



## Immature stages of *Pleuronota rufosquamosa* (Fairmaire, 1893) (Coleoptera: Scarabaeidae: Cetoniinae), with notes on its biology

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### Abstract

*Pleuronota rufosquamosa* (Fairmaire, 1893) is a little-known flower beetle from southern China and northern Vietnam, and due to taxonomic changes, the genus *Pleuronota* Kraatz, 1892 and the species became new records of China. Morphological characteristics of adults are redescribed. Descriptions of the 3<sup>rd</sup> instar larvae and pupae are also provided, and the morphological differences of the larvae are compared with four genera of the subtribe Taenioderina. All morphological structures are supplemented by photographs. The life history of *P. rufosquamosa* is briefly summarized based on field observation and artificial breeding.

**Key words:** Taenioderini, Taenioderina, new record, larva, pupa, China, Oriental Region

### Introduction

The genus *Pleuronota* Kraatz, 1892 (the tribe Taenioderini: subtribe Taenioderina) represents a poorly known group of flower beetles. The genus has 13 species (1 subspecies) in the world, which is distributed in southern China, Indo-China Peninsula, and Malay Archipelago (Krajčič 1998; Sakai & Nagai 1998).

The taxonomic history of the genus *Pleuronota* was complicated. The genus *Pleuronota* was originally established by Kraatz (1892) based on *P. octomaculata* Kraatz, 1892 from Java. *P. sexmaculata* Kraatz, 1894 was the second species described from Darjeeling (Kraatz 1894), and in the next 70 years no more species had been added. Bourgion (1916) mentioned that the “straight anterior margin of clypeus” of *P. sexmaculata* did not fit Kraatz’s (1892) definition on the genus *Pleuronota*, which had bisinuate clypeus. Mikšić (1971) was aware of this difference, however, he assigned 4 species related to *P. sexmaculata* to the genus *Pleuronota* and then erroneously designated *P. sexmaculata* as type species of the genus *Pleuronota* (Mikšić 1976). Moreover, Mikšić (1972) established a new genus *Macronotiola* Mikšić based on the type species *Macronota elongata* Gory & Percheron, 1833 and assigned other 3 species of *Macronota* and described 1 new subspecies in *Macronotiola*. To resolve this confusion, the genus *Macronotops* was proposed by Krikken (1977) to accommodate 6 *Pleuronota* species/subspecies (except *P. octomaculata*) sensu Mikšić (1976) and *Pleuronota octomaculata*, the type species of the genus *Pleuronota* (fixed by monotypy), was reiterated. Antoine (1986) added the difference of *Pleuronota* and *Macronotops* and indicated that in *Pleuronota*, the abdominal margin is conspicuously upturned and fits with the elytral margin, while this feature is not prominent in *Macronotops*. Qiu *et al.* (2019) pointed out *Macronotops* and *Bombodes* Westwood, 1848 both have an evident median lobe in male genitalia that can be easily separated from *Pleuronota*. Ma didn’t seem to notice Krikken (1977) and Antoine’s (1986) work. In the 1990s, except for *Macronotops sexmaculata* was still being placed in the genus *Pleuronota* (Ma 1992a, 1992b, 1995, 2002), 6 Chinese species were described under *Pleuronota* by Ma (1992a, 1993). Antoine (2000) moved all the 6 species to the genus *Macronotops*, and later 3 species were transferred to the genus *Bombodes* by Huang & Chen (2015).

Due to the above changes, China temporarily lacks records of the genus *Pleuronota*. This paper records again the genus *Pleuronota* and one species of China, *Pleuronota rufosquamosa* (Fairmaire, 1893).

Most *Pleuronota* species are distributed in Indonesia, but *P. rufosquamosa* (Fairmaire, 1893) is the only member of this genus found in southern China and northern Vietnam. This species was originally described under the genus *Taeniodera* Burmeister, 1842. Schenkling (1921) moved it to the genus *Macronota* Hoffmannsegg, 1817. It was placed under the genus *Coilodera* Hope, 1831 and left here for 30 years by Paulian (1960). Later, Mikšić (1976) moved it into *Macronotiola*. And finally, Krikken (1977) moved it into the genus *Pleuronota*. This view has been accepted for many years (Antoine 1990; Sakai & Nagai 1998; Smetana 2006; Krajčák 1998, 2011, 2012; Bezděk 2016).

Sakai & Nagai (1998) provided colorful habitus of *P. rufosquamosa* for the first time. However, this species has no modern description. So, we herein have redescribed the species by examining numerous specimens from different collections and provided high-resolution images.

The historical overview of immature stages of flower beetles described by Šípek & Král (2012) shows that there are no records of immature stages of the tribe Taenioderini. However, two years later, the larval morphology of the tribe Taenioderini was described by them, including 6 species from 4 genera (*Coilodera*, *Euselates* Thomson, 1880, *Meroloba* Thomson, 1880, and *Taeniodera* Burmeister, 1842) of the subtribe Taenioderina (Vendl *et al.* 2014). Fortunately, a female of *P. rufosquamosa* was collected from Nanling Natural Reserve in Guangdong Province, China in July 2023, and later we successfully bred it artificially, and the 3<sup>rd</sup> instar larvae and pupae were obtained. Based on these materials, the morphological characters of the larvae and pupae of *P. rufosquamosa* were here described which represents the first description of the immature stages of the genus. The larval morphology was compared with other related genera with high-resolution images.

Meanwhile, we also observed some habits of this species in the field and in the laboratory, and recorded its life cycle simply.

