

Taxonomic study of the tribe Campsomerini (Hymenoptera, Scoliidae) from northern Vietnam, with the description of a new species and a checklist of Vietnamese scoliid wasps

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Abstract

The tribe Campsomerini (Hymenoptera: Scoliidae) from northern Vietnam was studied, resulting in the finding of three species and six subspecies belonging to five genera. Three genera (*Megacampsomeris* Betrem, 1928 (with *M. shillongensis* (Betrem, 1928)), *Micromerialla* Betrem, 1964 (with *M. marginella marginella* (Klug, 1810)) and *Phalerimeris* Betrem, 1967 (with *P. phalerata phalerata* (de Saussure, 1858))) and three species (*Sericocampsomeris flavomaculata* Gupta & Jonathan, 1989, *Campsomeriella* (*Annulimeris*) *annulata* (Fabricius, 1793) and *C. (Campsomeriella) collaris* (Fabricius, 1775)) are recorded for the first time from Vietnam. One new species, *Sericocampsomeris vietnamica* Pham & van Achterberg, **sp. nov.** is described and illustrated. Identification keys to the genera, species and subspecies of the tribe Campsomerini from northern Vietnam and to the species of *Sericocampsomeris* Betrem, 1941 are presented. Lastly, we provide a checklist with 13 species and subspecies of Scoliidae from Vietnam.

Key Words

checklist, hairy wasp, key, new record, Oriental region, Scoliinae, *Sericocampsomeris*

Introduction

The family Scoliidae Latreille, 1802, is a group of solitary aculeate wasps belonging to the superfamily Vespoidea and is distributed worldwide. They are commonly known as digger wasps, hairy wasps or scarab-hunter wasps and are parasitoids of scarab larvae (Coleoptera, Scarabaeidae). There are about 560 species in 43 genera belonging to two subfamilies: Proscoliinae and Scoliinae. Proscoliinae, represented by a single genus, *Proscolia* Rasnitsyn, 1977 with two known species, is recorded from the South Palearctic Region, being known only from Armenia and Greece.

The Scoliinae, consisting of about 558 species distributed amongst 42 genera in two tribes, Campsomerini Betrem, 1965 and Scoliini Latreille, 1802 is recorded throughout the world, predominantly in tropical and subtropical regions (Day et al. 1981; Osten 2005; Girish Kumar and Pham Ph 2015; Liu et al. 2021a; Taylor and Barthélémy 2021).

Members of the Scoliidae are readily distinguished from other families of Hymenoptera by two primary characters: 1 - The wing membrane beyond the closed cells is closely striolate; and 2 - The mesosternum and metasternum form a flat plate overlying the bases of the mid- and hind coxae (Krombein 1978; Gupta and Jonathan 2003).

Males and females usually show a high degree of sexual dimorphism, differing in the number of antennal segments, often in wing venation, body-form and colour. While females are relatively easy to distinguish to genus and species, males are, in general, difficult to identify as they are very similar in external morphological characters (Gupta and Jonathan 2003; Liu et al. 2021b).

From North to South, Vietnam has a 3444 km long coastline and a 4639 km long land boundary. Known as a country of mega-biodiversity, it consists of subtropical and warm-temperate climate in the north and a tropical climate in the south. Northern Vietnam, especially, is within the Indo-Burma biodiversity hotspot and has, climatically, more or less warm-temperate characteristics and is expected to be a primary biodiversity centre (Pham Ph and Girish Kumar 2015). Unfortunately, diversity and taxonomic studies conducted in the country are few and fragmentary. This is most probably due to protracted wars in the past and the lack of Vietnamese entomologists. This lack of information includes the Scoliidae. The Vietnamese scoliid wasps were previously treated by Betrem (1928) in his monograph of the Indo-Australian Scoliidae with zoogeographical considerations, based mainly on specimens deposited in the Natural History Museum at Paris. Betrem (1941), Bradley and Betrem (1967), Gupta and Jonathan (2003), Liu et al. (2021a), Taylor and Barthélémy (2021) and Chen et al. (2022) listed scoliid species from Vietnam, but likely the references in the last five papers are based on Betrem (1928, 1941) only. Khuat et al. (2013) recorded an undetermined scoliid species from Ha Noi as *Campsomeris* sp.

Here, we study the taxonomy of the tribe Campsomerini (Hymenoptera, Scoliidae) from northern Vietnam, describe and illustrate a new species and provide a key to the genera, species and subspecies of the tribe from northern Vietnam and an identification key to all *Sericocampsomeris* species. The goal of this paper is to provide new species and genera

records for Vietnam and to considerably enhance the current knowledge on the scoliid wasp fauna of Vietnam; we also present a checklist of Scoliidae from the country.

Materials and methods

Specimens were collected using sweep nets and Malaise traps at localities in the following provinces in northern Vietnam: Ha Noi, Hai Phong, Hoa Binh, Lang Son, Lao Cai, Nam Dinh, Quang Ninh, Thanh Hoa, Thai Binh and Vinh Phuc. Adult morphological characters were observed and described from pinned and dried specimens with the aid of a stereoscopic microscope. Betrem (1928, 1941), Gupta and Jonathan (2003) and Liu et al. (2021b) were used to accomplish identifications to all taxon levels.

Our identification key to species of the genus *Sericocampsomeris* Betrem, 1941 was constructed, based on Vietnamese specimens and the original descriptions of *S. degaullei*, *S. stygia* and *S. punctata* by Betrem (1928), Gupta and Jonathan (2003) and Chen et al. (2022), respectively.

A checklist of Scoliidae from Vietnam was constructed using publications of Betrem (1928, 1941), Bradley and Betrem (1967), Gupta and Jonathan (2003), Osten (2005), Danilov and Dubatolov (2021), Liu et al. (2021a), Taylor and Barthélémy (2021) and Chen et al. (2022).

Photographic images were taken using a Nikon SMZ800N microscope camera and a Canon SD3500 IS camera.

Specimens examined, including the holotype and the paratype of the new species are deposited in the Institute of Ecology and Biological Resources (IEBR), Vietnam Academy of Science and Technology, Ha Noi, Vietnam.

Abbreviations used in the text are as follows: Metasomal tergum = **T(x)**, x being the tergum number, Metasomal sternum = **S(γ)**, γ being the sternum number.

Results and discussion

Order Hymenoptera

Family Scoliidae Latreille, 1802

Subfamily Scoliinae Latreille, 1802

Tribe Campsomerini Betrem, 1965

Key to the genera, species and subspecies of Campsomerini from northern Vietnam

(females of *Micromeriella* Betrem and *Megacampsomeris* Betrem unknown).

- 1 Females. Body robust; integument usually marked with reddish-yellow spots or bands; antenna short, with 10 flagellomeres; fore legs fossorial, outer surface of mid- and hind tibiae with numerous, short, heavy spines; metasoma 6-segmented, first metasomal segment as wide as propodeum, without three apical spines protruding posteriorly from last metasomal segment, frequently with sting protruding apically 2
- Males. Body slender; integument usually marked with yellow spots or bands; antenna long, with 11 flagellomeres; fore legs slender, outer surface of mid- and hind tibiae without numerous, short, heavy spines; metasoma 7-segmented, first metasomal segment narrower than propodeum, usually with three apical spines protruding posteriorly from last metasomal segment 5

- 2 Upper plate of metapleuron punctate dorsally, transition between its vertical and dorsal areas straight anteriorly and gradual posteriorly, without distinct carina below base of hind wing; frons with deep punctures in front of anterior ocellus; first submarginal cell of forewing almost entirely covered with short setae; forewing yellowish with conspicuous black mark subapically; legs ferruginous; T1–T3 with yellow bands apically; head, mesosoma and apical fringe of T1–T4 with dense reddish-golden setae (Fig. 5A) *Phalerimeris* Betrem (*P. phalerata phalerata* (de Saussure, 1858))
- Upper plate of metapleuron impunctate dorsally, transition between its vertical and dorsal areas straight, with distinct carina below base of hind wing; frons without deep punctures in front of anterior ocellus; first submarginal cell of forewing without setae; metasomal terga without yellow bands apically, forewing dark brown; legs black; vestiture variable 3
- 3 Larger species, 30–33 mm; lateral carina of propodeum extended beyond spiracle; dorso-median area of propodeum truncate posteriorly, posterior surface of propodeum with dense punctures; vertex behind posterior ocelli with dense punctures (Fig. 6C); mesopleural crest sharp; metasoma black, except yellow T5, T2–T4 with yellow spots laterally; mesosoma with black setae (Fig. 6D)..... *Sericocampsomeris* Betrem (*S. rubromaculata rubromaculata* (F. Smith, 1855))
- Smaller species, 14–22 mm; lateral carina of propodeum short, unextended up to spiracle; dorso-median area of propodeum triangularly protruding posteriorly, posterior surface of propodeum finely and sparsely punctate; vertex behind posterior ocelli with rather sparse small punctures; mesopleural crest not sharp; metasoma entirely black; head and mesosoma with white or red-brown setae..... *Campsomeriella* Betrem 4
- 4 Erect setae on occiput, scapula (lateroposterior part of pronotum), dorsal surface of pronotum and anterior part of mesoscutum white (Fig. 2A) *Campsomeriella collaris collaris* (Fabricius, 1798)
- Erect setae on occiput, scapula, dorsal surface of pronotum and anterior part of mesoscutum red-brown (Fig. 2D) *Campsomeriella collaris quadrifasciata* (Betrem, 1928)
- 5 Smaller species, 8–9 mm; frontal area above antennal socket not distinctly defined posteriorly, with sparse punctures medially, interspaces much larger than puncture diameter (Fig. 4B); [scutellum and metanotum with yellow spots; T1–T5 with yellow bands apically, those on T2 and T3 anteriorly emarginate medially (Fig. 4A); S2–S4 with narrow yellow bands apically, band on S4 sometimes interrupted medially; genitalia with sparse, long white setae on paramere, base of volsella and lamina volsellaris (Fig. 4C] *Micromeriella* Betrem (*M. marginella marginella* (Klug, 1810))
- Larger species, 10.0–24.5 mm; frontal area above antennal socket distinctly defined posteriorly, with dense punctures medially, interspaces much smaller than puncture diameter 6
- 6 Head elliptical in anterior view, maximum width $\approx 1.3 \times$ its height; front impunctate, with large, flat, triangular area in front of anterior ocellus; declivity of vertex conspicuously sloping and temples receding dorsally..... *Campsomeriella* Betrem 7
- Head subcircular in anterior view, maximum width $\approx 1.1 \times$ its height; front without large impunctate area in front of anterior ocellus; declivity of vertex moderately sloping and temples not receding dorsally..... 9
- 7 S6 and S7 without copulatory brushes; base of volsella covered with sparse and short setae (Fig. 1B) *Campsomeriella* (*Annulimeris*) *annulata annulata* (Fabricius, 1793)
- S6 and S7 with copulatory brushes, base of volsella covered with dense and long setae (Fig. 2C, F) 8
- 8 T1–T3 with wide yellow bands, covering almost entire T1, more than three-fourths of T2 and more than one-half of T3 (Fig. 2B); S2, S3 and S5 with a pair of rather small yellow spots posterolaterally *Campsomeriella* (*Campsomeriella*) *collaris collaris* (Fabricius, 1798)
- T1–T3 with narrow yellow bands, covering about one-half of T1 and T2, about one-third of T3 (Fig. 2E); S5 without a pair of small yellow spots posterolaterally *Campsomeriella* (*Campsomeriella*) *collaris quadrifasciata* (Betrem, 1928)
- 9 Scrobe, gena, mesoscutum and legs partly yellow; hind tibial spurs white; apical yellow band on T1 uninterrupted medially; apical yellow band on S3 broadly interrupted medially; paramere moderately long and stout; base of volsella with long setae 10
- Scrobe, gena, mesoscutum and legs entirely black; hind tibial spurs black; apical yellow band on T1 largely interrupted medially; apical yellow band on S3 uninterrupted or very narrowly interrupted medially; paramere short and slender; base of volsella with moderately long setae *Sericocampsomeris* Betrem 11
- 10 Antenna entirely black; metanotum with small yellow spot medially; hind legs entirely black (Fig. 5B); base of volsella with sparse setae, distance between bases of these setae more than their own diameter; length of body less than 13 mm (Fig. 5C) *Phalerimeris* Betrem (*P. phalerata phalerata* (de Saussure, 1858))
- Antenna reddish-brown; metanotum without yellow spot medially; hind legs partly yellow (Fig. 3A); base of volsella with dense setae, distance between bases of these setae less than their own diameter; length of body more than 17 mm (Fig. 3B)..... *Megacampsomeris* Betrem (*M. shillongensis* (Betrem, 1928))
- 11 Clypeus with yellowish band apically; head and mesosoma densely, deeply and coarsely punctate (Fig. 7A); scapula black; mesosoma with dense yellowish setae (Fig. 7B); T1–T3 with yellow bands apically (Fig. 7C); paramere with short setae (Fig. 7F)..... *Sericocampsomeris vietnamica* Pham & van Achterberg, sp. nov.
- Clypeus black; mesosoma moderately densely and shallowly punctate (Fig. 6A); scapula yellow; mesosoma with sparse, pale white setae; T1–T5 with yellow bands apically; paramere with dense and long setae (Fig. 6B) *Sericocampsomeris flavomaculata* Gupta & Jonathan, 1989

Campsomeriella Betrem, 1941

Campsomeris subgenus *Campsomeriella* Betrem, 1941: 86.

