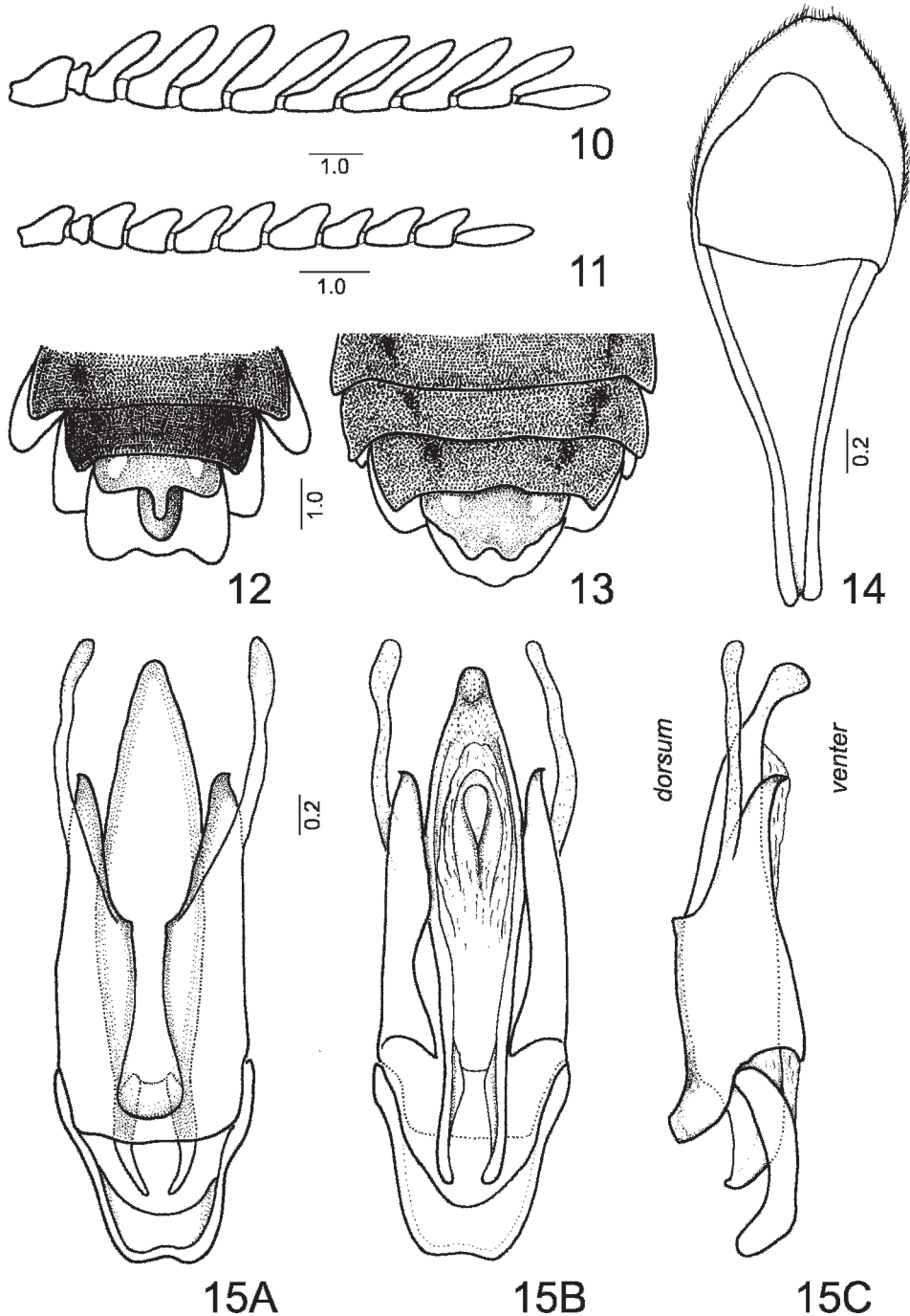
Vesta scutellonigra Olivier (Figs. 1–15)

Vesta chevrolatii Laporte de Castelnau, 1833: 133 [Type locality: Java, Indonesia], *in partim*. Motschulsky, 1853a: 43; Motschulsky, 1853b: 43; Gorham, 1880: 13; McDermott, 1964: 37.

Ethra chevrolatii (Laporte de Castelnau); Lacordaire, 1857: 317, *in partim*.