## Material and methods

**Feeding of adults and larvae.** A female adult was collected from Nanling Natural Reserve in Guangdong Province, China on 2023.VII.14, and was kept in laboratory conditions in a transparent plastic container (L: 21 cm × W: 13.5 cm × H: 13.5 cm), filled with two-thirds of crushed rotten wood which was fermented artificially in lab, such as apple wood, oak wood, and chestnut wood. The adult was abundantly supplied with ripe and sugary fruits (banana or apple), which were changed daily. The box was placed in the insect rearing cabinet (Aucma, SC-328NE) at about 26 °C. We kept it in a location that ensured the female can receive light during the day. The larvae were fed with rotten wood and raised to 3<sup>rd</sup> instar.

**Treatment of larval and pupal specimens.** Four 3<sup>rd</sup> instar larvae, seven male and one female pupae, all F1, obtained from artificial breeding of the female adult. Larvae and pupae have been killed by hot water (80 °C) for 30 s, then preserved in 80% ethanol. Adult characteristics and larval material were examined with a Motic ES-208 stereomicroscope.

**Imaging.** Each all-in-focus image was produced by stack of 8-57 photos mounted with Helicon Focus<sup>®</sup> 7.0. Images of details of larvae were produced by a LAOWA<sup>®</sup> 100 mm f/2.8 CA-Dreamer Macro 2X and a Canon<sup>®</sup> MP-E 65 mm f/2.8 Macro 5X mounted on a Canon<sup>®</sup> EOS 90D camera. All pictures were digitally enhanced using Adobe Photoshop<sup>®</sup> CS5.

**Morphological terminology.** The terminology of larval morphology follows Böving (1936), Sawada (1991). The terminology of pupal morphology follows Šípek *et al.* (2011), Sousa *et al.* (2018). The chaetotaxy of 3<sup>rd</sup> instar larva head of present study follows Šípek *et al.* (2008). Terminology of tomentose pattern of the elytra follows Qiu *et al.* (2017).

Separate labels are indicated by a "/" (forward slash). The following abbreviations identify the collections housing the material examined (curators are given in parentheses):

GXIP Institute of Plant Protection, Guangxi Academy of Agricultural Sciences, Nanning, China (Mr. Yong-Lin Ma, Mr. Xian-Ru Zeng)

IZGAS Institute of Zoology, Guangdong Academy of Sciences, Guangzhou, China (Mr. Zhen-Hua LIU)

MNHN Muséum National d'Histoire naturelle, Paris, France (Dr. Antoine Mantilleri)

## Results

### *Pleuronota rufosquamosa* (Fairmaire, 1893)

Chinese common name: 褐短绒花金龟

*Taeniodera rufosquamosa* Fairmaire, 1893: 293 (tapy locality: Tonkin: Lang -Song); Fairmaire, 1894: 291.

*Macronota rufosquamosa* (Fairmaire): Schenkling 1921: 142.

*Coilodera rufosquamosa* (Fairmaire): Paulian 1960: 17 (153) (Tonkin: Chapa).

*Macronotiola rufosquamosa* (Fairmaire): Mikšić 1976: 158

*Pleuronota rufosquamosa* (Fairmaire): Krikken 1977: 202; Antoine 1990: 28; Krajčák 1998: 92; Sakai & Nagai 1998: 350, plate.132, Figs 1559-1, 2; Krajčák 2012: 216.

**Material examination. CHINA: Guangdong:** 1 ♀ (SYSM), 1964.IV, Luogang (萝岗), Guangzhou, Qiu-Jian TANG leg.; 2 ♂♂ (MYNU), 1964.X.2, Luogang (萝岗), Guangzhou, Zheng-Yi XIE leg.; 1 ♀ (MYNU), 2009.VIII, Nanling, Zhong-Hua ZHENG leg.; 1 ♀ (IZGAS), 2020.VII.8, Nanling, FIT-16; 1 ♀ (MYNU), 2023.VII.14, Nanling Natural Reservein, Hao XU leg.; **Guangxi:** 1 ♀ (GXIP), 1987.VII.16, Maoershan, Xingan Co., Tian-Sheng PU leg.; 2 ♂♂ (MYNU), 2015.V.15, Dayaoshan, alt.1250 m, Jinxiu Co., Jin-Teng ZHAO leg.; 3 ♀♀ (MYNU), 2015.V.18, Dayaoshan, Jinxiu Co., Jin-Teng ZHAO leg.; 4 ♂♂, 1 ♀ (MYNU), 2015.VI, Dayaoshan, alt.1200 m, Jinxiu Co., Jin-Teng ZHAO leg.; 1 ♀ (MYNU), 2015.VI.13, Dayaoshan, alt.1200 m, Jinxiu Co., Jin-Teng ZHAO leg.; 1 ♂ (MYNU), 2015.VI.27, Dayaoshan, alt.1200 m, Jinxiu Co., Jin-Teng ZHAO leg.; 1 ♂, 2 ♀♀ (MYNU), 2015.VII.3–4, Dayaoshan, alt.1200 m, Jinxiu Co., Jin-Teng ZHAO leg.; 1 ♀ (MYNU), 2015.VII.8, Dayaoshan, alt.1300 m, Jinxiu Co., Jin-Teng ZHAO leg.; 1 ♂ (MYNU), 2015.VII.13–14, Dayaoshan, alt.1200 m, Jinxiu Co., Jin-Teng ZHAO leg.; 1 ♂ (MYNU), 2014.VII.29, Shengtangshan, alt.1200 m, Jinxiu Co., Jin-Teng ZHAO leg.; 4 ♀♀ (MYNU), 2014.VII.29, Dayaoshan, alt.1300 m, Jinxiu Co., Jin-Teng ZHAO leg.; 1 ♂, 3 ♀♀ (MYNU), 2014.VII.31, Dayaoshan, alt.1200 m, Jinxiu Co., Jin-Teng ZHAO leg.; 4 ♀♀ (MYNU), 2014.VIII.3, Dayaoshan, alt.1300 m, Jinxiu Co., Jin-Teng ZHAO leg.; 1 ♂, 1 ♀ (MYNU), 2014.VIII.23, Shengtangshan, alt.1100 m, Jinxiu Co., Jin-Teng ZHAO leg.; 1 ♀ (MYNU), 2014.IX.1, Dayaoshan, alt.1200 m, Jinxiu Co., Jin-Teng ZHAO leg.; 2 ♂♂, 1 ♀ (MYNU), 2015.VII.17, Yinshan Park, Jinxiu Co., Lu QIU leg.; 1 ♀ (MYNU), 2023.VI.2, Huaping, Sanmen, Longsheng Co., Lu QIU leg.; 1 ♀ (MYNU), 2023.V.27, Xiabaxia, Wantian, Lingui, Guilin, alt. 657 m, Jian-Yue QIU leg. **VIETNAM:** 1 ♀ (MYNU), 2014.V, Ha Giang; 1 ♂ (MYNU), 2014.VI, Tam Dao, N.Vietnem; 1 ♀ (MNHN), Tonkin // *Macronota rufosquamosa* From. G. RuTov det. 195 // *Macronota rufosquamosa* G.Rutov det.19.