Campsomeriella Betrem, 1967: 25.

Type species. *Scolia thoracica* Fabricius, 1787.

***Campsomeriella (Annulimeris) annulata annulata* (Fabricius, 1793)**

Fig. 1A, B

Tiphia annulata Fabricius, 1793: 225.

Campsomeris servillei Lepeletier, 1845: 501.

Scolia annulata (Fabricius): F. Smith 1855: 100.

Elis (Dielis) annulata (Fabricius): de Saussure and Sichel 1864: 196.

Elis aglaea Cameron, 1901: 19.

Campsomeris annulata (Fabricius): Rohwer 1921: 88.

Campsomeris (Dielis) annulata (Fabricius): Betrem 1928: 94–95.

Campsomeris (Phalerimeris) annulata (Fabricius): Bradley 1964: 9.

Campsomeriella (Annulimeris) annulata (Fabricius): Betrem 1967: 25–29.

Campsomeris (Campsomeriella) annulata annulata (Fabricius): Tsuneki 1972: 18–19.

Campsomeriella (Annulimeris) annulata (Fabricius): Krombein 1979: 1317.

Specimens examined. VIETNAM: Thai Binh: 1 ♂, Hong Minh, Hung Ha, 24.vi.2013, Coll. Phong Huy Pham. Ha Noi: 4 ♂♂, Co Nhue 2, Bac Tu Liem, 13.xii.2015, Coll. Phong Huy Pham. Hoa Binh: 6 ♂♂, Tan Thanh, Luong Son, 1–30.viii.2018, Malaise traps, Coll. Phong Huy Pham.

Diagnosis. Male. Body length 11–16 mm. Front large-ly impunctate, with large, flat, triangular area in front of anterior ocellus; declivity of vertex conspicuously sloping and temples receding dorsally; antennal segment not distinctly crenulate; S6 and S7 without copulatory brushes; base of mandible, clypeus laterally, dorsal surface of pronotum, callosity, scapula, broad stripe narrowly interrupted medially on the scutellum, large spot on metanotum medially, small apical stripe on inner surface of first femur, apical half on the outer surface of all femora, outer surface of first and second tibiae and outer surface of first and fifth fore tarsal segments yellow; T1–T5 with apical yellow bands, covering about one-third of T1, T4 and T5 and about one-half of T2 and T3 (Fig. 1A); apical yellow bands on S2–S4 broadly interrupted medially; metasoma with blue reflections; erect vestiture white, except black on two last metasomal segments; wings lightly infumated; base of volsella covered with sparse and short setae (Fig. 1B).

Female. Unknown.

Distribution. Vietnam (new record): Ha Noi, Hoa Binh, Thai Binh (Fig. 8A). Elsewhere: Bhutan, China, India, Indonesia, Japan, Korea, Malaysia, Myanmar, Nepal, Philippines (Betrem 1928; Gupta and Jonathan 2003; Girish Kumar and Pham Ph 2015; Liu et al. 2021a; Taylor and Barthélémy 2021).

***Campsomeriella (Campsomeriella) collaris collaris* (Fabricius, 1775)**

Fig. 2A–C

Tiphia collaris Fabricius, 1775: 354.

Tiphia thoracica Fabricius, 1798: 254.

Colpa parvula Lepeletier, 1845: 548.

Elis (Dielis) thoracica (Fabricius): Bingham 1897: 99.

Elis (Dielis) fimbriata (Burmeister): Bingham 1897: 99.

Campsomeris (Campsomeris) collaris (Fabricius): Betrem 1928: 126.

Campsomeris (Campsomeriella) collaris (Fabricius): Betrem 1941: 89.

Campsomeris (Campsomeriella) collaris collaris (Fabricius): Bradley 1964: 12.

Campsomeriella (Campsomeriella) collaris collaris (Fabricius): Betrem 1967: 29.

Specimens examined. VIETNAM: Thai Binh: 1 ♀, Phuong Cong, Tien Hai, 03.ix.2015; 4 ♀♀ + 4 ♂♂, Coll. Phong Huy Pham; Dong Minh and Dong Hoang, Tien Hai, 27.vii.2017, 2.ix.2017 Coll. Phong Huy Pham; 2 ♀♀ + 3 ♂♂, Hong Minh, Hung Ha, 25.vi.2013, 10.vii.2017, Coll. Phong Huy Pham. Hoa Binh: 1 ♀, Thanh Nong, Kim Boi, 5.viii.2017, Coll. Phong Huy Pham; 1 ♀, My Tan, Tan Thanh, Luong Son, 27.vi.2019, Coll. Phong Huy Pham. Thanh Hoa: 3 ♀♀ + 4 ♂♂, Sam Son town, 22.vi.2016, 26–28.vii.2020, Coll. Phong Huy Pham; 2 ♀♀ + 2 ♂♂, Hai Tien, Hoang Hoa, 1.vi.2022, Coll. Phong Huy Pham. Ha Noi: 2 ♀♀ + 4 ♂♂, Red River Bank, Long Bien, 13.ix.2015, Coll. Phong Huy Pham; 2 ♀♀ + 3 ♂♂, Lien Mac, Bac Tu Liem, 26.viii.2017, 19.viii.2017, 22.x.2017, 6.vii.2019, Coll. Phong Huy Pham; 2 ♀♀, Van Hoa, Ba Vi, 8.i.2020, Coll. Phong Huy Pham; 6 ♀♀ + 2 ♂♂, Co Nhue 2, Bac Tu Liem, 12.xii.2015, 05.i.2016, 12.xii.2022, 1.i.2023, Coll. Phong Huy Pham; 2 ♀♀ + 2 ♂♂, Minh Khai, Bac Tu Liem, iii–vi.2019, Malaise traps, Coll. Phong Huy Pham; 1 ♂, Thuy Xuan Tien, Chuong My, Malaise trap, Coll. Phong Huy Pham. Vinh Phuc: 3 ♀♀, Me Linh Station for biodiversity, Me Linh, 2.vi.2018, Coll. Phong Huy Pham. Nam Dinh: 1 ♀, Xuan Thuy National Park, Xuan Thuy, 3.ix.2016, Coll. Phong Huy Pham. Quang Ninh: 1 ♂, Bai Chay, Ha Long, 14.vi.2020, Coll. Phong Huy Pham.

Diagnosis. Female. Body length 14–21 mm. Vestiture black, except greyish on clypeus, front and antennal scape; occiput, dorsal surface of pronotum, scapula and anterior part of mesoscutum with dense, erect white setae; wings dark brown, with conspicuously blue reflections (Fig. 2A).

Male. Body length 10–15 mm. S6 and S7 with copulatory brushes; metasoma with light blue reflections; broad stripe along lateral margin of clypeus, base of mandible, dorsal surface of pronotum, scapula dorsally and posteriorly, stripe on callosity, tegula anteriorly; moderately large band on scutellum narrowly interrupted medially, rather small median spot on metanotum, stripe on apical half of all femora, outer surface of all tibiae and outer surface of first and fifth fore tarsal segments yellow; T1–T4 with apical yellow bands, covering almost entire T1, more than three-fourths of T2, more than one-half of T3 and approximately one-half of T4 (Fig. 2B); a pair of rather small yellow spots on S2, S3 and S5 posterolaterally; erect

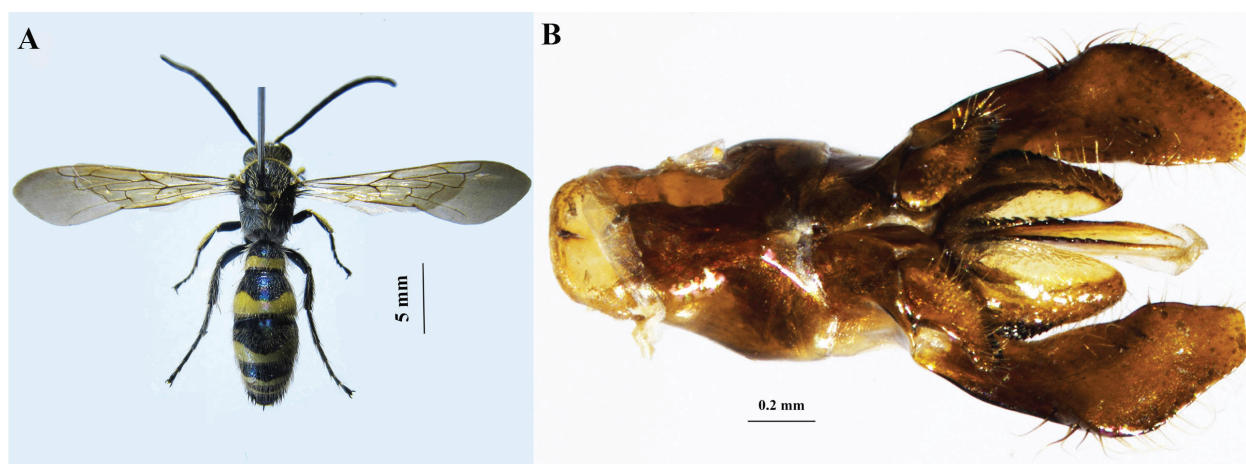


Figure 1. *Campsomeriella (Annulimeris) annulata annulata* (Fabricius, 1793), male. **A.** Habitus, dorsal view; **B.** Genitalia, ventral view.

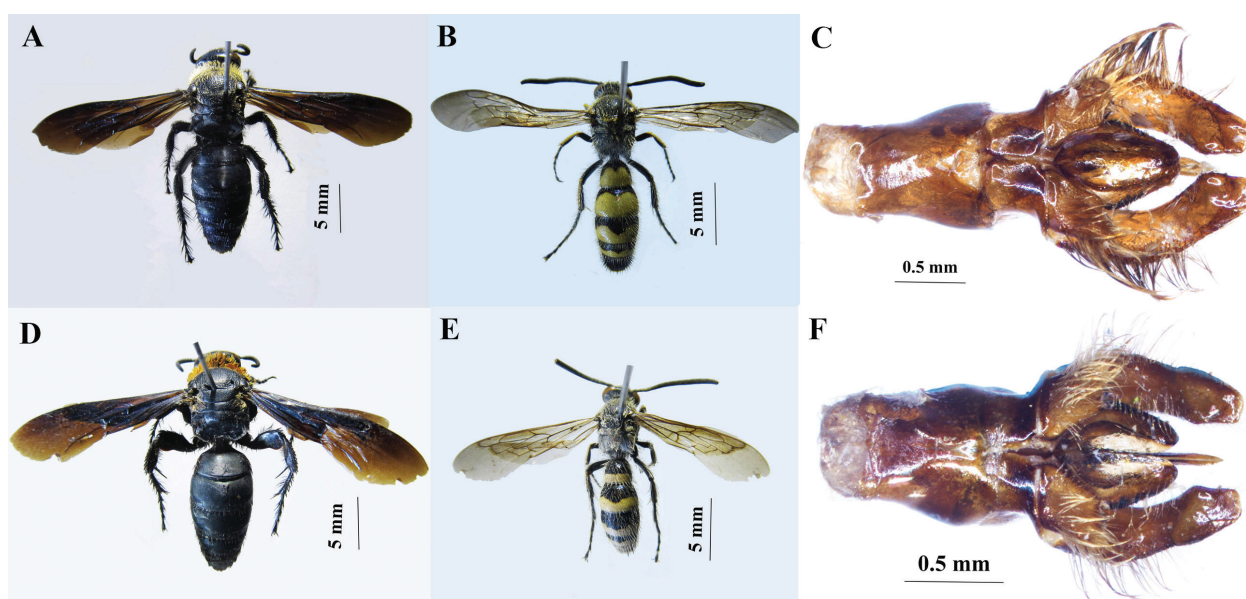


Figure 2. *Campsomeriella (Campsomeriella) collaris collaris* (Fabricius, 1775) and *Campsomeriella (Campsomeriella) collaris quadrifasciata* (Fabricius, 1798). **A–C.** *C. (C.) collaris collaris*; **D–F.** *C. (C.) collaris quadrifasciata* (**A, D.** Habitus, female, dorsal view; **B, E.** Habitus, male, dorsal view; **C, F.** Genitalia, ventral view).

vestiture white, except black on S5–S7; S6 and S7 with long, dense black setae; wings lightly infumated; base of volsella covered with dense and long setae (Fig. 2C).