Figs. 1-9. Type specimens of some *Vesta* species. 1-3) *Vesta scutellonigra* Olivier [originally as *V. chevrolatii* var. *scutello nigro*], lectotype male and labels; 4-6) *V. formosana* Pic (= *V. scutellonigra*), lectotype male and labels; 7-9) *V. chevrolatii* Laporte de Castelnau, lectotype male and labels.



Figs. 10–15. *Vesta scutellonigra* Olivier. 10) antenna, male; 11) ditto, female; 12) 6th–9th abdominal segments (tergites 6th–8th and sternites 6th–9th = ventrites 5th–8th), male, ventral view; 13) 5th–8th abdominal segments, female, ventral aspect; 14) aedeagal sheath, dorsal view; 15) male genitalia, dorsal (A), ventral (B), and lateral (C) aspects. Figs. 12–13 and 15A–C each in same scale; unit of scale bars = mm.

Aethra chevrolati Gemminger and Harold, 1869: 1638 [incorrect subsequent spelling, unavailable], *in partim*.

Vesta chevrolati Olivier, 1885: 334 [incorrect subsequent spelling, unavailable]; Olivier, 1888: 43; Olivier, 1907: 17; Olivier, 1910a: 13; 1911a: 145; Okada, 1931: 135; Miwa, 1931: 99; McDermott, 1966: 79–80; Lai *et al.* 1998: 214 (checklist); Jeng *et al.*, 1999a: 77 (distribution).

Vesta chevrolati var. *scutello nigro* Olivier, 1913: 269 [Type locality: Jiashien (= Kosempo), Kaohsiung County, southern Taiwan]. Automatically emended to *scutellonigro* as original spelling (ICZN, 1999: Arts. 11.9.5, 32.5.2.3) and further emended to *scutellonigra* so that its gender agrees with that of *Vesta* (ICZN, 1999: Art. 31.2).

Vesta scutellonigra Okada, 1931: 136. **New synonymy.**

Vesta scutellonigro Okada, 1931: 142 [incorrect subsequent spelling, unavailable].

Vesta formosana Pic, 1944: 2 [Type locality: Tainan, Taiwan]. McDermott, 1966: 80; Lai *et al.*, 1998: 214. **New synonymy.**

DIAGNOSIS: BL 16–19 mm, BW 5.4–6.3 mm; body elongate and depressed. Coloration black, prothorax and mesosternum vividly red, last two ventrites and T8 yellowish brown (Figs. 12–13). Antenna of male pectinate (Fig. 10), with branches broad and about 1.2–2 times as long as their respective antennomeres; terminal antennomere about as long as preceding branch. Elytra elongate, each with four noticeable carinae. Abdominal tergites dull laterally; V7 with a slender projection. PW/PL = 1.2–1.4; EL/EW = 1.9–2.2; EL/PL = 3.5–4.2. Aedeagal sheath (Fig. 14) about 2.6 mm long, twisted toward left, with its sternite narrow at base. Male genitalia (Fig. 15) about 2.5–2.6 mm long; median lobe tapering toward apex from basal half, more or less slender in apical eighth in lateral aspect (Fig. 15C); paramere shortly hooked at apex; basal piece nearly bilaterally symmetric, broadly U-shaped.

SEXUAL DIMORPHISM: Females slightly larger than males; antennae strongly serrate (Fig. 11); abdomen dilated (Fig. 13); T8 with central lobe longer than lateral ones.

TYPE MATERIAL EXAMINED: 1 syntype of *V. scutellonigra* (*vide* Remarks, *infra*): ♂, “IS FORMOSA, Kosempo, IV-1908, HANS. SAUTER/var. *scutello nigro*/Mus. Civ. Genova” (MNHN, here designated as lectotype: Figs. 1–3). 1 syntype of *V. formosana*: ♂, “Tainan, Formosa IV/307/sp. pres Chevrolati Cast./formosana mihi (peut etre var.: *impressicollis* Fairm.” (MNHN, here designated as lectotype: Figs. 4–6); 1 syntype of *V. chevrolatii* (Figs. 7–9): “♂/*Vesta Aethra* Cast., *Chevrolatii* Ich, *Pecticornis* Chvr.(?) JAVA/Coll. Chevrolat, type Castelnau” (MNHN).

MATERIAL EXAMINED: **Taiwan.** Kaohsiung Co.: 2♂, Liugui, 3.III.1978, K. Matsuda; Pintung Co.: 2♂, Kenting, 28.III.1972, K. Masuda; 1♂, Kenting, 4.IV.1978, K. Murakami; Taitung Co.: 1♂ and 1♀, Jhiben, 25.III.1998, M. Hirata; 1♂: “Tainan, Formosa IV/307/*Vesta chevrolati* Cast (div vid) (var. *scutello et femular nigris*)” (MNHN).