#### Supplemental description of adults (Figs 1–8).

**Redescription** (male). General: Body length 15.0–18.0 mm; width 6.5–7.5 mm, widest at humeral umbone, gradually narrowed backward. Body black. Surface with white, fulvous and brown, semierect, acicular and scale-shaped setae. **Head:** Dorsal surface with dense setiferous punctures (except midline of frons); setae fulvous; setae on frons turn into scales. Anterior margin of clypeus bisinuate, not raised. Maxillary palpus and labial palpus brown. Eye canthus extending laterally, narrow, long. Antenna dark brown; antennal club long, about 2 times length of antennomeres 2–7 combined; inner side of antennomere 8 with few short, fulvous, setae. Ventral surface clad with long, fulvous setae. **Pronotum:** Nearly heptagonal; widest at middle; posterior margin significantly extended backward and covered anterior margin of scutellum; pronotal ridges slightly raised. Surface with dense setiferous punctures (except margin and pronotal ridges); setae (most scale-shaped) short. **Scutellum:** Elongated triangular. Surface with sparse, short setae. **Elytron:** Black, with 4 white tomentose maculae (posthumeral macula, lateral macula, median macula and sutural macula). Widest near the humeral umbone, gradually narrowed to the apex. Surface with dense, short and long sinuous striolae; with short, scale-shaped setae; discolateral costa and humeral umbone glabrous, without setae. The color of setae gradually from brown to white from the base to the end of elytron. Apicosutural angle not pointed. **Mesepimeron, metepisternum and metepimeron:** Black, surface clad with dense, fulvous, long setae. **Sternum:** Preprosternum with dense, long, fulvous setae. Sides of ostprosternum and mesosternum with sparse, long, fulvous setae. Mesometasternal process short triangular, flat; with sparse,

arcuatepunctures and short setae; apex rounded. Metasternum shiny, with sparse, arcuatepunctures; disc flat, without setae; setae gradually denser from middle to side; a longitudinal, yellowish, tomentose macula close to side. **Pygidium:** Surface rugose, with numerous, short and long, sinuous striolae; with sparse, tiny, white, acicular setae.



FIGURES 1–6. Habitus of *Pleuronota rufosquamosa*: 1–3, male; 4–5, female.



**FIGURES 7–9.** Habitus of *Pleuronota rufosquamosa*: 7, male; 8, female; 9, male genitalia.

**FIGURES 10–15.** Artificial breeding and wild habitat: 10, adult female feeding on banana; 11, eggs in rotten wood; 12, 2<sup>nd</sup> instar larvae; 13, habitat of Huaping Natural Reserve in Guangxi Province; 14, habitat of Nanling Natural Reserve in Guangdong Province; 15, adult female found in a Lingren funnel trap.

**Abdomen:** Convex, six abdominal sternites visible. Shiny, with arcuate, setiferous punctures; punctures denser on side; setae short, yellowish. Sternites VI with a row of dense, long, yellowish setae along posterior margin. Sternites II–V with a distinct, yellowish, tomentose macula close to posterior margin on each side. In dorsal view, sternites II–IV with a distinct, transversal, yellowish band along posterior margin on each side. Dorsal surface concave, elytra embedded in abdomen. **Legs:** Slender, simple. Metacoxa, all femora, and tibiae clad with sparse, short and long, fulvous setae. Meso- and metatibia with a small spine near the middle of outer margin. Protibia wide, with 3 teeth. Metatarsus as long as metatibia. Each tarsal segment of meso- and metatarsi with a cluster of stiff, long setae. **Male genital:** Simple, narrowed towards the apex. Apex expanded with sharp protrusions on both sides.

**Sexual dimorphism:** Female is extremely similar to male, except 1) body larger; 2) antennal club shorter; 3) pronotum more rounded; 4) protibia wider; 5) metatarsus a little shorter than metatibia.

**Description of immature stages** (Figs 16–41).

**Body** (Fig. 28). Length 25.9–30.0 mm, C-shaped, whitish.

**Head capsule** (Fig. 16). Maximum width about 3.0 mm, surface of cranium shiny and glabrous, with indistinct, sparse, setiferous micro-sculpture, yellowish brown; clypeus and labrum slightly darker; area around frontoclypeal suture and apices of mandibles usually black. Epicranial suture extending between frontal suture; frontal sutures more or less bisinuate. Frontal sutures distinctly sinuated. Epicranial insertions of antennal muscles indistinct. Stemmata very indistinct. Cranial chaetotaxy is summarized in Table 1.