Distribution. Vietnam (new record): Ha Noi, Hoa Binh, Nam Dinh, Quang Ninh, Thai Binh, Thanh Hoa, Vinh Phuc (Fig. 8B). Elsewhere: Bangladesh, India, Nepal, Sri Lanka (Betrem 1928; Krombein 1978; Gupta and Jonathan 2003; Liu et al. 2021a; Taylor and Barthélémy 2021).

Campsomeriella (Campsomeriella) collaris quadrifasciata (Fabricius, 1798)

Fig. 2D–F

Scolia quadrifasciata Fabricius, 1798: 231.

Campsomeris quadrifasciata Fabricius: Betrem 1928: 336.

Campsomeris (Campsomeriella) quadrifasciata Fabricius: Betrem 1941: 89.

Campsomeris (Campsomeriella) collaris quadrifasciata Fabricius: Betrem and Bradley 1964: 19.

Campsomeriella (Campsomeriella) collaris quadrifasciata Fabricius: Betrem 1967: 29.

Specimens examined. VIETNAM: Thai Binh: 13 ♀♀, Hong Minh, Hung Ha, 25.vi.2013, 10.vii.2017, Coll. Phong Huy Pham. Thanh Hoa: 1 ♀ + 2 ♂♂, Sam Son town, 22.vi.2016, 26–28.vii.2020, Coll. Phong Huy Pham; 2♂, Hai Tien, Hoang Hoa, 1.vi.2022, Coll. Phong Huy Pham. Ha Noi: 1 ♀ + 1 ♂, Nghia Do, Cau Giay, 04.i.2016, 16.vii.2017, Coll. Phong Huy Pham; 1 ♀ + 2 ♂♂, Red river bank, Long Bien, 13.ix.2015, Coll. Phong Huy Pham; 1 ♀, Lien Mac, Bac Tu Liem, 19.viii. 2017, 22.x.2017, Coll. Phong Huy Pham; 2 ♀♀, Van Hoa, Ba Vi, 8.i.2020, Coll. Phong Huy Pham; 8 ♀♀ + 2 ♂♂, Co Nhue 2, Bac Tu Liem, 05.i.2016, 13.xii.2015, 21.xii.2022, Coll. Phong Huy Pham. Lang Son: 1 ♂, Huu Lien, Huu Lung, 13.vi.2018, Coll. Phong Huy Pham.

Diagnosis. Female. Body length 14–22 mm. Vestiture black, except greyish-white on clypeus, front and antennal scape; occiput, dorsal surface of pronotum, scapula and anterior part of mesoscutum with dense, erect red-brown setae; wings dark brown, with light blue reflections (Fig. 2D).

Male. Body length: 10–14 mm. S6 and S7 with copulatory brushes; metasoma with light blue reflections; broad stripe along lateral margin of clypeus, base of mandible, very narrow stripe on scapula posteriorly, very small spot on callosity, tegula anteriorly, small stripe on apical half of fore femur, outer surface of mid-femur apically, small spot on hind femur apically, outer surface of fore and mid-tibiae, large stripe on apical half of hind tibia and outer surface of first and fifth fore tarsal segments yellow; apical yellow bands on T1–T4, covering about one-half of T1, T2 and T4 and about one-third of T3 (Fig. 2E); a pair of small yellow spots on S2 and S3 posterolaterally, sometimes on S4; erect vestiture white, except black on two last metasomal segments; wings lightly infumated; base of volsella covered with dense and long setae (Fig. 2F).

Distribution. Vietnam: Ha Noi, Lang Son, Thanh Hoa, Thai Binh (Fig. 8C). Elsewhere: China, Indonesia, Malaysia, Myanmar, Thailand (Betrem 1928, 1941; Gupta and Jonathan 2003).

Campsomeriella collaris (Fabricius) is a polytypic taxon that is widely distributed primarily in the Oriental region. The species consists of three subspecies, *C. collaris collaris* (Fabricius), *C. collaris quadrifasciata* (Fabricius) and *C. collaris insularis* Gupta & Jonathan, 2003 (Osten 2005). These subspecies are distinguished, in females, by differences in the colour of the erect setae on the head and mesosoma and reflections on wings and in males, by the difference in yellow spots.

In northern Vietnam, *C. collaris collaris* (Fabricius) and *C. collaris quadrifasciata* (Fabricius) are the most common and recognised scoliid species because of the entirely black body in females, the dark brown wings and erect white or red-brown setae on the occiput, scapula and anterior part of the mesoscutum; and the very large yellow bands on T1–T3 in males of *C. collaris collaris* (Fabricius).

Campsomeriella collaris collaris was originally described from India by Fabricius (1775) as *Tiphia collaris*. Krombein (1979) stated that the subspecies occurs only in Sri Lanka and southern India. Gupta and Jonathan (2003) showed the subspecies being common and widely distributed in the Indian subregion and recorded it occurring in Nepal and Bangladesh. Betrem (1928) recorded only *C. collaris quadrifasciata* from northern and central Vietnam. Liu et al. (2021a, 2021b) recorded *C. (C.) collaris* from China without recognition of subspecies. Judging from the key characters and images, these specimens should be classified as *C. (C.) collaris quadrifasciata*. Taylor and Barthélémy (2021) recorded it from Hong Kong. In this present study, the first author found that populations collected at the same locality, for example, Thai Binh and Thanh Hoa, would key to both *C. collaris collaris* and *C. collaris quadrifasciata*. We hypothesise

that *C. collaris* populations are variable in colour in India, Nepal, Bangladesh to Vietnam and China and that recognition of both subspecies is probably not warranted as indicated in Liu et al. (2021a, 2021b). Future research is needed to better understand the colour variation of this species in a larger geographical context.

Some small female specimens (14–15 mm body length) have dense greyish setae on the occiput, scapula and anterior part of the mesoscutum, suggesting that variation in the colour of setae on the body is at least partly related to overall size.

Khuat et al. (2013) recorded a scoliid as *Campsomeris* sp. from Ha Noi. The specimens (two females and two males collected at Bai Giua Song Hong, Long Bien district in 2012) would key to *C. collaris quadrifasciata*.

Megacampsomeris Betrem, 1928

Campsomeris subgenus *Megacampsomeris* Betrem, 1928: 138.

Megacampsomeris Betrem: Betrem in Betrem and Bradley 1972: 164.

Type-species. *Tiphia grossa* Fabricius, 1804.

Megacampsomeris shillongensis (Betrem, 1928)

Fig. 3A, B

Campsomeris (*Megacampsomeris*) *shillongensis* Betrem, 1928: 155–156.

Campsomeris (*Megacampsomeris*) *lindenii* Lepeletier: Betrem 1928: 151–152.

Megacamposeis shillongensis (Betrem): Betrem in Betrem and Bradley 1972: 164.

Specimens examined. VIETNAM: Lao Cai: 2 ♂♂, Cat Cat, Sa Pa, 21.ix.2017, Coll. Phong Huy Pham.

Diagnosis. Male. Body length 16–18 mm. Frontal spatium densely punctate, with small impunctate area posteriorly at the middle; hind tibial spur white; antenna reddish-brown; base of mandible, clypeus, scrobe, large spot on gena, scapula, dorsal surface of pronotum, callosity, small spot at posterior corners of mesoscutum, tegula anteriorly, fore coxa, stripe on outer surface of all femora, outer surface of fore and mid-tibiae and outer surface of first fore tarsal segment yellow; apical yellow bands on T1–T4 narrow, about one-third of T1 and about one-fifth of T2–T4 (Fig. 3A); S2–S4 with small apical yellow bands, that on S2, interrupted narrowly and those on S3 and S4 interrupted more widely; erect vestiture goldish-white, except black on three last metasomal segments; wings yellowish, lightly infuscated at apex; genitalia with paramere moderately long and stout, base of volsella with dense and long setae, distance between base of these setae less than their own diameter (Fig. 3B).

Female. Unknown.

Distribution. Vietnam (new record): Lao Cai (Fig. 8D). Elsewhere: India, Myanmar, Nepal (Betrem 1928; Gupta and Jonathan 2003; Girish Kumar and Pham Ph 2015).

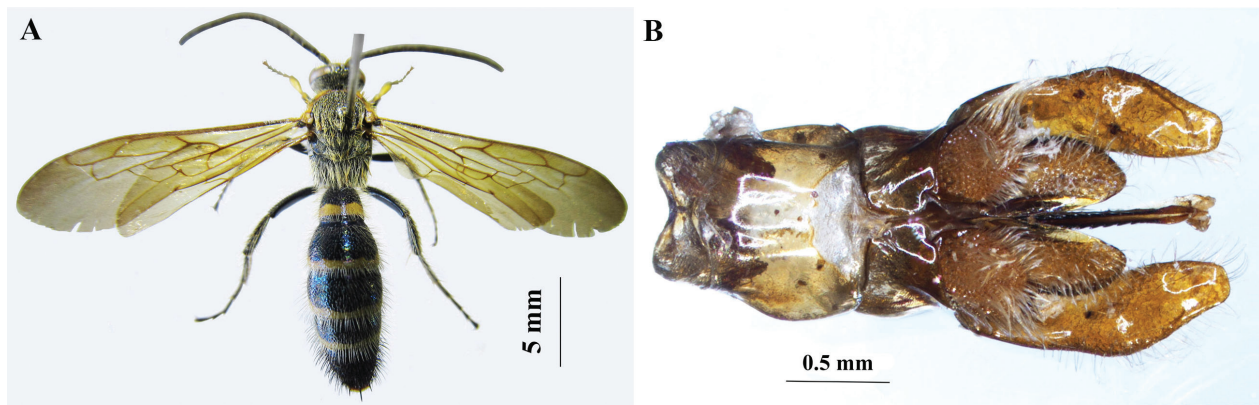


Figure 3. *Megacampsomeris shillongensis* (Betrem, 1928), male. **A.** Habitus, dorsal view; **B.** Genitalia, ventral view.

Micromeriella Betrem, 1964

Campsomeris subgenus *Micromeris* Betrem in Bradley 1964: 186.

Micromeriella Betrem Betrem in Bradley 1972: 166.

Type species. *Scolia marginella* Klug, 1810.

Micromeriella marginella marginella (Klug, 1810)

Fig. 4A–C

Scolia marginella Klug, 1810: 214.

Elis (*Campsomeris*) *hirsuta* de Saussure, 1858: 234.

Elis (*Dielis*) *hirsuta* de Saussure: Saussure and Sichel 1864: 216.

Elis (*Dielis*) *marginella* (Klug): de Saussure and Sichel 1864: 186.

Scolia hirsuta (de Saussure): Dalla Torre 1897: 163.

Campsomeris (*Campsomeris*) *marginella marginella* (Klug): Betrem 1928: 135.

Campsomeris (*Campsomeriella*) *marginella marginella* (Klug): Betrem 1941: 90.

Campsomeris (*Micromeris*) *marginella marginella* (Klug): Bradley and Betrem 1968: 329.

Micromeriella marginella (Klug): Betrem and Bradley 1972: 119.

Micromeriella marginella marginella (Klug): Bradley 1974: 443.

Specimens examined. VIETNAM: Ha Noi: 1 ♂, Lien Mac, Bac Tu Liem, 27.viii.2017, Coll. Phong Huy Pham; 1 ♂, Long Bien, 12.xii.2015, Coll. Phong Huy Pham. Thai Binh: 2 ♂♂, Hong Minh, Hung Ha, 10.vii.2017, Coll. Phong Huy Pham. Thanh Hoa: 2 ♂, Hai Tien, Hoang Hoa, 1.vi.2022, Coll. Phong Huy Pham.

Diagnosis. Male. Body length 7–10 mm. Metasoma with faint blue reflections dorsally; flagellum brown; clypeus, except for large black spot medially, base of mandible (Fig. 4B), scapula, tiny spot on callosity, small spot on tegula anteriorly, stripe on scutellum medially, small median spot on metanotum posteriorly, about one-third of anterior surface of fore coxa beneath, small stripe on apical half of all femora and outer surface of hind tibia, outer surface of fore and mid-tibiae, outer surface of fore tarsus and mid-basitarsus yellow; T1–T5 with apical yellow bands, that on T1, moderately emarginate anteromedially

and covering about one-third of T1, those on T2–T4, conspicuously emarginate anteromedially and covering one-half of T2–T4, that on T5, not emarginate anteriorly (Fig. 4A); S2–S4 with narrow apical yellow bands, that on S4, interrupted medially or reduced to spot posterolaterally; erect vestiture white, sparse on metasoma and moderately dense on head and mesosoma; two last metasomal segments with black setae; tomentum silvery, relatively sparse on head and side of mesosoma; wings hyaline; genitalia with paramere stout; base of volsella with sparse and long setae (Fig. 4C).