REMARKS: Olivier (1911a) recorded *V. chevrolatii* (as *chevrolati* in his description, *vide infra*) from Taiwan and later described it as a variety under the name “*scutello nigro*” (Olivier, 1913). These two words together refer to a single entity (*i.e.*, black scutellum) and are therefore admissible as a species-group name when they are united into a single word (ICZN, 1999: Arts. 11.9.5, 32.5.2.3). Okada (1931) adopted Olivier’s concept and described the Taiwanese population as a distinct species for which he simultaneously used the names *V. scutellonigra* and *V. scutellonigro* in the

same paper. Okada (1931) attributed authorship for these taxa to himself thereby indicating that he intended them to be new relative to the name proposed by Olivier (1913). Accordingly, these names are herein treated as synonyms rather than emendations. Under the Principle of First Reviser (ICZN, 1999: Art. 23) we adopt *scutellonigra* as the valid name for Okada's taxon as this spelling appears twice in his article, while *scutellonigro* appears only once. *Vesta scutellonigra* Okada is accordingly a junior synonym, and simultaneously a junior homonym, of *V. scutellonigra* Olivier while *scutellonigro* becomes an incorrect subsequent spelling and thereby unavailable. Okada did not designate a type series but referred his taxon to the original series of Olivier (1913). The type series is therefore identical to Olivier's original designation (ICZN, 1999: Art. 72.4.4). While the name may appear malformed in Latin, it cannot be altered as incorrect Latinization does not constitute a case by which a name may be emended (ICZN, 1999: Art. 32.3).

Vesta formosasa Pic is without doubt a new synonym of *V. scutellonigra*. Gemminger and Harold (1869) changed the original spelling of *chevrolatii* to *chevrolati* which was subsequently cited by several authors (*vide supra*). Though the latter has been more frequently used than the former since then, it does not match the requirements of a prevailing usage to be preserved as the correct original spelling (ICZN, 1999: Arts. 23.9.1, 33.3.1). Accordingly *chevrolati* is an incorrect subsequent spelling and unavailable (ICZN, 1999: Art. 33.4).

We accept Okada's conclusion and consider *V. scutellonigra* as a species distinct from *V. chevrolatii* rather than as a subspecies of the latter. In support of this decision we cite the following differences between males of *V. scutellonigra* and of *V. chevrolatii*: 1) scutellum is red in *V. chevrolatii* and black in *scutellonigra*, as the specific epithet denotes; 2) abdominal T8 black or dark brown in *V. chevrolatii* but yellowish brown in *V. scutellonigra*; 3) antennal branches are narrow and tapering toward apex in *V. chevrolatii*, broad and somewhat rounded apically in *V. scutellonigra*; 4) pro- and mesofemora black in *V. scutellonigra* but yellowish brown in *V. chevrolatii*; 5) median lobe of aedeagus is more slender and acute in apical third in *V. chevrolatii* by comparison with *V. scutellonigra*.