**TABLE 1.** Cranial chaetotaxy of the larva of *Pleuronota rufosquamosa* (Fairmaire, 1893).

Group of setae	Epicranium			Frons				Clypeus			Labrum				
	DES	PES	EES	AES	PFS	AFS	EFS	AAS	ACS	ECS	PLS	PMS	ELS	LLS	MLS
Long and medium setae	1/1–2	-	1/0	1/0	1/0	-	-	1/0	1/0	1/0	-	1/0	2/0	0/4	0/3–4
Minute setae	2–3	8–9	2–5	-	-	-	1	-	-	-	-	-	-	-	-

Abbreviations. AAS = setae on anterior frontal angle; ACS = anterior clypeal setae; AES = anterior epicranial setae; AFS = anterior frontal setae; DES = dorsoepicranial setae; ECS = exterior clypeal setae; EES = exterior epicranial setae; EFS = exterior frontal setae; ELS = exterior labral setae; LLS = setae on lateral labral lobe; MLL = setae of medial labral lobe, PES = posterior epicranial setae; PFS = posterior frontal setae; PLS = posterior labral setae; PMS = paramedial labral setae.

**Antennae** (Figs 17–18). Relative length of antennomeres I–IV (AN I–IV): AN I > AN IV > AN II > AN III). Vento-apical projection of AN III with single sensory spot. Ultimate antennomere (AN IV) with 4–6 dorsal and 4–6 ventral sensory spots and a round apical sensory spot.

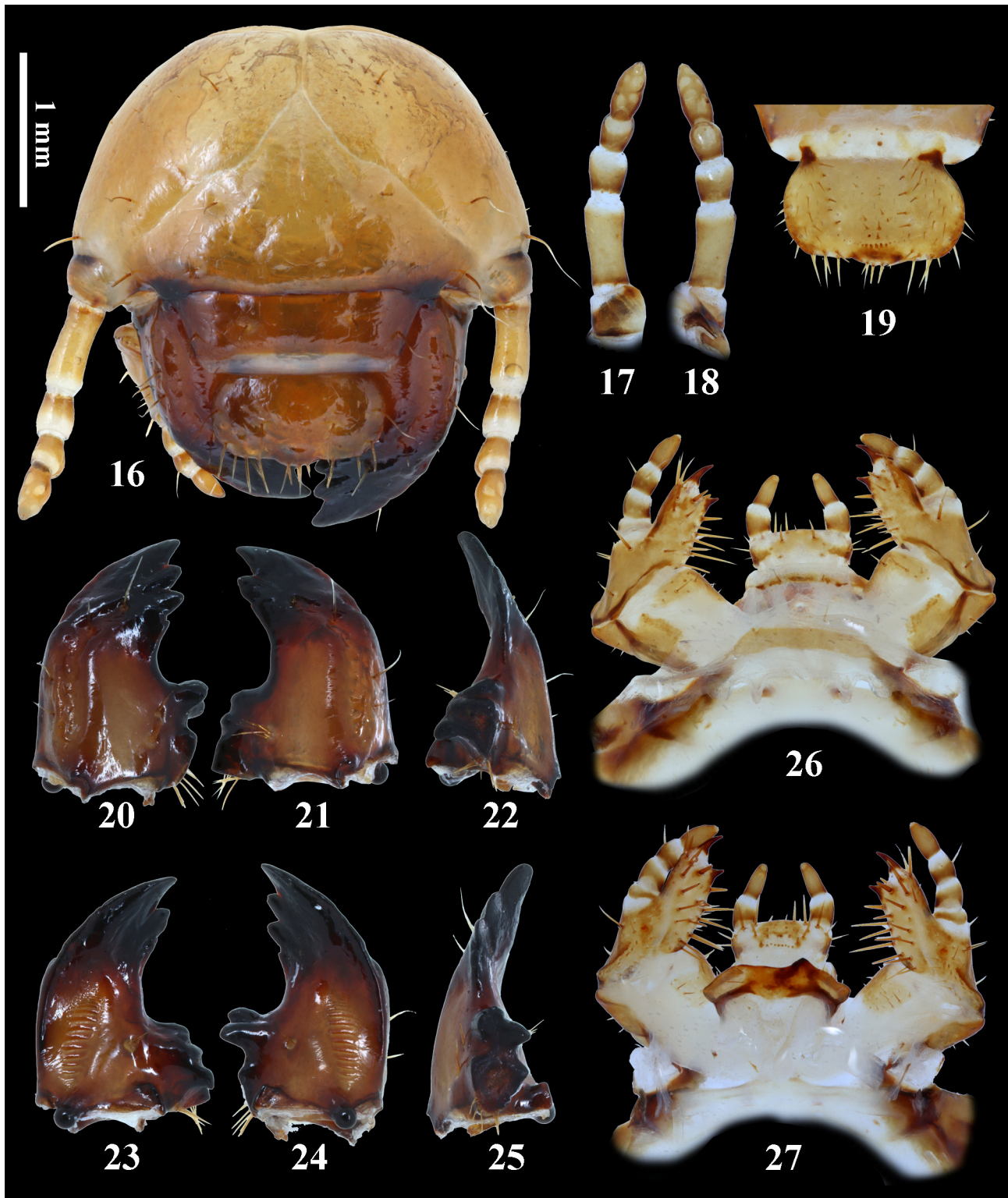
**Clypeus** (Fig. 16). Trapezoidal. Postclypeus reddish brown, somewhat sclerotized, with one anterior and one exterior clypeal setae. Membranous anteclypeal part whitish, smooth, narrow, width about 1/4 of entire clypeal area.

**Labrum** (Fig. 16). Symmetrical, anterior margin trilobed. Dorsal surface with a transverse row of setae along anterior margin; a pair of posterior labral setae and a pair of paramedial labral setae on each side. Clithra present.