Female. Unknown.

Distribution. Vietnam (new record): Ha Noi, Thai Binh (Fig. 8E). Elsewhere: China, India, Sri Lanka, Taiwan (Betrem 1928; Gupta and Jonathan 2003; Liu et al. 2021a).

Micromeriella marginella is widely distributed in the Oriental region. The species ranges from Sri Lanka through India to Southeast Asia and also in China and Taiwan. There have been seven subspecies recorded for *M. marginella*, namely *M. marginella marginella* (Klug), *M. m. bariensis* (Tsuneki, 1972), *M. m. billitonensis* (Tullgren, 1904), *M. m. formosana* (Betrem, 1928), *M. m. modesta* (F. Smith, 1855), *M. m. terinata* (F. Smith, 1858) and *M. m. thainana* (Tsuneki, 1972). Osten (2005) did not recognise *M. m. bariensis*, *M. m. billitonensis* and *M. m. thainana*. The seven subspecies are distinguished by the difference in yellow marks on the body in males and by alteration of apical yellow bands on the metasomal terga in females. These characters are likely insufficient to retain the subspecies as valid taxa.

Phalerimeris Betrem, 1967

Campsomeris subgenus *Phalerimeris* Betrem in Bradley and Betrem 1967: 294.

Phalerimeris Betrem: Bradley 1974: 460.

Type species. *Elis* (*Campsomeris*) *phalerata* de Saussure, 1858.

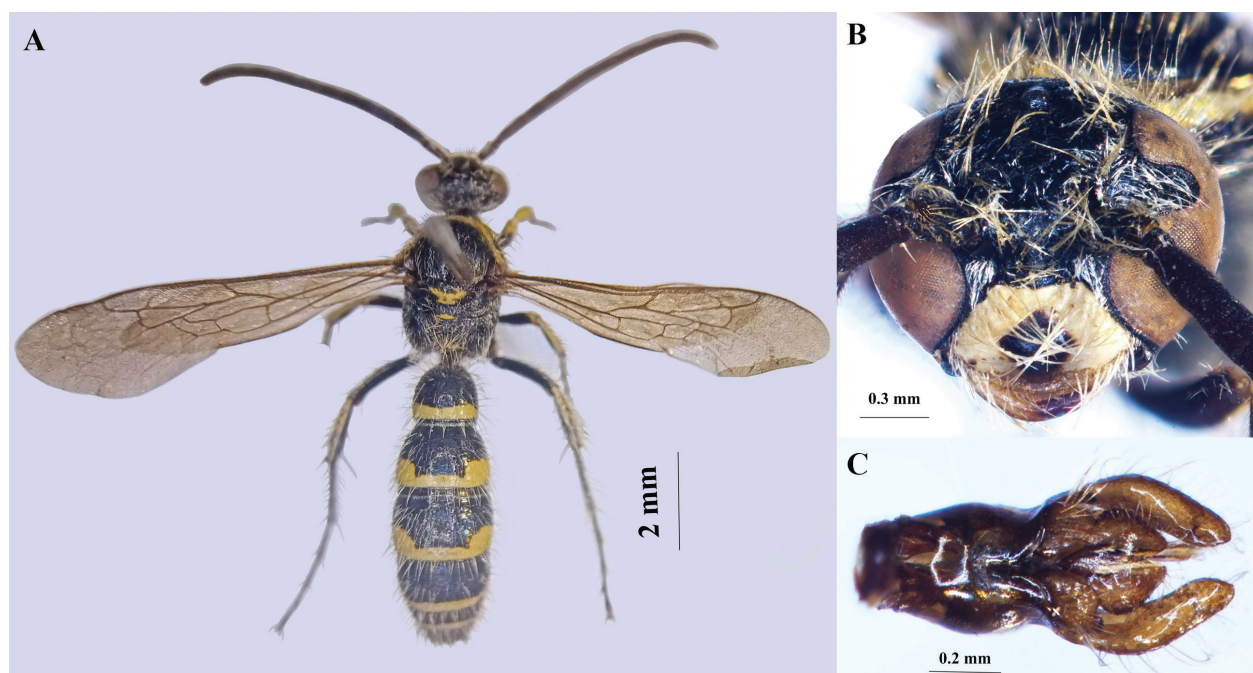


Figure 4. *Micromeriella marginella marginella* (Klug, 1810), male. **A.** Habitus, dorsal view; **B.** Head, frontal view; **C.** Genitalia, ventral view.

***Phalerimeris phalerata phalerata* (de Saussure, 1858)**

Fig. 5A–C

Elis (*Campsomeris*) *phalerata* de Saussure, 1858: 233.

Elis (*Dielis*) *phalerata* de Saussure: de Saussure and Sichel 1864: 201.

Elis (*Dielis*) *iris* Lepeletier: Magretti 1892: 247.

Campsomeris albopilosa Rohwer, 1911: 480.

Campsonleris (*Dielis*) *phalerata phalerata* (de Saussure): Betrem 1928: 103.

Campsomeris lindenii (Lepeletier): Yano 1932: 317.

Campsomeris (*Phalerimeris*) *phalerata* (de Saussure): Betrem in Bradley and Betrem 1967: 294.

Phalerimeris phalerata phalerata (de Saussure): Bradley 1974: 460.

Specimens examined. VIETNAM: Quang Ninh: 3 ♀♀, Yen Tu National Park, Uong Bi, 27.vi.2013, Coll. Phong Huy Pham; 2 ♂♂, Bai Chay, 14.vi.2020, Coll. Phong Huy Pham. Nam Dinh: 1 ♀ + 1 ♂, Xuan Thuy National Park, Xuan Thuy, 31.xii.2015, Coll. Phong Huy Pham. Ha Noi: 2 ♀♀ + 2 ♂♂, My Dinh, Nam Tu Liem, 17.xi.2015, Coll. Phong Huy Pham; 3 ♀♀ + 2 ♂♂, Lien Mac, Bac Tu Liem, 6.vii.2019, Coll. Phong Huy Pham; 1 ♀ + 2 ♂♂, Van Hoa, Ba Vi, 8.i.2020, Coll. Phong Huy Pham; 1 ♀ + 2 ♂♂, Long Bien, 12.xii.2015, Coll. Phong Huy Pham; 4 ♀♀, Co Nhue 2, Bac Tu Liem, 03.iv.2017, 4.iv.2022, Coll. Phong Huy Pham. Hoa Binh: 2 ♀♀ + 4 ♂♂, Tan Lac, Yen Thuy, 3.viii.2017, Coll. Phong Huy Pham. Thai Binh: 3 ♀♀ + 5 ♂♂, Dong Minh and Dong Hoang, Tien Hai, 27.vii.2018, Coll. Phong Huy Pham.

Diagnosis. Female. Body length 12–20 mm. Front with deep punctures in front of anterior ocellus; lateral carina of propodeum extended beyond spiracle; forewing yellowish and hyaline, with first submarginal cell almost entirely covered with short setae and with a large black

spot subapically; legs ferruginous; antenna black; mandible often red-brown; T1–T3 with narrow yellow bands apically; apical fringes on T1–T4 reddish-golden; erect vestiture and tomentum reddish-golden, except black on two last metasomal segments (Fig. 5A).

Male. Body length 10–13 mm. Antenna and legs wholly black; metasoma with faint blue reflections; clypeus, except for large black spot medially, base of mandible, lower part of inner eye orbit, scrobe, elongate mark on gena, scapula, callosity, tiny mark on mesoscutum posterolaterally, small spot on tegula anteriorly, narrow band on scutellum anteriorly, large median spot on metanotum, anterior side of fore coxa, apical mark on fore and hind femora beneath, narrow stripes above and below on mid-femur, outer surfaces of fore and mid-tibiae and outer surface of first fore tarsi yellow; apical yellow bands on T1–T4, covering less than one-half of their length (Fig. 5B); S2–S4 with narrow apical yellow bands, that on S4, broadly interrupted medially; erect vestiture pale white, except black on two last metasomal segments and some black setae on T5 apically; wings hyaline, slightly infumated at apex; forewing without dark mark subapically; base of volsella with sparse setae, distance between bases of these setae more than their own diameter (Fig. 5C).

Distribution. Vietnam (new record): Ha Noi, Hoa Binh, Nam Dinh, Quang Ninh, Thai Binh (Fig. 8F). Elsewhere: Bhutan, China, India, Indonesia, Malaysia, Myanmar, Nepal, Taiwan, Thailand (Betrem 1928; Gupta and Jonathan 2003; Girish Kumar and Pham Ph 2015; Liu et al. 2021a; Taylor and Barthélémy 2021).

Phalerimeris phalerata is widely distributed in the Oriental region and ranges from Sri Lanka, India and Nepal, eastwards to Southeast Asia and also into China and Taiwan.

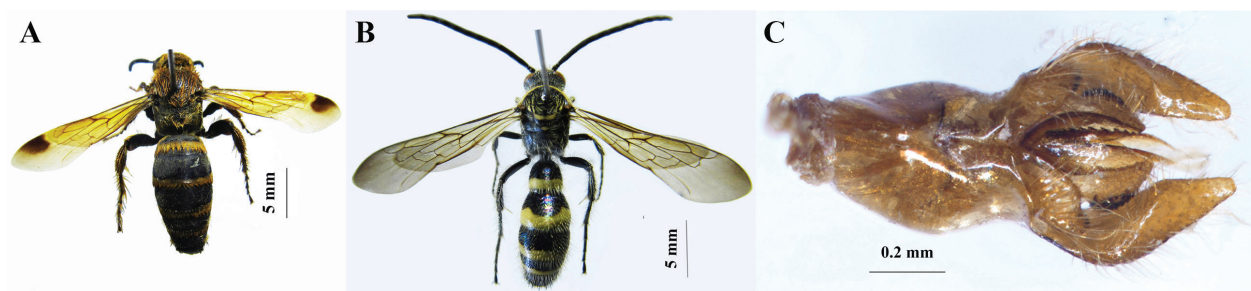


Figure 5. *Phalerimeris phalerata phalerata* (de Saussure, 1858). **A.** Habitus, female, dorsal view; **B.** Habitus, male, dorsal view; **C.** Genitalia, ventral view.

Three subspecies have been recorded *P. phalerata phalerata* (de Saussure), *P. p. turneri* (Betrem, 1928) and *P. p. bankanensis* (Betrem, 1928). Osten (2005) did not recognise the last subspecies. In females, these three subspecies are distinguished, based on apical fringes on the metasomal terga and the yellow bands on T1 and T2. In *P. p. phalerata*, the apical fringes on T1–T4 are reddish-golden, the apical fringe on T5 and setae on T6 are black and the yellow bands on T1 and T2 are narrow and continuous in the middle area. In *P. p. turneri*, the apical fringes on T1–T5 and setae on T6 are reddish-golden and the yellow bands on T1 and T2 are moderately broad and continuous in the middle area. In *P. p. bankanensis*, the apical fringes on T1–T5 and setae on T6 are reddish-golden and the yellow bands on T1 and T2 are rather narrow and interrupted in the middle. The males of all three subspecies are very similar (de Saussure 1858; Betrem 1928; Gupta and Jonathan 2003).

In some female specimens of *P. phalerata phalerata* from North Vietnam, the apical yellow bands on T1 and T2 are narrow, about one-third the length of T1 and one-fifth that of T2 and continuous in the middle area. The apical yellow band on T3 is also narrow, but interrupted in the middle. The apical fringe on T5 includes both median black and lateral yellow setae and setae on T6 are entirely black. Therefore, the population of this species in northern Vietnam shows variation suggesting that *P. p. turneri* should be synonymised with *P. p. phalerata*.

Sericocampsomeris Betrem, 1941

Campsomeris subgenus *Sericocampsomeris* Betrem, 1941: 91.

Sericocampsomeris Betrem: Betrem and Bradley 1972: 12.

Type species. *Scolia stygia* Illiger, 1802.

Sericocampsomeris flavomaculata Gupta & Jonathan, 1989

Fig. 6A, B

Sericocampsomeris flavomaculata Gupta and Jonathan, 1989: 53.