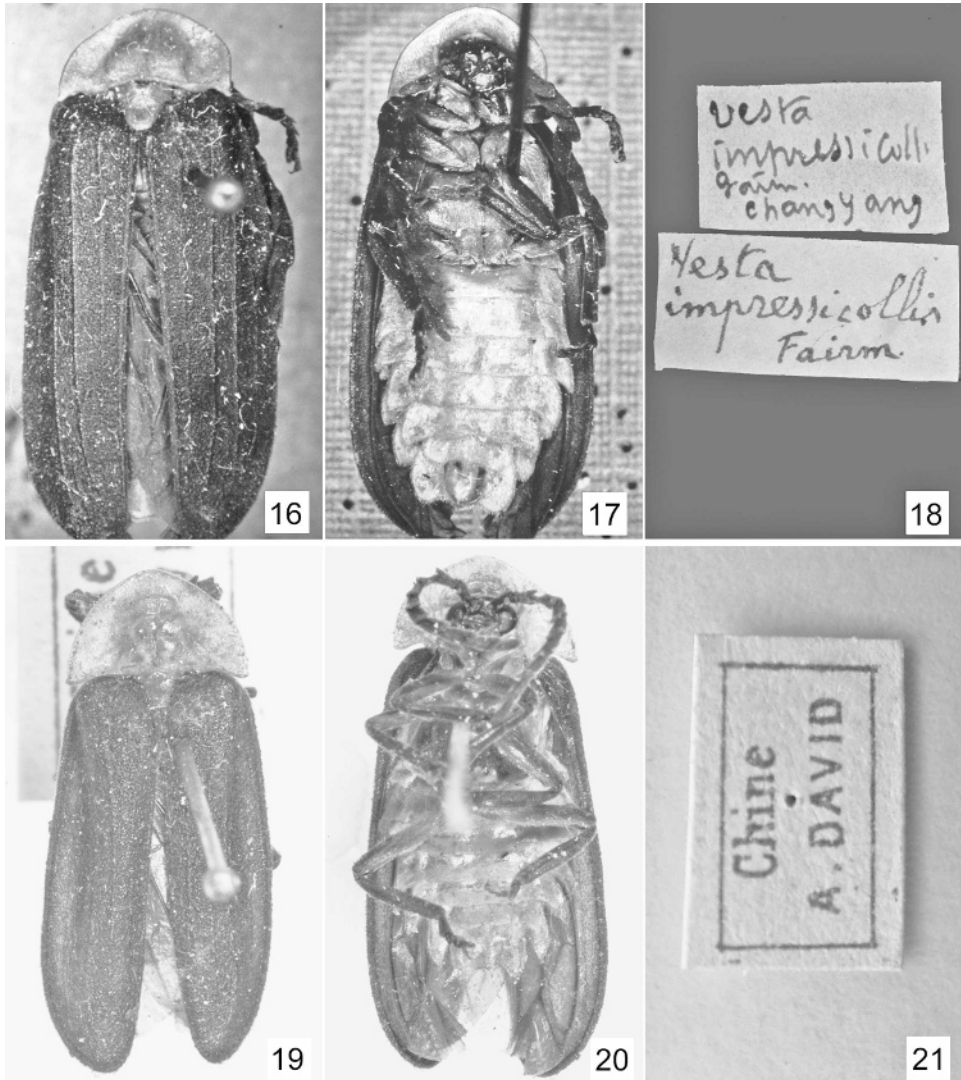
DISTRIBUTION: Southern and southeastern Taiwan.

PHENOLOGY: Adults are active from February to April.

Vesta impressicollis Fairmaire
(Figs. 16–18, 22–27)

Vesta impressicollis Fairmaire, 1891: 15 [Type locality: Changyang, Hubei Province, China]. Fairmaire, 1909: 247 (Guizhou Province); Olivier, 1907: 17; 1910a: 14; 1913: 269 (Taiwan); Winkler, 1924–1932: 491; Kano, 1930: 242; Miwa, 1931: 99; Okada, 1931: 142; Lai *et al.*, 1998: 214 (checklist); Jeng *et al.*, 1999a: 77 (distribution).

DIAGNOSIS: BL 15–20 mm, BW 5.1–6.3 mm; body elongate and compressed. Coloration vivid or pinkish red; head, antennae, legs, and elytra black, last two ventrites yellowish brown (Figs. 24–25). Antenna of male pectinate (Fig. 22), with branches slightly longer than or about as long as their respective antennomeres; last antennomere longer than preceding branch. Elytra subparallel-sided and elongate; each with 3–4 noticeable carinae in which humeral and two inner costae stronger (sutural costa not counted). Abdominal tergite sharply pointed posterolaterally; V7 with a slender projection. PW/PL = 1.3–1.5; EL/EW = 2.1–2.4; EL/PL = 4.1–4.4.