**Epipharynx** (Fig. 19). Haptomerum: zygum convex and moderately sclerotized with a transverse, arcuate row of 5 stout setae in the middle, 5 minute setae on the right and 4 minute setae on the left. Acroparia: lateral lobes of epipharynx with 3 long setae, medial lobe with 3 and 3–4 setae. Acanthoparia with 3 setae. Proplegmatium absent. Plegmatium absent. Chaetoparia asymmetric, with 2–3 irregular, distinct, longitudinal rows of stout, long setae near the acanthoparia and 1–2 irregular, distinct longitudinal rows with stout, spine-like setae. Gymnoparia absent. Torma asymmetrical. Dextortorma straight, robust, short; right pternotorma well developed. Laeotorma absent; left pternotorma well developed. Haptolachus: with 4 sensilla on the base. Sensorial cone (= left nesium) present, sclerotized plate (= right nesium) absent. Plate-shaped sclerite absent. Sensilla of haptolachus organized in two groups (both with two sensilla). Phoba and crepis absent.

**Mandibles** (Figs 20–25). Asymmetrical. Longitudinal furrow present. Dorsal surface of both mandibles with 2 setae near the apical area and 2 setae located along outer margin. Ventral surface with 8–9 ventromolar setae. A brustia of 7–8 long setae on the basal margin of molar part. Stridulatory area present, with 13–14 transversal ridges. Left mandible (Figs 20, 24–25) with 4 scissorial teeth; apical tooth only slightly falcate; second and third tooth prominent and obtuse; fourth tooth small and stunted. Left molar with 2 lobes and 1 calyx; calyx flattened, sub-

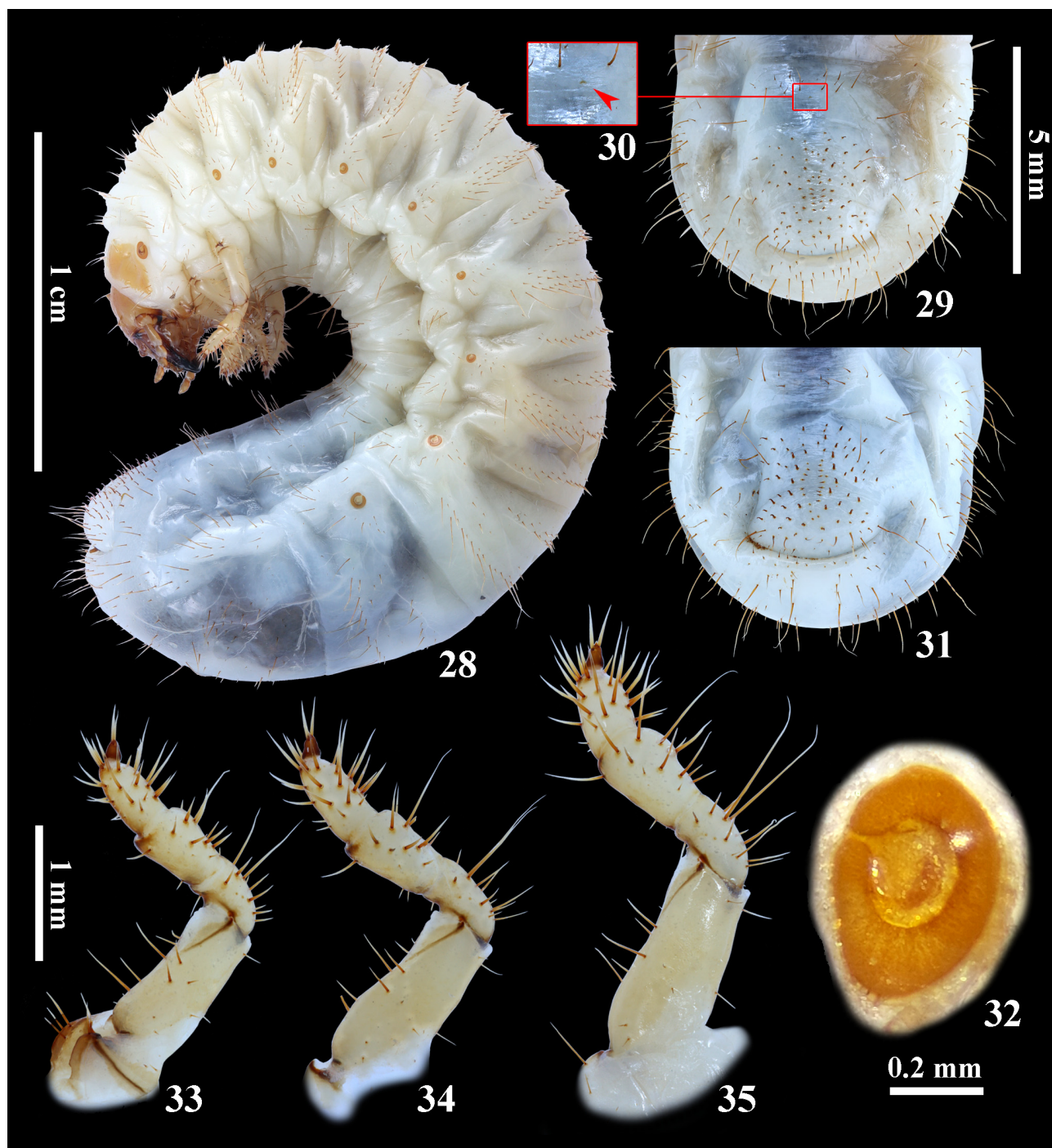
triangular. Dorsal surface of left mandible near the molar with 2 groups of setae. Right mandible (Figs 21–23) with three scissorial teeth; apical and second teeth prominent; the third tooth scarcely developed and no SN recognisable. Molar area of right mandible with 3 transverse lobes and 1 calyx divided into two triangular lobes. One group of setae located in dorsal surface of the right mandible near the molar. Lateral outline of both mandibles without prominent external tooth.