Specimens examined. VIETNAM: Ha Noi: 3 ♂♂, Lien Mac, Bac Tu Liem, 27.viii.2017, 4.ix.2017; 3 ♂♂, Red

River Bank, Long Bien, 13.ix.2015, 13.xi.2015; Coll. Phong Huy Pham.

Diagnosis. Male. Body length 17–21 mm. Clypeus broadly impunctate medially, with coarse, dense punctures laterally and posteriorly; frontal spatium with small, contiguous punctures; mesosoma moderately densely and shallowly punctate; clypeus black; scapula, tiny spots on posterolateral corners of mesoscutum, apical bands on T1–T5 and S2–S4, spots on S2 and S3 anterolaterally and small spots on S5 and S6 posterolaterally yellow; apical yellow bands on T1–T3 broad, covering more than one-half of their length, that on T1, broadly interrupted medially, those on T2 and T3, deeply and broadly emarginate, those on T4 and T5, covering less than one-half of their length and narrowly emarginate medially (Fig. 6A); yellow bands on S2–S5 narrowly interrupted medially; vestiture white, except black on T6 and T7; tomentum on head and mesosoma silvery; wings yellowish, forewing slightly infumated apically; base of volsella with dense and long setae; outer margin of paramere with dense and long setae medially; inter margin with sparse and short setae medially (Fig. 6B).

Female. Unknown.

Distribution. Vietnam (new record): Ha Noi (Fig. 8G). Elsewhere: China (Hong Kong), India, Nepal (Gupta and Jonathan 1989, 2003; Taylor and Barthélémy 2021; Chen et al. 2022).

Sericocampsomeris rubromaculata rubromaculata (F. Smith, 1855)

Fig. 6C, D

Scolia rubromaculata F. Smith, 1855: 99.

Elis (Campsomeris) bicolor de Saussure, 1858: 233.

Elis (Dielis) rubromaculata (F. Smith): de Saussure and Sichel 1864: 196.

Elis (Dielis) bicolor de Saussure: de Saussure and Sichel 1864: 186.

Scolia bicolor (de Saussure): Dalla Torre 1897: 148.

Scolia (Elis) rubromaculata F. Smith: Tullgren 1904: 468.

Campsomeris (Dielis) rubromaculata rubromaculata (F. Smith): Betrem 1928: 119.

Campsomeris (Dielis) bicolor (de Saussure): Betrem 1928: 121.

Campsomeris rubromaculata (F. Smith): Betrem 1932: 415.

Campsomeris (Sericocampsomeris) rubromaculata rubromaculata (F. Smith): Betrem 1941: 95.

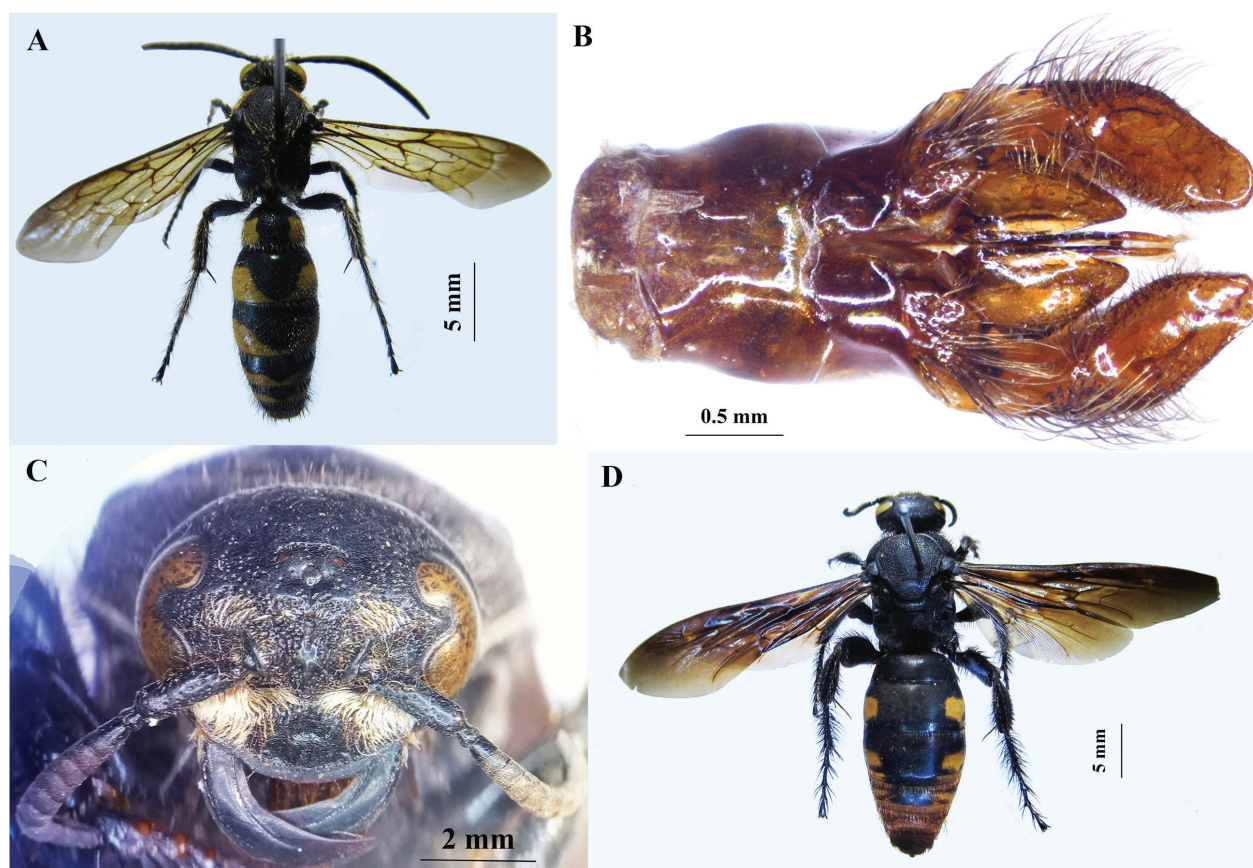


Figure 6. *Sericocampsomeris flavomaculata* Gupta & Jonathan, 1989 and *Sericocampsomeris rubromaculata rubromaculata* (Smith, 1855). **A, B.** *S. flavomaculata*, male; **C, D.** *S. rubromaculata rubromaculata*, female (**A, D.** Habitus, dorsal view; **B.** Genitalia, ventral view; **C.** Head, frontal view).

Sericocampsomeris rubromaculata rubromaculata (F. Smith): Betrem in Betrem and Bradley 1972: 12.

Specimens examined. VIETNAM: Ha Noi: 2 ♀♀, Lien Mac, Bac Tu Liem, 27.viii.2017; 1 ♀, My Dinh, Nam Tu Liem, 16.x.2015, Coll. Phong Huy Pham. Thai Binh: 2 ♀♀, Dong Hoang, Tien Hai, 2.viii.2018; 3 ♀♀, Hong Minh, Hung Ha, 20–25.vi.2013, 25.x.2019, Coll. Phong Huy Pham. Nam Dinh: 1 ♀, Xuan Thuy National Park, Xuan Thuy 23.v.2016, Coll. Phong Huy Pham. Vinh Phuc: 1 ♀, Ngoc Thach, Me Linh, 31.v.2019, Coll. Phong Huy Pham. Lang Son: 1 ♀, Lang Son city, 23.iv.2022, Coll. Phong Huy Pham.

Diagnosis. Female. Body length 30–33 mm. Lateral carina of propodeum extending beyond spiracle; dorso-median area of propodeum not triangularly protruded posteriorly, posterior surface of propodeum with dense punctures; vertex behind posterior ocelli with dense punctures (Fig. 6C); mesopleural crest sharp; mandible usually with red-brown spots; T2 and T3 with a pair of yellow spots posterolaterally, T2 and T3 reddish-brown anteriorly, T5 yellow, T4 almost entirely yellow, S3–S6 reddish-brown; erect vestiture black, except whitish on scrobe and frons; occiput and gena with blackish-grey setae; apical fringes and setae on T3–T5 and S3–S5 reddish-golden; T6 with reddish-golden setae; wings dark brown, with violet reflections (Fig. 6D).

Male. Unknown.

Distribution. Vietnam: Ha Noi, Lang Son, Nam Dinh, Thai Binh, Vinh Phuc (Fig. 8H). Elsewhere: China, Indonesia, Malaysia, Myanmar (Betrem 1928; Gupta and Jonathan 2003; Liu et al. 2021a; Chen et al. 2022).

***Sericocampsomeris vietnamica* Pham & van Achterberg, sp. nov.**

<https://zoobank.org/CCA7D1C8-1B23-41C1-8E72-CA2169C7661F>
Fig. 7A–F

Specimens examined. Holotype. ♂, VIETNAM: Hai Phong, Cat Ba National Park, Cat Hai district, 20°47'50"N, 107°4'15"E, 7 m alt., 17.ii.2016, Coll. Phong Huy Pham (IEBR). **Paratype.** 1♂, same place, date and collector as holotype (IEBR).

Diagnosis. *Sericocampsomeris vietnamica* belongs to the genus *Sericocampsomeris* because of the following combination of characters: Body length 21–24.5 mm; frontal spatium densely punctate; frontal fissura present, extending up to anterior ocellus; anterior ocellus distinctly larger than posterior ocelli and set in a broad and shallow pit; wings yellowish and hyaline, forewing with two recurrent veins; integument black; clypeus marked with yellow; mandible, scapula, scutellum and metanotum entirely black; hind tibial spur black; metasoma with yellow bands on apical tergites and sternites; vestiture yellowish-white

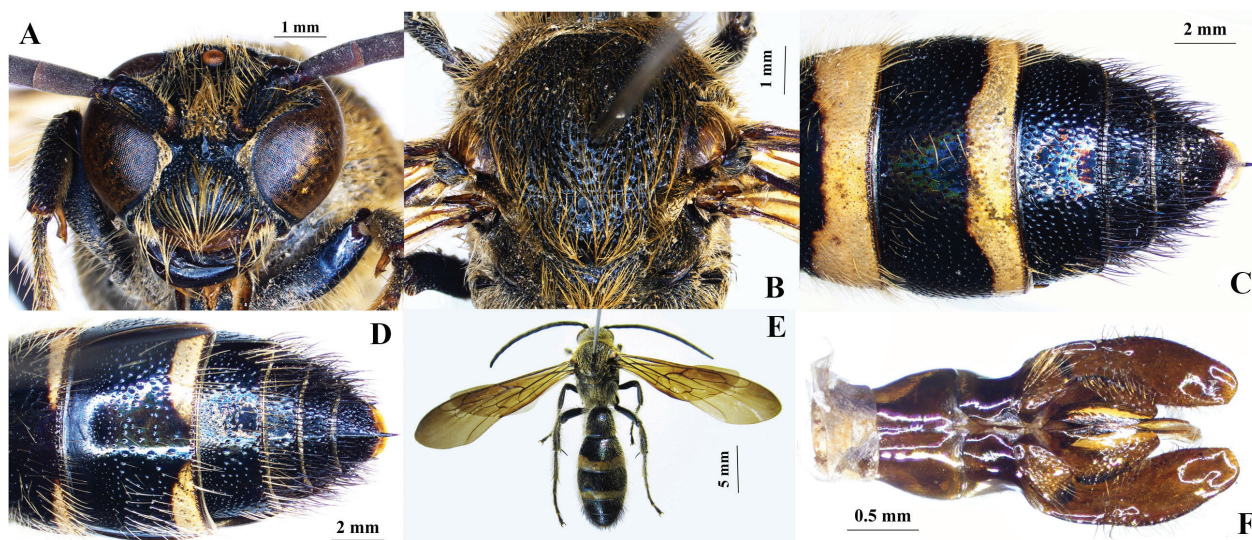


Figure 7. *Sericocampsomeris vietnamica* Pham & van Achterberg, sp. nov., holotype, male. **A.** Head, frontal view; **B.** Mesosoma, dorsal view; **C.** Metasoma, dorsal view; **D.** Metasoma, ventral view; **E.** Habitus, dorsal view; **F.** Genitalia, ventral view.

mixed with black; paramere slender, outer margin moderately angled medially, rounded apically, inner margin substraight, dorsal surface with dense and long setae, ventral surface with sparse and short setae; volsella with setae, moderately dense basally and sparse ventrally (for diagnosis of male *Sericocampsomeris*, see Betrem (1941) (page 92), Betrem and Bradley (1972) (page 12), Gupta and Jonathan (2003) (page 58), Liu et al. (2021b) (pages 146 and 159) and Taylor and Barthélémy (2021) (pages 20 and 42)).