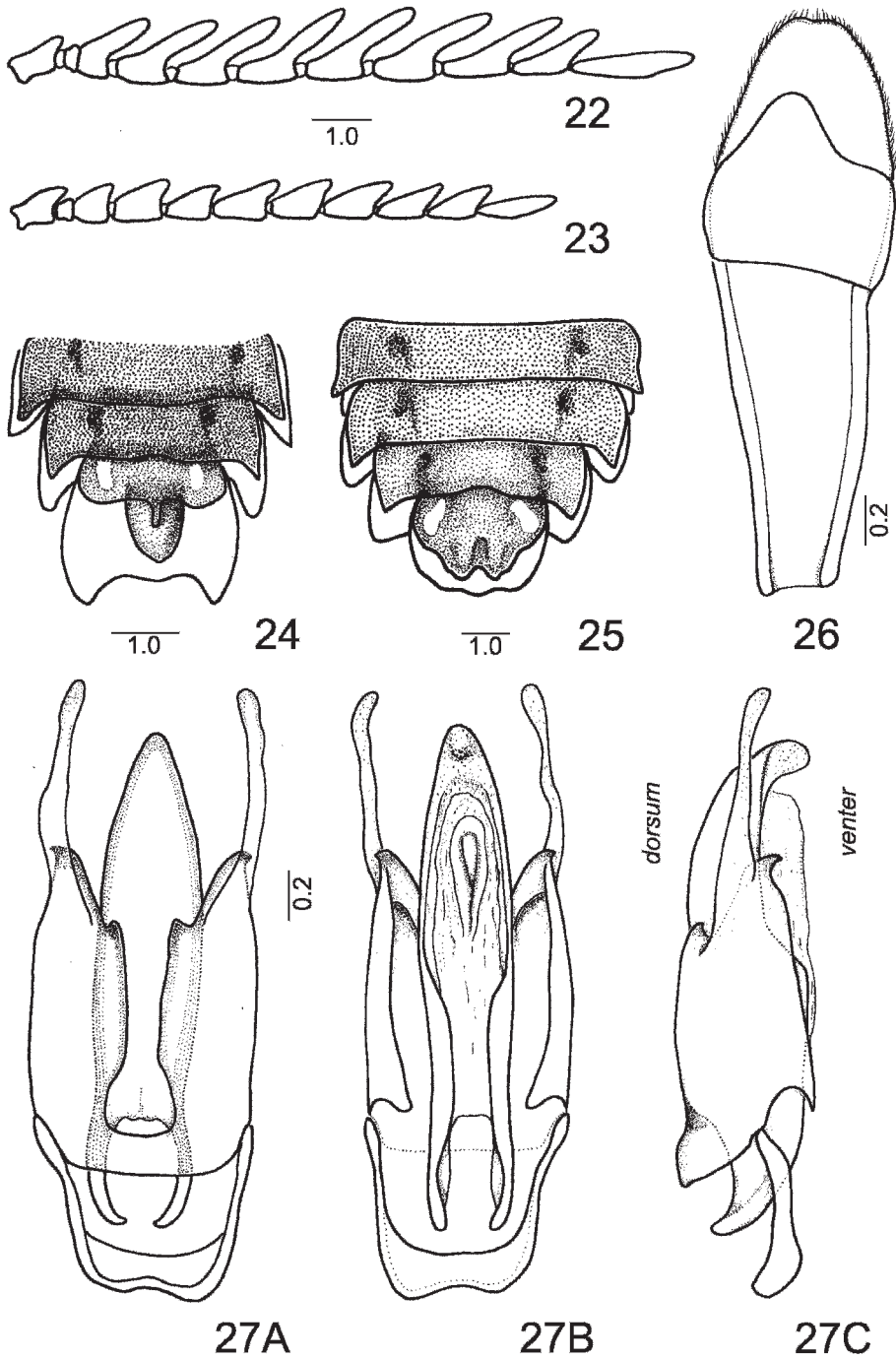


Figs. 16–21. Type material of two *Vesta* species. 16–18) *Vesta impressicollis* Fairmaire, lectotype male and labels; 19–21) *Lucernuta flaviventris* Fairmaire (= *V. flaviventris*), holotype male and label.

Aedeagal sheath (Fig. 26) 2.6–2.7 mm long, twisted toward left, broad at base of sternite. Male genitalia (Fig. 27) about 2.3–2.5 mm in length, similar to those of preceding species; median lobe broad in lateral aspect (Fig. 27C); basal piece slightly asymmetric at apex.

SEXUAL DIMORPHISM: Females slightly larger than males; antennae serrate (Fig. 23); abdomen enlarged (Fig. 25), with T8 slightly trilobed.

TYPE MATERIAL EXAMINED: Three syntypes of *V. impressicollis*: 2♂ and 1♀, one male labeled “*Vesta impressicollis* Fairm. Chang Yang/*Vesta impressicollis* Fairm.” (here designated as lectotype: Figs. 16–18); the other two without labels (MNHN).



Figs. 22-27. *Vesta impressicollis* Fairmaire. 22) antenna, male; 23) ditto, female; 24) 6th-9th abdominal segments (tergites 6th-8th and sternites 6th-9th = ventrites 5th-8th), male, ventral view; 25) 5th-8th abdominal segments, female, ventral aspect; 26) aedeagal sheath, dorsal view; 27) male genitalia, dorsal (A), ventral (B), and lateral (C) aspects. Figs. 22-23 and 27A-C each in same scale; unit of scale bars = mm.