**FIGURES 16–27.** *Pleuronota rufosquamosa*, 3<sup>rd</sup> instar larva: 16, cranium; 17–18, right antenna: dorsal view (17), ventral view (18); 19, epipharynx; 20–25, mandibles: left mandible in dorsal (20), ventral (24), and internal view (25), right mandible in dorsal (21), ventral (23), and internal view (22); labium, maxillae, ventral view (26), dorsal view (27).

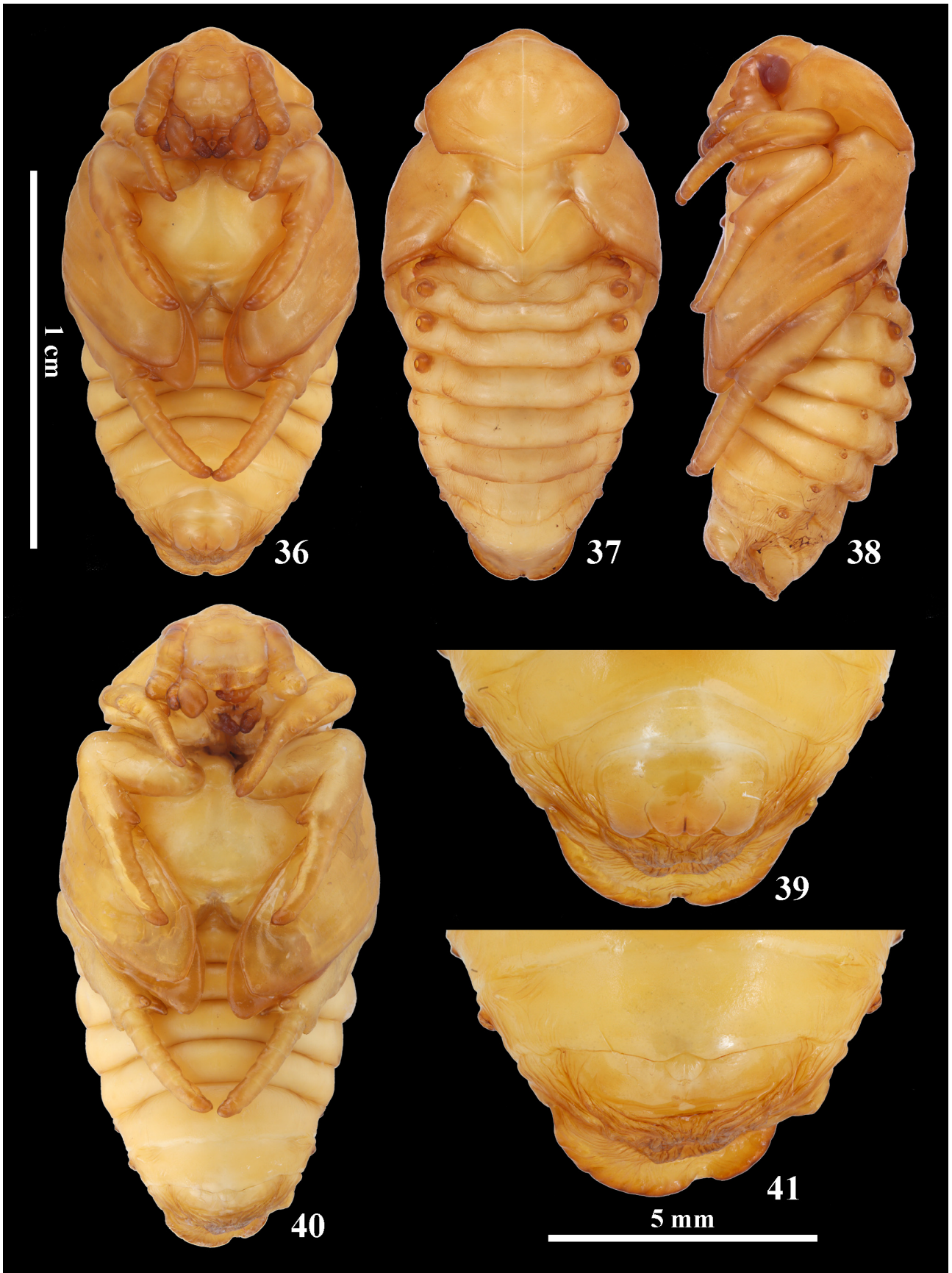
**Maxilla** (Figs 26–27). Symmetrical. Dorsal surface of cardo with 1 seta and labacoparia with 13–14 setae. Ventral surface of cardo with 1 seta and labacoparia with 5–7 setae. Dorsal surface of stipes with approximately 9–10 slender hair-like setae and 3 or 4 anterolateral setae. Maxillary stridulatory with a row of 7–8 spine-like stridulatory teeth and 1 blunt tubercle. Ventral surface of stipes with a proximal and a distal seta. Galea and lacina entirely fused forming mala, galeo-lacinal suture indistinct, entirely absent on ventral face. Galear portion of mala with a falcate uncus and 4 long, stout, hair-like setae in longitudinal rows, and 2 slender and shorter setae. Lacinal part of mala with an uncus and about 20 long and stiff setae. Maxillary palps tetramerous, penultimate palpomere with 2 setae.

**Hypopharyngeal sclerome** (Fig. 27). Asymmetrical, obliquely transverse, with a sharp and sclerotized process on right side. Phoba present on left lateral lobe, right side of the basal membrane (below the right lateral lobe) without phoba. Both lateral lobes only feebly sclerotized.



**FIGURES 28–35.** *Pleuronota rufosquamosa*, 3<sup>rd</sup> instar larva: 28, habitus; 29, 31, raster; 30, a spot; 32, thoracic spiracle; 33–35, legs: fore leg (33), middle leg (34), and hind leg (35).