This new species is similar to *S. flavomaculata* and *S. stygia* by having clypeus impunctate medially, with dense punctures posteriorly; frontal spatium densely and distinctly punctate; frontal fissure present, extending to anterior ocellus; anterior ocellus distinctly larger than posterior ocelli and set in a broad and shallow pit; scutellum and metanotum without longitudinal carina medially; dorso-median area of propodeum without distinct tubercle medially; T1–T3 with yellow bands apically. The new species is easily distinguished from *S. flavomaculata* and *S. stygia* by the following characters: head, scape, mesoscutum, scutellum and metanotum densely, coarsely, deeply punctate; clypeus sparsely punctate laterally and anteriorly; anterior margin of clypeus dark yellow; scapulae, scutellum and metanotum entirely black; T4 without yellow band apically; apical yellow bands on S2 and S3 narrow, broadly interrupted medially; head and mesosoma with yellowish setae; wings yellowish; metasoma with conspicuous blue reflections.

Description. Male. Body length 21–24.5 mm (holotype: 22.5 mm); forewing length 20–21 mm (holotype: 20 mm).

Colour. Black, except yellow on anterior margin of clypeus; tegula testaceous (Fig. 7A, B); T1–T3 with yellow bands apically, that on T1, very narrow and broadly interrupted medially, covering about one-sixth of T1, that on T2, narrowly emarginate medially, covering less than one-half of T2, that on T3, covering about one-fourth of T3 (Fig. 7E); apical yellow bands on S2 and S3 narrow, broadly interrupted medially; metasoma with conspicuous blue reflections (Fig. 7C).

Vestiture. Yellowish-white, except black on two last metasomal segments (Fig. 7D), T5 with yellowish-white setae mixed black setae; tomentum silvery (Fig. 7C). Wings hyaline, yellowish, forewing slightly infumated subapically, with two recurrent veins (Fig. 7E).

Head. Clypeus rugose on apical half, impunctate medially, sparsely punctate laterally and anteriorly, densely punctate posteriorly (Fig. 7A); frontal spatium densely and distinctly punctate, with small tubercle between antennal sockets (Fig. 7A); frontal fissure weakly impressed, extending to anterior ocellus; front with a few scattered punctures; vertex with weak groove near hind ocelli elongated to inner eye margin; scape, vertex and gena with dense punctures; anterior ocellus distinctly larger than posterior ocelli and set in a broad and shallow pit.

Mesosoma. Scapula, mesoscutum, metanotum and dorsal propodeum with dense, coarse, deep punctures, interspaces much smaller than puncture diameter; scutellum with punctures separated by about their diameter (Fig. 7B); scutellum and metanotum moderately convex, without longitudinal carina medially; mesopleuron and metapleuron densely punctate; lateral carina of propodeum distinctly prominent and long, extending beyond spiracle; dorso-median area of propodeum without being distinctly tuberculate medially.

Metasoma. Metasoma moderately densely and coarsely punctate (Fig. 7C, E); two-thirds of S1 densely and coarsely punctate anteriorly; median tubercle on S2 moderately risen anteriorly; S7 with longitudinal carina medially (Fig. 7D).

Genitalia (Fig. 7F). Brown; paramere glabrous, dorsal surface with dense and long setae, ventral surface with sparse and short setae, outer margin with a few short setae, moderately-angled medially, rounded apically, inner margin sub-straight; base of volsella covered with moderately dense and long setae, with dense punctures; lamina volsellaris sparsely punctate, interspaces larger than puncture diameter, with sparse and short setae ventrally

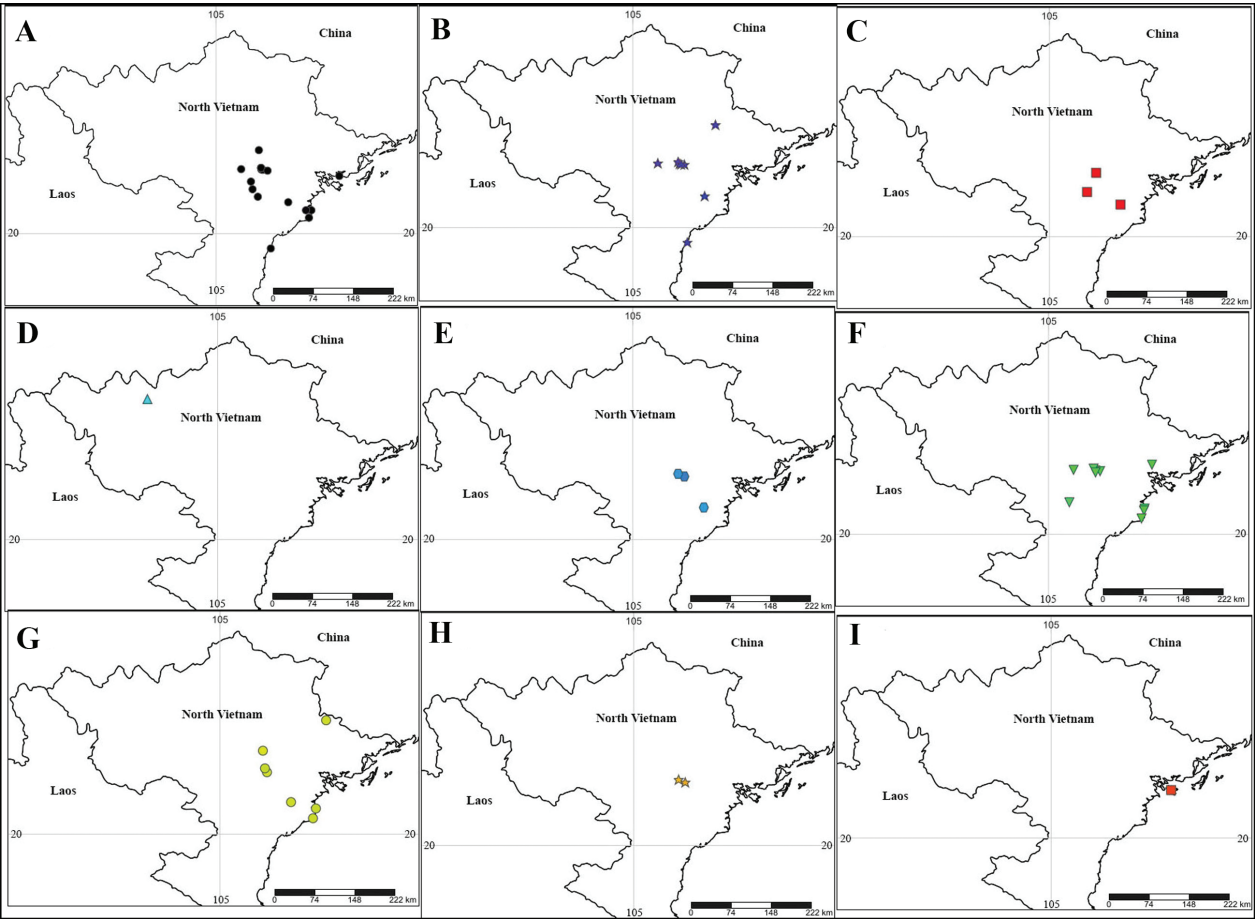


Figure 8. Distribution of the Scoliid species from northern Vietnam. **A.** *Campsomeriella* (*Annulimeris*) *annulata annulata* (Fabricius, 1793); **B.** *Campsomeriella* (*Campsomeriella*) *collaris collaris* (Fabricius, 1775); **C.** *Campsomeriella* (*Campsomeriella*) *collaris quadrfasciata* (Fabricius, 1798); **D.** *Megacampsomeris shillongensis* (Betrem, 1928); **E.** *Micromeriella marginella marginella* (Klug, 1810); **F.** *Phalerimeris phalerata phalerata* (de Saussure, 1858); **G.** *Sericocampsomeris flavomaculata* Gupta and Jonathan, 1989; **H.** *Sericocampsomeris rubromaculata rubromaculata* (Smith, 1855); **I.** *Sericocampsomeris vietnamica* Pham & van Achterberg, sp. nov.

(Fig. 7F); aedeagus with eight teeth, apical teeth conspicuously reduced.
Female. Unknown.

Etymology. The species name refers to the country of origin, Vietnam.
Distribution. Vietnam: Hai Phong Province (Fig. 8I).

Identification key to species of *Sericocampsomeris* Betrem

Key to females (females of *S. flavomaculata* Gupta & Jonathan, 1989, *S. punctata* Liu & Chen, 2022, and *S. vietnamica* Pham & van Achterberg, sp. nov. are not known).

- 1 Metanotum and dorso-median area of propodeum sparsely punctate; T2 and T3 reddish-brown anteriorly; T2 and T3 with large yellow spots laterally; apical fringes on T2–T5 and S3–S6 reddish-golden; metasomal setae back and reddish-gold; (China, India, Indonesia, Malaysia, Myanmar, Vietnam)*S. rubromaculata* (F. Smith, 1855)
- Metanotum and dorso-median area of propodeum densely punctate; metasoma entirely black, except T2 and large yellow spot on T3 laterally; apical fringes on T2–T5 and S2–S6 dark brown to black..... 2
- 2 Scapula and upper margin of clypeus with golden setae; metasoma with dark brown setae, except T6 with reddish-brown setae; T3 with large yellow mark covering almost its dorsum; (China, Vietnam) *S. degaullei* (Betrem, 1928)
- Scapula, clypeus and metasoma with black setae; metasoma black, except small yellow spots on T2 and T3 laterally; (Bangladesh, Bhutan, India, Indonesia, Malaysia, Myanmar)..... *S. stygia* (Illiger, 1802)

Key to males

- 1 T1–T3 with yellow bands apically..... 2
- T1–T3 without yellow bands apically; T3 reddish-yellow partly or predominantly 5

- 2 Head and mesosoma densely, coarsely and deeply punctate; T4 without apical yellow band; apical yellow band on T1 very narrow, about one-fifth $\times$ length of T1 and broadly interrupted medially; setae on head and mesosoma yellowish; (Vietnam)..... *S. vietnamica* Pham & van Achterberg, sp. nov.
- Head and mesosoma sparsely to densely punctate; T4 with apical yellow band, apical yellow band on T1 absent or present, in latter case, that is large, at least one-third of length of T1; colour of setae on head and mesosoma variable..... 3
- 3 Clypeus and legs with yellow spots; scutellum and metanotum with broad yellow bands medially; band on T1 not emarginate and uninterrupted, band on T2 shallowly emarginate, band on T3 not emarginate *S. stygia* (Illiger, 1802)
- Clypeus and legs without yellow spots; scutellum and metanotum entirely black; band on T1 emarginate or interrupted, bands on T2 and T3 deeply emarginate 4
- 4 Clypeus without yellow band apically; scapula yellow; T1 with broad yellow band interrupted medially, bands on T2 and T3 very broad and deeply emarginate medially; T5 with yellow band apically; (China (Hong Kong), India, Nepal, Vietnam)..... *S. flavomaculata* Gupta & Jonathan, 1989
- Clypeus with yellow band apically; scapula black; T1 with yellow band uninterrupted medially, bands on T2 and T3 moderately broad and narrowly emarginate medially, T5 without yellow band apically; (China) *S. punctata* Liu & Chen, 2022
- 5 Scutellum and metanotum with longitudinal carina medially; T1 and T2 entirely black; wings infusate; metasomal setae dark brown, except reddish-brown on T4–T7 *S. degaullei* (Betrem, 1928)
- Scutellum and metanotum without longitudinal carina medially; T1 and T2 almost reddish-yellow; wings yellowish to brownish; metasomal setae pale yellow, except black on T5–T7 *S. rubromaculata* (F. Smith, 1855)

The genus *Sericocampsomeris* Betrem was described as a subgenus of *Campsomeris* and raised to generic level by Betrem and Bradley (1972). Betrem (1941) recorded 10 species for the genus (as *Campsomeris* (*Sericocampsomeris*)). Gupta and Jonathan (1989) recorded eight species and described one new species, *S. flavomaculata* Gupta and Jonathan. Osten (2005) listed *S. degaullei* Betrem, 1928 (with two subspecies, *S. degaullei degaullei* Betrem, 1928 and *S. d. rubropilosa* Betrem, 1941); *S. rubromaculata* (F. Smith, 1855) (with five subspecies, *S. rubromaculata rubromaculata* (F. Smith, 1855); *S. r. beharensis* (Betrem, 1928); *S. r. bomeana* (Cameron, 1902); *S. r. hainanensis* (Betrem, 1928); and *S. r. pseudoin dica* (Betrem, 1928)) and *S. stygia* (Illiger, 1802) and omitted *S. flavomaculata* Gupta and Jonathan (also see Taylor and Barthélémy (2021)). Gupta and Jonathan (2003), after reexamining *Megacampsomeris bella* that was originally described by Bingham (1897) as *Elis* (*Dielis*) *bella*, moved it to *Sericocampsomeris*. Osten (2005) retained it in *Megacampsomeris*. Schulten et al. (2011) raised the subgenus *Bellimeris* of *Megacampsomeris* to the generic level and included *M. bella*. Kim (2020) produced characteristics of the genus *Bellimeris*, which consists of only *B. bella* and *B. stoetznery* after studying and describing the male of the latter. Liu et al. (2021b) listed *B. bella* as *Megacampsomeris bella*. Recently, Chen et al. (2022) reviewed the genus *Sericocampsomeris* from China, recognised three species and described a new species. Altogether, including the new species described in this study, six species have been retained in *Sericocampsomeris*. The genus is mainly distributed in the Oriental region and ranges from Sri Lanka, India and Nepal to Southeast Asia and southern China. Four Vietnamese species have been recorded, three, *S. vietnamica* Pham & van Achterberg, sp. nov., *S. flavomaculata* and *S. rubromaculata* in the present study and one, *S. degaullei* in Betrem (1928).