MATERIAL EXAMINED: **Taiwan:** Taipei Co.: 1♂, Wulai, VII/1997, J. Lai; 1♂, Hsindian, 18.V.1982, M.L. Chu; Taoyuan Co.: 1♂, Mt. Lala, 25.VI.1988, J.D. Ding; Nantou Co.: 1♂, Shizitou, 10-13.VI.1995, Y. Arita; 1♀, Lushan, 11.V.1975, S. Imasaka; 1♂, Jhiyuetan, 28.V.1975, K. Matsuda; 1♂, Fenghuang-gu, 27.IV.1997, Y.F. Hsu; Chiayi Co.: 2♂, Fenchihu, 7.VII.1986, C.C. Chang; 1♂, Mt. Ali, 12.VII.1984, Y. Arita; Ilan Co.: 18♂ and 7♀, Chilan Giant Tree Park, 2-4.VII.2003, C.L. Li; Hwalien Co.: 15♂ and 6♀, Wangrong logging track, 9.VII.2003, M.L. Jeng; 1♂, Shenmigu, 22.IV.1996, M.F. Chen. **China:** Sichuan Prov.: 1♂, Moxi, Hailougou, 1-7.VII.1994, D. Král & J. Farkač; Yunnan Prov.: 2♂, Xianguan, 18.VI.1994; J. Farkač & D. Král; Shaanxi Prov.: 1♂, Xian, Huashan, 17-22.VI.1991, Z. Kayval; Fujian Prov.: 3♂, Guadun [=Kuatun, Fukien], 8.VII.1946, C. X. Fu [= TSCHUNG SEN.].

REMARKS: We found a pair of specimens identified as *Lucernuta nigroflava* Fairmaire in David Oberthür's collection in MNHN. They agree well with *V. impressicollis*. However, they clearly do not match Fairmaire's (*in* Deyrolle and Fairmaire 1878) or Olivier's (1886) descriptions of *L. nigroflava*. The true *L. nigroflava* should have black abdominal ventrites except the apical three segments yellow, as the specific epithet clearly indicates. Indeed, owing to this Fairmaire (*in* Deyrolle and Fairmaire 1878) suspected the species capable of luminescence. Olivier (1886) stated that the type(s) of *L. nigroflava* was in Oberthür's collection. All of the identification labels in that box were in Fairmaire's hand, and it is possible that these specimens are types if they do, indeed, represent material upon which he based descriptions. However, as noted, these specimens do not match the descriptions provided by Deyrolle and Fairmaire (1878) nor Olivier (1886) and are not believed to represent the former's syntype series for *L. nigroflava*. The true type(s) of *L. nigroflava* was probably somewhere else and a subsequent individual perhaps misplaced these two specimens in the position for *L. nigroflava* in Oberthür's box. Thus, we are not able to confirm at present this strongly suspected synonymy.

DISTRIBUTION: The species occurs in both China and Taiwan, and is widely distributed in the latter except the most southern regions.

PHENOLOGY: The species is active from April to July in Taiwan.

Vesta rufiventris (Motschulsky)

(Figs. 28–33)

Cratolampis rufiventris Motschulsky, 1853b: 43 [Type locality. China]. Gemminger and Harold, 1869: 1654.

Craptolampis (*Vesta*) *rufiventris* Motschulsky; Fairmaire, 1891: 15.

Lucernuta rufiventris (Motschulsky); Olivier, 1907: 26.

Vesta rufiventris (Motschulsky); Fairmaire, 1909: 247 (Guizhou, China); Olivier, 1910a: 14; 1913: 269 (Taiwan); Winker, 1924–1932: 491; Miwa, 1931: 100; Lai *et al.*, 1998: 214; Jeng *et al.*, 1999a: 77; Chen, 1999: 168; 2003: 207.

Pyrocoelia rufiventris (Motschulsky); Olivier, 1911b: 56.

Vesta (*Cratolampis*) *rufiventris* (Motschulsky); Okada, 1931: 142.

Lychnuris rufiventris (Motschulsky); McDermott, 1966: 18.