**FIGURES 36–41.** *Pleuronota rufosquamosa*, pupa: 36–39, male in ventral (36), dorsal (37), lateral view (38), and detail of genital ampulla (39); 40–41, female in ventral (40), and detail of genital ampulla (41).

**Ligula** (Fig. 27). Dorsal surface with approximately 4–5 long hair-like setae on each side, a paramedial longitudinal row of 2–3 stout setae near the medial line. Base of ligula with a transverse row of about 8 campaniform setae. Labial palpi bimerous.

**Thorax** (Fig. 28). Prothorax with one dorsal lobe, meso- and metathorax with three lobes. Prothoracic sclerite well sclerotized, with 6 setae on the anteroventral margin and another 1 seta in the postero-dorsal area. Each dorsal lobe of thoracic segments with one row of sparse, short and long setae. Prothoracic spiracle with C-shaped respiratory plate. Fore and middle legs (Figs 33–34) subequal in shape and size; hind legs (Fig. 35) thicker and longer. Pretarsus conical with minute pointed tip and 2 apical setae. Bullar opening of thoracic spiracle (Fig. 32) narrow, arms of respiratory plate nearly concealed.

**Abdomen** (Fig. 28). 9-segmented, segments IX and X fused dorsally, ventrally separated by an incomplete groove. Segments I–VII with 3 dorsal lobes, segment VIII–IX with 2 dorsal lobes. Each dorsal lobe of abdominal segments I–VIII with 2–3 rows of setae; setae of anterior rows short; setae of posterior row short and long. Abdominal spiracles similar to mesothoracic spiracle; abdominal spiracles I–VI subequal in size; abdominal spiracles VII–VIII subequal in size and larger than abdominal spiracles I–VI. All spiracular areas with 4–6 slender, short and long setae. Bullar of abdominal spiracles I–V opening wide, while abdominal spiracles VI–VIII narrow. Dorsum of ultimate abdominal segment (fused segments IX and X) unevenly covered by sparse and long setae. Anal slit transverse.

**Raster** (Figs 29, 31) with a pair of palidia. Each palidium composed of a row of 7–10 short pali. Teges almost entirely separated by pali. Tegilla with numerous apically hamate setae and 2 stiff, long, hair-like setae. Ventral anal lip with short and long, apically recurved/hamate setae.

**Pupa** (Figs 36–41). Body yellow, length about 13.5–14.9 mm, width about 7 mm, bent ventrally. Head with vertex almost hidden under pronotum in dorsal view. Mouthparts and antenna well separated. Maxillary palps slightly prominent. Compound eyes distinct. Elytra curved ventrally around body and with slightly distinct grooves. Protibia with typical 3 external spines and 1 internal spur, meso- and metatibia with 2 distinct internal spines and 2 internal spurs, tarsomeres more or less well defined. Abdominal tergites well defined, with barely visible rudiments of tergopleural glands between segments I–II, II–III, III–IV, IV–V, V–VI, and VI–VII. Spiracles of segment I vaguely visible under the wings; spiracles of segment II–VIII clearly visible; spiracles of segments I–IV much larger than others. All spiracles distinctly elevated. Genital ampullae well visible and considerably different between sexes, located in sternite IX. Male genital ampulla (Fig. 39) large, protruding, with symmetrical wave apex, female genital ampulla (Fig. 41) formed by 2 small tubercles.

**Field Biology and breeding observations.** This species primarily inhabits in mountain region at 1000–1500 m. Adults visit flowers as pollinators, while their larvae are saprophagous, feeding on rotten wood.

The life cycle of *P. rufosquamosa* was observed during July 2023 to May 2024 under laboratory conditions. A female adult was collected on July 14, 2023, which had already been mated in the wild. Then, 16 eggs were found on the 20<sup>th</sup> and 5 more eggs were found till 23<sup>rd</sup>. The eggs were initially elongated oval in shape, and after a period of keeping in wet rotten wood, they absorbed water and swelled to nearly spherical. The entire larval development was very fast. By the 30<sup>th</sup>, the female adult died. The 1<sup>st</sup> instar period lasted about one week. In late September, 19 larvae were alive and had reached 2<sup>nd</sup> instar. In late October, 3<sup>rd</sup> instar larvae were found coexisting with cocoons (some larvae had already pupated). Before pupating, the 3<sup>rd</sup> instar larvae used their feces that had not yet been excreted to make oval cocoons. Some cocoons were completely in rotten wood, and others were against the wall of box. The cocooning period was relatively long, taking about 4 to 5 months. In January 2024, adults were found hibernating in the cocoons. Pupae emerged at the end of February and adults were active at the end of April 2024.