A checklist of Scoliidae from Vietnam

Family Scoliidae Latreille, 1802

Subfamily Scoliinae Latreille, 1802

Campsomerini Betrem, 1965

Campsomeriella Betrem, 1941

Campsomeris - subgenus *Campsomeriella* Betrem, 1941: 86.
Campsomeriella Betrem, 1967: 25.

Type species. *Scolia thoracica* Fabricius, 1787.

Campsomeriella collaris quadrifasciata (Fabricius, 1798)

Scolia quadrifasciata Fabricius, 1798: 231.
Campsomeris aureicollis Lepeletier, 1845: 132.
Campsomeris quadrifasciata Fabricius: Betrem 1928: 336.
Campsomeris (*Campsomeriella*) *quadrifasciata* Fabricius: Betrem 1941: 89.
Campsomeriella (*Campsomeriella*) *collaris quadrifasciata* Fabricius: Betrem 1967: 29.

Distribution. China, India, Indonesia, Laos, Malaysia, Philippines, Singapore, Thailand, Vietnam: Ha Noi, Quang Ninh(?), Quang Tri, southern Vietnam (Betrem 1928).

Betrem (1928) recorded this subspecies from Vietnam as *Campsomeris aureicollis* Lepeletier, 1845, but Osten (2005) synonymised it under *Campsomeriella collaris quadrifasciata* (Fabricius, 1798). Specimens are known from Tien Yen (possibly Tien Yen District, Quang Ninh Province), Tonkin, Hanoi (both males and females), Cochinchina: Annam (currently central Vietnam, Quang-Tri (possibly Quang Tri Province currently) (Betrem 1928).

***Campsomeriella sauteri berlandi* (Betrem, 1928)**

Campsomeris sauteri berlandi Betrem, 1928: 123.

Campsomeris (*Campsomeriella*) *sauteri* Betrem: Betrem 1941: 88.

Campsomeriella (*Campsomeriella*) *quadrifasciata sauteri* Betrem: Betrem 1967: 29.

Distribution. Vietnam: Cochin-China (currently southern Vietnam) (Betrem 1928).

***Colpacampsomeris* Betrem, 1941**

Campsomeris subgenus *Colpacampsomeris* Betrem, 1941: 101.

Colpacampsomeris Betrem: Betrem in Bradley 1974: 445.

Type species. *Scolia indica* de Saussure, 1855.

***Colpacampsomeris indica* (de Saussure, 1855)**

Scolia (*Lacosi*) *indica* de Saussure, 1855: 46.

Scolia ignita Smith, 1855: 101.

Scolia (*Discolia*) *indica* de Saussure: de Saussure and Sichel 1864: 119.

Scolia indica de Saussure: Dalla Torre 1897: 165.

Campsomeris (*Dielis*) *indica* (de Saussure): Betrem 1928: 116.

Campsomeris (*Dielis*) *assamensis* Betrem, 1928: 111

Campsomeris (*Colpacampsomeris*) *indica* (de Saussure): Betrem 1941: 101.

Campsomeris (*Colpacampsomeris*) *indica assamensis* Betrem: Betrem 1941: 102.

Campsomeris (*Colpacampsomeris*) *indica indica* (de Saussure): Betrem in Bradley and Betrem 1967: 308.

Colpacampsomeris indica indica (de Saussure): Betrem in Bradley 1974: 445.

Distribution. Bangladesh, India, Myanmar, Malaysia, Sri Lanka, Vietnam: Cochin China (southern Vietnam) (Betrem 1941; Bradley and Betrem 1967; Gupta and Jonathan 2003).

***Sericocampsomeris* Betrem, 1941**

Campsomeris - subgenus *Sericocampsomeris* Betrem, 1941: 91.

Sericocampsomeris Betrem: Betrem and Bradley 1972: 12.

Type species. *Scolia stygia* Illiger, 1802.

***Sericocampsomeris degaullei* (Betrem, 1928)**

Campsomeris degaullei Betrem, 1928: 121.

Campsomeris (*Sericocampsomeris*) *degaullei* Betrem: Betrem 1941: 93.

Distribution. China, Vietnam: Tonkin (currently northern Vietnam): Ha Noi, Tuyen Quang (Betrem 1928; Liu et al. 2021a; Chen et al. 2022).

Betrem (1928) described this subspecies, based on females collected from northern Vietnam (Ha Noi and Tuyen Quang).

***Sericocampsomeris rubromaculata* (Smith, 1855)**

Scolia rubromaculata Smith, 1855: 99.

Elis (*Campsomeris*) *bicolor* de Saussure, 1858: 233.

Elis (*Dielis*) *rubromaculata* (Smith): de Saussure and Sichel 1864: 196.

Elis (*Dielis*) *bicolor* de Saussure: de Saussure and Sichel 1864: 186.

Scolia bicolor (de Saussure): de Saussure 1897: 148.

Scolia (*Elis*) *rubromaculata* Smith: Tullgren 1904: 468.

Campsomeris rubromaculata (Smith): Betrem 1928: 119.

Campsomeris (*Dielis*) *bicolor* (de Saussure): Betrem 1928: 121.

Campsomeris (*Sericocampsomeris*) *rubromaculata rubromaculata* (Smith): Betrem 1941: 95.

Sericocampsomeris rubromaculata rubromaculata (Smith): Betrem in Betrem and Bradley 1972: 12.

Distribution. China, India, Indonesia, Malaysia, Myanmar, Vietnam: Ha Noi (Betrem 1928; Gupta and Jonathan 2003; Liu et al. 2021a; Chen et al. 2022).

Scoliini* Latreille, 1802**Austroscolia* Betrem, 1927**

Scolia (*Austroscolia*) Betrem, 1927: xcvi.

Type species. *Scolia ruficeps* Smith, 1855.

***Austroscolia ruficeps* (Smith, 1855)**

Scolia capitata Guérin-Ménéville, 1838: 248 (not Fabricius, 1804).

Scolia ruficeps Smith, 1855: 111.

Scolia westermanni de Saussure, 1858: 212.

Triscolia nigropilosa Micha, 1927: 100.

Triscolia tenggerana Micha, 1927: 100.

Triscolia viridiaenea Micha, 1927: 100.

Triscolia ruficeps impressifrons Micha, 1927: 100.

Scolia (*Triscolia*) *capitata* Guérin-Ménéville: de Saussure and Sichel 1864: 47.

Triscolia ruficeps (Smith): Micha 1927: 96.

Scolia (*Austroscolia*) *ruficeps* Smith: Betrem 1927: xcvi.

Austroscolia ruficeps Smith: Bradley and Betrem 1967: 319.

Distribution: China, India, Indonesia, Malaysia, Myanmar, Philippines, Vietnam: Indochine: Sai Gon (currently Ho Chi Minh City) (Betrem 1941; Taylor and Barthélémy 2021).

***Carinoscolia* Betrem, 1927**

Scolia - subgenus *Carinoscolia* Betrem, 1927: xcvi.
Carinoscolia Betrem: Bradley and Betrem 1967: 293.

Type species. *Scolia opalina* Smith, 1858.

***Carinoscolia yunnanensis* (Betrem, 1941)**

Scolia (*Carinoscolia*) *yunnanensis* Betrem, 1928: 188.
Scolia (*Carinoscolia*) *yunnanensis* Betrem: Betrem 1941: 116.

Distribution. China, Japan, Laos, Vietnam: Annam (currently central Vietnam) (Betrem 1928; Taylor and Barthélémy 2021; Liu et al. 2021a)

***Megascolia* Betrem, 1964**

Scolia - subgenus *Triscolia* de Saussure and Sichel: Betrem 1927: xcvi.
Scolia - subgenus *Triscolia* (section *Triscolia*) de Saussure and Sichel: Betrem 1928: 228.
Scolia - subgenus *Triscolia* (section *Megascolia* Betrem), Betrem, 1928: 239.
Megascolia Betrem: Betrem and Bradley 1964: 437.

Type species. *Scolia procer* Illiger, 1802.

***Megascolia (Regiscolia) azurea azurea* (Christ, 1791)**

Scolia azurea Christ, 1791: 256.
Scolia rubiginosa Fabricius, 1793: 230.
Scolia ornata Lepeletier, 1845: 517.
Scolia magnifica de Saussure, 1859: 175.
Scolia (*Triscolia*) *rubiginosa* Fabricius: Bingham 1897: 76–77.
Triscolia azurea azurea Christ: Micha 1927: 117.
Scolia (*Triscolia*) *azurea rubiginosa* Fabricius: Betrem 1928: 231.
Scolia (*Triscolia*) *azurea christiana* Betrem & Guiglia, 1958: 96.
Megascolia (*Regiscolia*) *azurea christiana* Betrem & Guiglia: Betrem and Bradley 1964: 444.

Distribution. Bangladesh, Bhutan, China, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam: Tonkin (currently northern Vietnam): Thuong Lam (possibly being a location in Ha Noi currently), Annam (currently central Vietnam): An-Ninh nahe Quang-Tri (Quang Tri Province), Cochinchina (currently southern Vietnam): Nha Trang (currently belonging to Khanh Hoa Province) (Betrem 1928; Gupta and Jonathan 2003; Taylor and Barthélémy 2021; Liu et al. 2021a).

Betrem (1928) recorded this subspecies under *Scolia azurea rubiginosa* Fabricius, 1793.

***Megascolia (Regiscolia) azurea cochinchensis* (Betrem, 1928)**

Scolia azurea cochinchensis Betrem, 1928: 232.
Megascolia (*Regiscolia*) *azurea cochinchensis* Betrem: Betrem and Bradley 1964: 444.

Distribution. Vietnam: Cochinchina (currently southern Vietnam) (Betrem 1928; Gupta and Jonathan 2003).

***Scolia* Fabricius, 1775**

Scolia Fabricius, 1775: 355.
Scolia - subgenus *Lacosi* Guérin-Méneville, 1839: 243.
Lisoca Costa, 1858: 8.
Scolia - subgenus *Discolia* de Saussure: de Saussure and Sichel 1864: 55.
Scolia - subgenus *Scolia* Fabricius: Betrem 1927: xcvi.
Scolia Fabricius: Betrem and Bradley 1964: 89.

Type species. *Scolia quadripustulata* Fabricius, 1775.

***Scolia (Discolia) binotata* Fabricius, 1804**

Scolia binotata Fabricius, 1804: 244.
Scolia sexpustulata Klug, 1805: 243.
Scolia quadripustulata humeralis de Saussure, 1864: 321.
Scolia barmanica Magretti, 1892: 242.
Scolia burmanica Dalla Torre, 1897: 150.
Scolia cucullata Bingham, 1897: 82.
Scolia humeralis Bingham, 1897: 81.
Scolia quadripustulata formosensis Betrem, 1928: 150.
Scolia quadripustulata kancisarensis Betrem, 1928: 318.

Distribution. Bhutan, China, India, Japan, Laos, Malaysia, Myanmar, Singapore, Sri Lanka, Vietnam: Tonkin: Than-Moi (possibly Lang Son Province currently), Cochinchina: Kompong (possibly a location in Khanh Hoa Province currently) (Betrem 1928; Taylor and Barthélémy 2021; Liu et al. 2021a).

Betrem (1928) recorded this species from Vietnam under the subspecies *Scolia 4-pustulata barmanica* Magretti, 1892 and *Scolia 4-pustulata humeralis* de Saussure, 1864.

***Scolia (Discolia) decorata desidiosa* Bingham, 1896**

Scolia desidiosa Bingham, 1896: 424.
Scolia (*Scolia*) *decorata desidiosa* Bingham: Betrem 1928: 321.
Scolia (*Scolia*) *histrionica histrionica* Betrem, 1941: 63.
Scolia (*Discolia*) *desidiosa*, Bingham: Betrem 1947: 86.