DIAGNOSIS: BL 12–15 mm, BW 6.0–6.3 mm; body elongate oval and depressed. Pronotal central disc, prosternite, and abdominal ventrites 1–6 red; pronotal margins smoky brown; scutellum, elytra, and meso- and metasternites black; last two ventrites yellowish brown. Antenna of male serrate (Fig. 28). Pronotum transversely

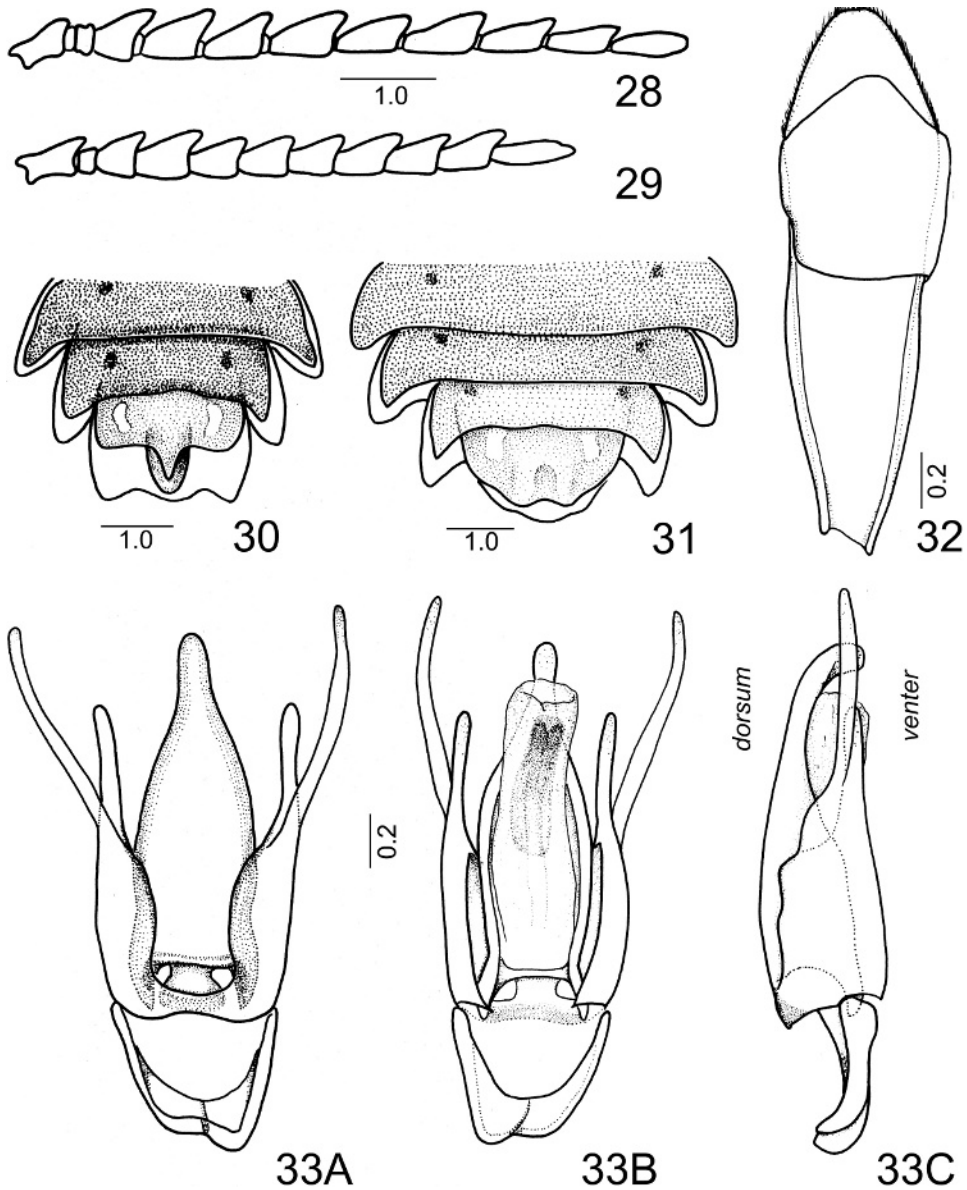


Fig. 28–33. *Vesta rufiventris* (Motschulsky). 28) antenna, male; 29) ditto, female; 30) 6th–9th abdominal segments (tergites 6th–8th and sternites 6th–9th = ventrites 5th–8th), male, ventral view; 31) 5th–8th abdominal segments, female, ventral view; 32) aedeagal sheath, dorsal view; 33) male genitalia, dorsal (A), ventral (B), and lateral (C) aspects. Figs. 28–29 and 33A–C each in same scale; unit of scale bars = mm.

subtriangular. Elytra elongate oval, broadest in apical third, carinae not so distinct as in preceding two species. Abdominal tergites more or less pointed posterolaterally, V7 with a triangular projection (Fig. 30). PW/PL = 1.5–1.7; EL/EW = 1.6–1.8; EL/PL = 3.3–3.5. Aedeagal sheath (Fig. 32) about 2.2 mm long, twisted toward right, broad at base of sternite. Male genitalia (Fig. 33) about 2.0 mm in length; median

lobe abruptly narrowed in apical seventh; paramere slender in apical third and rounded apically; inner margins smoothly curved; basal piece asymmetric.