## Discussion

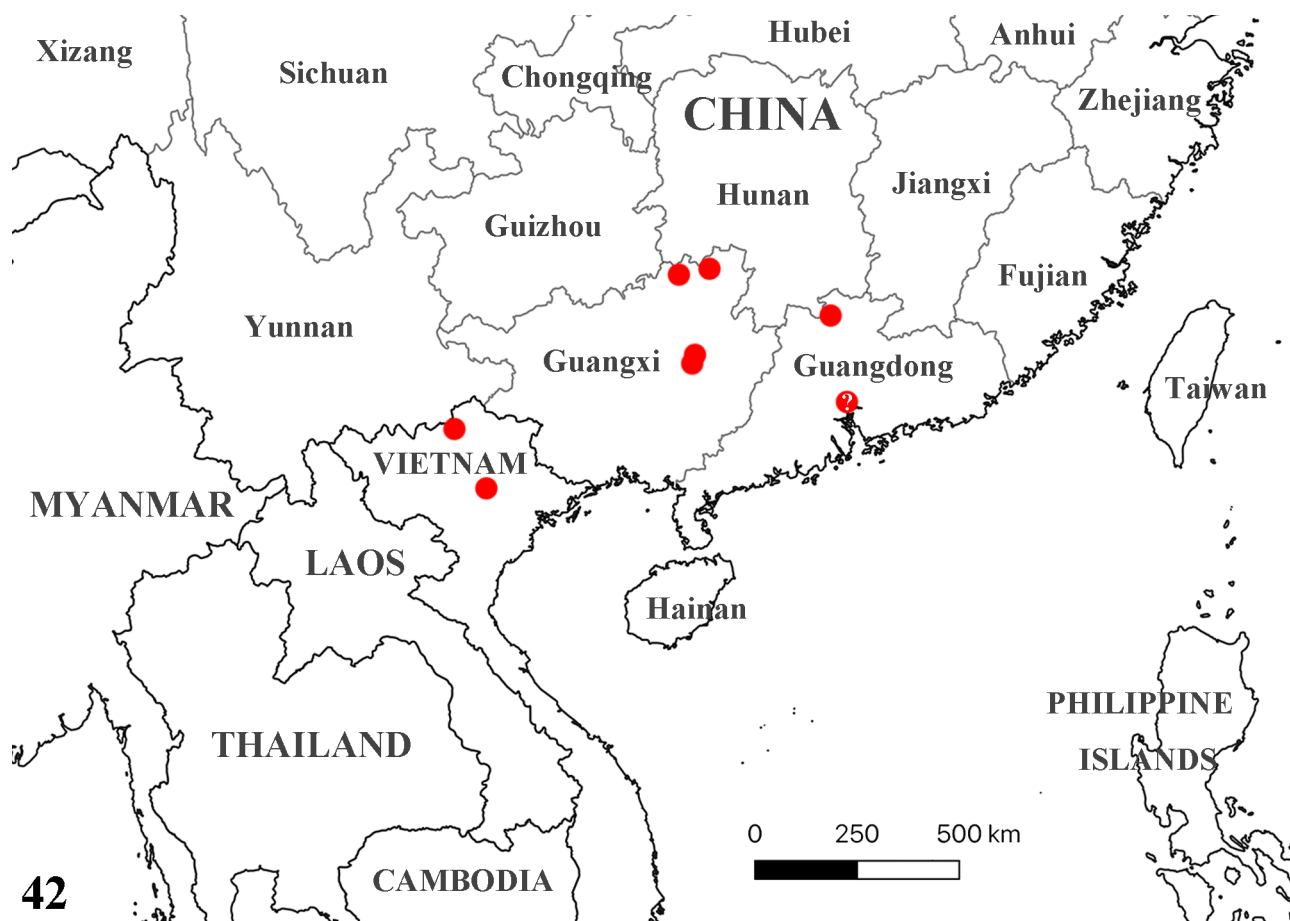
Based on the morphology of Taenioderini larvae studied by Vendl *et al.* (2014), we chose larvae of 2 species of *Coilodera*, 2 species of *Euselates*, 1 species of *Meroloba* and 1 species of *Taeniodera*, to compare morphological characteristics with *Pleuronota*. The differences of the larvae of different genera are shown in Table 2. The most significant difference is the plate-shaped sclerite of epipharynx which is absent in *Pleuronota*, while clearly present in the other genera.

**TABLE 2.** The differences of the larvae of different genera.

	<b>Laetorma</b>	<b>Plate-shapd sclerite</b>	<b>Lacinial unci</b>	<b>Stridulatory area</b>
<i>Coilodera</i>	strongly reduced/absent	present	single	Approximately 20 ridges
<i>Euselates</i>	strongly reduced/absent	present	two	20-25 ridges
<i>Meroloba</i>	absent	present	single	10 ridges
<i>Taeniodera</i>	absent	present	two	16-17 ridges
<i>Pleuronota</i>	absent	absent	single	13–14 ridges

We pointed out a spot (Fig. 30) located on the ventral surface of the penultimate abdominal segment of the 3<sup>rd</sup> instar larva, about 1 mm from the suture between the two segments (IX and X). Hurpin (1953) mentioned that this spot can be used to distinguish sexes of Coleoptera larvae, which is present in males and absent in females. We suspect that this method should also be applicable to the sex differentiation of larvae in *P. rufosquamosa*, but there is no validation process in this study, which will be the focus of future research.

The species has two distribution records in Luogang (萝岗), Guangzhou, and no more specimen of *P. rufosquamosa* was collected since 1964. It is possible that the specimens were mislabeled. Although Guangzhou has rapidly expanded into a large city over the past few decades, there are still many forests around it. Based on our collection experience, this species is usually distributed above 700 m, but the location of the label “Luogang, Guangzhou” is a place at an altitude of less than 100 m.



**FIGURES 42.** Distribution of *Pleuronota rufosquamosa*.

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
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## 褐短绒花金龟 *Pleuronota rufosquamosa* 幼虫和蛹形态描述及其生物学记录 (鞘翅目: 金龟科: 花金龟亚科)

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**摘要:** 褐短绒花金龟 *Pleuronota rufosquamosa* 是一种分布于中国南部和越南北部的鲜为人知的花金龟。由于分类学上的变化绒花金龟属 *Pleuronota* 和该种成为了中国的新记录。本文重新描述了成虫形态特征, 还描述了三龄幼虫和蛹的形态特征, 并附以清晰照片, 同时与陷纹花金龟亚族 *Taenioderina* 的4个属进行了幼虫形态差异比较。根据野外观察和人工饲养, 简要总结了褐短绒花金龟的生活史。

**关键词:** 凹背花金龟族; 陷纹花金龟亚族; 新记录; 幼虫; 蛹; 中国; 东洋区