Distribution. Bhutan, China, India, Myanmar, Taiwan, Vietnam: Tonkin (currently northern Vietnam) (Betrem 1928; Danilov and Dubatolov 2021).

Danilov and Dubatolov (2021) listed this subspecies under *Scolia (Discolia) histrionica* (Fabricius, 1787) from Vietnam, Mongolia and Thailand, based on specimens

deposited in the collection of the Siberian Zoological Museum, Russia.

Scolia (Discolia) superciliaris sauteri Betrem, 1928

Scolia (Discolia) sauteri Betrem, 1928: 277.

Scolia superciliaris sauteri Betrem: Betrem 1941: 137.

Distribution. China, Taiwan, Vietnam: Cochin-China (currently southern Vietnam), Tonkin (currently northern Vietnam) (Betrem 1928).

Scolia (Discolia) superciliaris staudingeri Betrem, 1928

Scolia (Scolia) sauteri staudingeri Betrem, 1928: 278.

Scolia (Scolia) superciliaris staudingeri Betrem: Betrem 1941: 135.

Scolia (Discolia) superciliaris staudingeri Betrem: Betrem and Bradley 1964: 92.

Distribution. China, India, Myanmar, Nepal, Taiwan, Vietnam: Annam (currently central Vietnam) (Betrem 1928; Gupta and Jonathan 2003).

Betrem (1928) described this subspecies, based only on males collected from central Vietnam.

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References

- Betrem JG (1928) Monographie der Indo-Australischen Scoliidien mit zoogeographischen Betrachtungen. Treubia 9(Supplement), 1–388.
- Betrem JG (1932) De Scoliidien-fauna van Banka. Entomologische Berichten 9: 412–415.
- Betrem JG (1941) Étude systématique des Scoliidæ de Chine et leurs relations avec les autres groupes de Scoliidæ. Notes d'entomologie Chinoise 8(4): 47–188.
- Betrem JG (1967) The natural groups of *Campsomeriella* Betr., 1941 (Hymenoptera: Scoliidæ). Entomologische Berichten 27: 25–29.
- Betrem JG, Bradley JC (1964) Annotations on the genera *Triscolia*, *Megascolia* and *Scolia*. Zoologische Mededeelingen 39: 433–444.
- Betrem JG, Bradley JC (1972) The African Campsomerinae (Hym., Scoliidæ). Monografieën van de Nederlandse Entomologische Vereniging 6: 1–326.
- Bingham CT (1897) The Fauna of British India, including Ceylon and Burma: Hymenoptera, I (Wasps and Bees). Taylor and Francis, London, 579 pp. <https://doi.org/10.5962/bhl.title.100738>
- Bradley JC (1964) The Fabrician types of Scoliidæ (Hymenoptera), with notes and an appendix by J.G. Betrem. Spolia Zoologica Musei Hauniensis 21: 1–38.
- Bradley JC (1974) The types of Scoliidæ (Hymenoptera) described by Henri de Saussure or by Jules Sichel, or by them jointly. Revue Suisse de Zoologie 81(2): 417–485. <https://doi.org/10.5962/bhl.part.76015>
- Bradley JC, Betrem JG (1967) The types of Scoliidæ described by Frederick Smith (Hymenoptera). Bulletin of the British Museum (Natural History). Entomology 20(7): 287–327.
- Bradley JC, Betrem JG (1968) Friedrich Klugs material of Scoliidæ with especial reference to his type specimens. Deutsche Entomologische Zeitschrift 15(4–5): 321–334. <https://doi.org/10.1002/mmnd.19680150406>
- Cameron P (1901) On the Hymenoptera collected during the Skeat-Expedition to the Malay Peninsula, 1899–1900. Proceedings of the Zoological Society of London 2(1): 16–44. <https://doi.org/10.1111/j.1469-7998.1901.tb08163.x>
- Cameron P (1902) On the Hymenoptera collected by Mr. Robert Shelford at Sarawak, and on the Hymenoptera of the Sarawak Museum. Journal of the Straits Branch of the Royal Asiatic Society 37: 29–140.
- Chen HY, Liu Z, Wang Z, Yang SJ, Luo SX (2022) Review of the genus *Sericocampsomeris* Betrem, 1941 (Hymenoptera, Scoliidæ) from China. Deutsche Entomologische Zeitschrift 69(2): 125–138. <https://doi.org/10.3897/dez.69.83335>
- Dalla Torre CG (1897) Catalogus Hymenopterorum hucusque descriptorum systematicus et synonymicus. VIII. W. Engelmann, Lipsiae (Leipzig), 144–188.
- Day MC, George RE, David M (1981) The most primitive Scoliidæ (Hymenoptera). Journal of Natural History 15(4): 671–684. <https://doi.org/10.1080/00222938100770471>
- Danilov Y, Dubatolov VV (2021) Scoliidæ collection of Siberian Zoological Museum. <http://szmn.eco.nsc.ru/Hymenop/Scoliida.htm> [accessed 21 December 2021]
- Fabricius JC (1775) Systema Entomologiae, Sistens Insectorum Classes, Ordines, Genera, Species, Adiectis Synonymis, Locis, Descriptionibus, Observationibus. Korte, Flensburg und Leipzig [Flensburgi et Lipsiae], 28 + 832 pp. <https://doi.org/10.5962/bhl.title.36510>
- Fabricius JC (1787) Mantissa Insectorum Sistens Eorum Species Nuper Detectas Adiectis Characteribus Genericis Differentiis Specificis, Emendationibus, Observationibus. Tome I. Hafniae, Copenhagen, 348 pp. <https://doi.org/10.5962/bhl.title.11657>
- Fabricius JC (1793) Entomologia systematica. Vol. 2. VIII. Impensis. Hafniae, Copenhagen, viii + 519 pp.
- Fabricius JC (1798) Supplementum Entomologiae Systematicae. Hafniae, Copenhagen, 4 + 572 pp.
- Fabricius JC (1804) Systema Piezatorum: Ordines, Genera, Species; Synonymis, Locis, Observationibus, Descriptionibus. Reichard, Brunsvigae, 439 + 32 pp. <https://doi.org/10.5962/bhl.title.10490>

- Girish Kumar P, Pham Ph H (2015) New distributional records of scoliid wasps (Insecta: Hymenoptera: Scoliididae) from India. Records of the Zoological Survey of India 115(4): 325–334.
- Gupta SK, Jonathan JK (1989) On the description of *Sericocampsomeris flavomaculata*, sp. nov., with notes on the hitherto known species of the genus *Sericocampsomeris* Betrem (Hymenoptera: Scoliididae). Annals of Entomology, Dehra Dun 7(2): 53–57.
- Gupta SK, Jonathan JK (2003) Fauna of India and the adjacent countries, Hymenoptera: Scoliididae. Records of Zoological Survey of India, Kolkata, 277 pp.
- Illiger K (1802) Neue Insecten. Magazin für Insektenkunde (Illiger) 1: 195–198.
- Khuat DL, Pham QM, Dang TH, Tran DD (2013) A case study on influence of urbanization process on beneficial bees and wasps in Hanoi area. Proceedings of the 5th National Scientific Conference on Ecology and Biological Resources. Agricultural Publishing House, 1450–1457.
- Kim JK (2020) Male description of *Bellimeris stoetznieri* (Betrem, 1928), with male characteristics of the genus *Bellimeris* Betrem, 1972 (Hymenoptera: Scoliididae: Scoliinae: Campsomerini) and taxonomic notes on related genera and species. Oriental Insects 55(4): 503–512. <https://doi.org/10.1080/00305316.2020.1840452>
- Klug F (1810) Fortsetzung des im vorigen Bande abgebrochenen Versuchs über die Gattungen *Scolia* und *Tiphia*. Beiträge zur Naturkunde 2: 167–216.
- Krombein KV (1978) Biosystematic studies of Ceylonese Wasps, II: A monograph of the Scoliididae (Hymenoptera: Scolioidea). Smithsonian Contributions to Zoology 283(283): 1–56. <https://doi.org/10.5479/si.00810282.283>
- Krombein KV (1979) Superfamily Scolioidea. In: Krombein KV, Hurd Jr PD, Smith DR, Burks BD (Eds) Catalog of Hymenoptera in America North of Mexico. Smithsonian Institution Press, Washington D.C., 1253–1321. <https://doi.org/10.5962/bhl.title.5074>
- Latreille PA (1802) Historie naturelle, generale et particuliere, des crustaces et des insects. Ouvrage faisant suite à l'histoire naturelle générale et particulière, composée par Leclerc de Buffon, et rédigée par C.S. Sonnini, membre de plusieurs sociétés savantes. Tome troisième. Familles naturelles des genres. Dufart, Paris, xii + 13–467. [1 (errata)] <https://doi.org/10.5962/bhl.title.15764>
- Lepelletier A (1845) Historie naturelle des insects. Vol. 3. Hyménoptères. Librairie encyclopédique de Roret, Paris, 646 pp.
- Liu Z, van Achterberg C, He JH, Chen XX (2021a) A checklist of Scoliididae (Insecta: Hymenoptera) from China. Zootaxa 4966(2): 101–126. <https://doi.org/10.11646/zootaxa.4966.2.1>
- Liu Z, van Achterberg C, He JH, Chen XX, Chen HY (2021b) Illustrated keys to Scoliididae (Insecta, Hymenoptera, Scolioidea) from China. ZooKeys 1025: 139–175. <https://doi.org/10.3897/zookeys.1025.61385>
- Magretti P (1892) Imenotteri; Viaggio de Leonardo Fea in Birmanicae Regioni vicini 43, parte prima Mutillidae Scollidei Tiphidae. Annali del Museo Civico di Storia Naturale Giacomo Doria 12: 97–266.
- Osten T (2005) Checkliste der Dolchwespen der Welt (Insecta: Hymenoptera, Scoliididae). Naturforschende Gesellschaft 220: 1–62.
- Pham Ph H, Girish Kumar P (2015) Known biogeography and distribution pattern of solitary wasps from Vietnam so far (Hymenoptera: Vespidae: Eumeninae). Records of the Zoological Survey of India 115(2): 171–177.
- Rohwer SA (1911) On some hymenopterous insects from the island of Formosa. Proceedings of the United States National Museum 39(1794): 477–485. <https://doi.org/10.5479/si.00963801.1794.477>
- Rohwer SA (1921) The Philippine wasps of the subfamilies Scoliinae and Elidinae. Philippine Journal of Science 19: 75–90. <https://doi.org/10.5962/bhl.part.1236>
- Saussure de H (1858) Description de diverses especes nouvelles ou peu connues du genre *Scolia*. Annales de la Société Entomologique de France 3(6): 193–249.
- Saussure de H (1864) Melanges Hymenopterologiques, 1 Fascicule, Appendix. Memoires de la Société de physique et d'histoire naturelle de Genève, Genève, 457 pp.
- Saussure de H, Sichel J (1864) Catalogue des espèces de l'ancien genre *Scolia*, contenant les diagnoses, les descriptions et la synonymie des espèces, avec des remarques explicatives et critiques. V. Mason, Geneve et Paris, 1–350 pp. [2 pl.] <https://doi.org/10.5962/bhl.title.9323>
- Schulten GGM, Feijen HR, Feijen C (2011) The genus *Bellimeris* Betrem (Hymenoptera: Scoliididae, Campsomerinae). Zoologische Mededeelingen 85: 887–903.
- Smith F (1855) Mutillidae and Pompilidae. In: Catalogue of the Hymenopterous Insects in the collection of the British Museum. Taylor and Francis, London, 203 pp. [5 pl]
- Smith F (1858) Catalogue of the Hymenopterous Insects collected at Sarawak, Borneo; Mount Ophir, Malacca; and at Singapore, by A. R. Wallace. Journal of the Linnean Society of London, Zoology 2(6): 42–130. <https://doi.org/10.1111/j.1096-3642.1857.tb01759.x>
- Taylor C, Barthélémy C (2021) A review of the digger wasps (Insecta: Hymenoptera: Scoliididae) of Hong Kong, with description of one new species and a key to known species. European Journal of Taxonomy 786: 1–92. <https://doi.org/10.5852/ejt.2021.786.1607>
- Tsuneki K (1972) Studies on the scoliid wasps of eastern Asia (Hymenoptera). Etizenia 62: 1–41.
- Tullgren A (1904) On some species of the genus *Scolia* (s.l.) from the East Indies collected by Carl Aurivillius. Arkiv för Zoologi 1: 465–472.
- Yano M (1932) Scoliididae. In Icon. Insects of Japan (Edition-I): 317–321.