SEXUAL DIMORPHISM: Females larger and much broader than males; antennae (Fig. 29) shorter and not as serrate as in male; abdomen (Fig. 31) greatly dilated and lobed, more or less diamond-shaped.

MATERIAL EXAMINED: **Taiwan.** Taoyuan Co.: 3♂, Baling, 18.VII.1997, K. Mizota; Ilan Co.: 2♂, Mt. Taiping [= Taiheizan], 9.VII.1933, M. Chujo; 2♂ and 2♀, Mingchi, 20.VII.1997, K. Mizota; 2♂, Chilan Giant Tree Park, VII.2003, C.L. Li. Hwalian Co.: Tungli [=Kirisato], 7.VIII.1954, R. Takahashi. **China.** Fujian Prov.: 1♂ and 1♀, Guadun [= Fukien, Kuatun], 27.VI.1946, C.X. Fu [= Tschung-Sen, Fu]; Sichuan Prov.: 1♂, Mt. Emai, 18.VII.1990, L. & M. Bocak (Naturhistorisches Museum Basel, Switzerland NMB). We did not examine the types of those species that are perhaps deposited in the Zoological Museum, St. Petersburg or Moscow State University.

REMARKS: This species was described as the second *Cratolampis* species by Motschulsky. This genus has been synonymized with *Lucernuta* or *Vesta* by different authors (*vide supra*). The taxa *Lucernuta*, *Pyrocoelia*, and *Lychnuris* have been long confused as synonyms due to different interpretations by subsequent authors, and have only recently been clarified by Jeng *et al.* (1999c). This explains why *rufiventris* was alternately transferred among these genera during its taxonomic history. Such generic misplacements may have resulted by authors being misled by the serrate antennae. The morphology of the male genitalia of *V. rufiventris* fundamentally agrees with that of the other species of *Vesta*.

DISTRIBUTION: The species is distributed in Taiwan and central and southern China. Most of the recently collected specimens from Taiwan were from the northern regions, but the species was previously recorded from central and southern Taiwan by Kano (1930) and Miwa (1931). Olivier (1907) and Satô (1970) recorded the species from the Philippines. We examined Satô's material from the Philippines and found it was of *V. flavicollis* (Motschulsky) and not *V. rufiventris*. We have not examined Olivier's specimens from the Philippines.

PHENOLOGY: The species is active from June to August in Taiwan.

ADDITIONAL REMARK: We examined the type specimen of another species, *Lucernuta flaviventris* Fairmaire (**n.comb.** in *Vesta*), from Moupin of Sichuan Province, China (*in* Deyrolle and Fairmaire, 1878). The species is surely a species of *Vesta* and its taxonomic history mirrors that of *V. rufiventris* (*vide infra*). Actually, the general morphology suggests that *L. flaviventris* is likely a junior synonym of *V. rufiventris*. Both species can be found in Sichuan Province. Presently we will leave the synonymy open because we did not examine the male genitalia of *L. flaviventris* nor compare the specimen with the type of *V. rufiventris*. Despite the implication of the specific epithet, *L. flaviventris* has a faded pink coloration to the abdomen rather than yellow. It is not rare to see such kind of fading of coloration among *Vesta* specimens along ages.

Vesta flaviventris (Fairmaire), **new combination**
(Figs. 19–21)

Lucernuta flaviventris Fairmaire *In* Deyrolle and Fairmaire, 1878: 114 [Type locality: Moupin (= currently known as Baoxing County), Sichuan Province, China]; Olivier, 1907: 25; Winkler, 1924–1932: 491.

Pyrocoelia flaviventris (Fairmaire); Olivier, 1886: 197, 203.

Lychnuris flaviventris (Fairmaire); McDermott, 1966: 15.

TYPE MATERIAL EXAMINED: Holotype of *L. flaviventris*, ♂: “Chine, A. DAVID/*Lucernuta flaviventris* F. Moupin” (MNHN, Figs. 19–21).

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