

A review of the genus *Chrysocryptus* Cameron (Ichneumonidae: Phygadeuontinae), with description of a new species

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Abstract. The phygadeuontine genus *Chrysocryptus* (Ichneumonidae) is reviewed for the first time on the basis of ichneumonid collections in the Institute of Ecology and Biological Resources, Hanoi (Vietnam), the Natural History Museum, London (UK), and the Naturalis Biodiversity Center, Leiden (the Netherlands). A new species, *Chrysocryptus brevis*, is described from northern Vietnam. In addition, *C. aureopilosus* is recorded for the first time from Vietnam and from Indonesia (West Java). A key to all four known species of the genus *Chrysocryptus* is included.

Key words. Ichneumonidae, new species, new records, Indonesia, New Guinea, Papua

INTRODUCTION

Chrysocryptus is a small and distinctive phygadeuontine genus with only three recognised species restricted to the Indo-Papuan area (Yu et al., 2012). All three species were described in the early 20th century and very little else has been published on the genus until now. Cameron (1902) described *Chrysocryptus* on the basis of the genotype, *C. aureopilosus*, from Sarawak (Borneo). In 1911, the same author described *Anunda pilosellus*, which was subsequently removed to the genus *Chrysocryptus* by Townes et al. (1961). Cushman (1922) described the third species, *C. romani*, from the Philippines. On the basis of ichneumonid collections in the Institute of Ecology and Biological Resources, Hanoi, Vietnam, we herein describe a new species of *Chrysocryptus* from Vietnam. In addition, we provide the first records of *C. aureopilosus* from Vietnam and Indonesia (West Java) and additional distribution records based on specimens in the collections of the Natural History Museum, London (UK) and Naturalis Biodiversity Center, Leiden (the Netherlands). A key to all four known species of *Chrysocryptus* is compiled. Note that we recognise Phygadeuontinae as a distinct subfamily from Cryptinae, in line with Santos (2017).

MATERIAL AND METHODS

Specimens in this paper are deposited in the Institute of Ecology and Biological Resources, Hanoi, Vietnam (IEBR), the Natural History Museum London, UK (NHMUK), and the Naturalis Biodiversity Center, Leiden, the Netherlands (RMNH). The other collection referred to in this paper is the National Museum of Natural History, Smithsonian Institution, Washington, DC, USA (USNM).

Morphological terminology follows Broad et al. (2018). Photographs were taken with a Leica M80 stereomicroscope combined with a Leica IC80HD camera.

TAXONOMY

Chrysocryptus Cameron, 1902

Chrysocryptus Cameron, 1902. Jour. Straits Branch Roy. Asiatic Soc. 37: 58.

Type species. *Chrysocryptus aureopilosa* Cameron, 1902. Monobasic.

Synonym. *Anunda* Cameron, 1911: 231.

Type species. *Anunda pilosella* Cameron, 1911. Monobasic.

Diagnosis. Head and mesosoma densely covered with long blond setae; apical margin of clypeus broadly convex, with three small teeth at the center; lower mandibular tooth about half as long as upper tooth; occipital carina complete; mesoscutum with notauli deep and posteriorly convergent; propodeum with strong carinae, area superomedia longer than wide; fore wing with vein *3rs-m* present, areolet pentagonal, *2m-cu* weakly inclivous; first tergite long and

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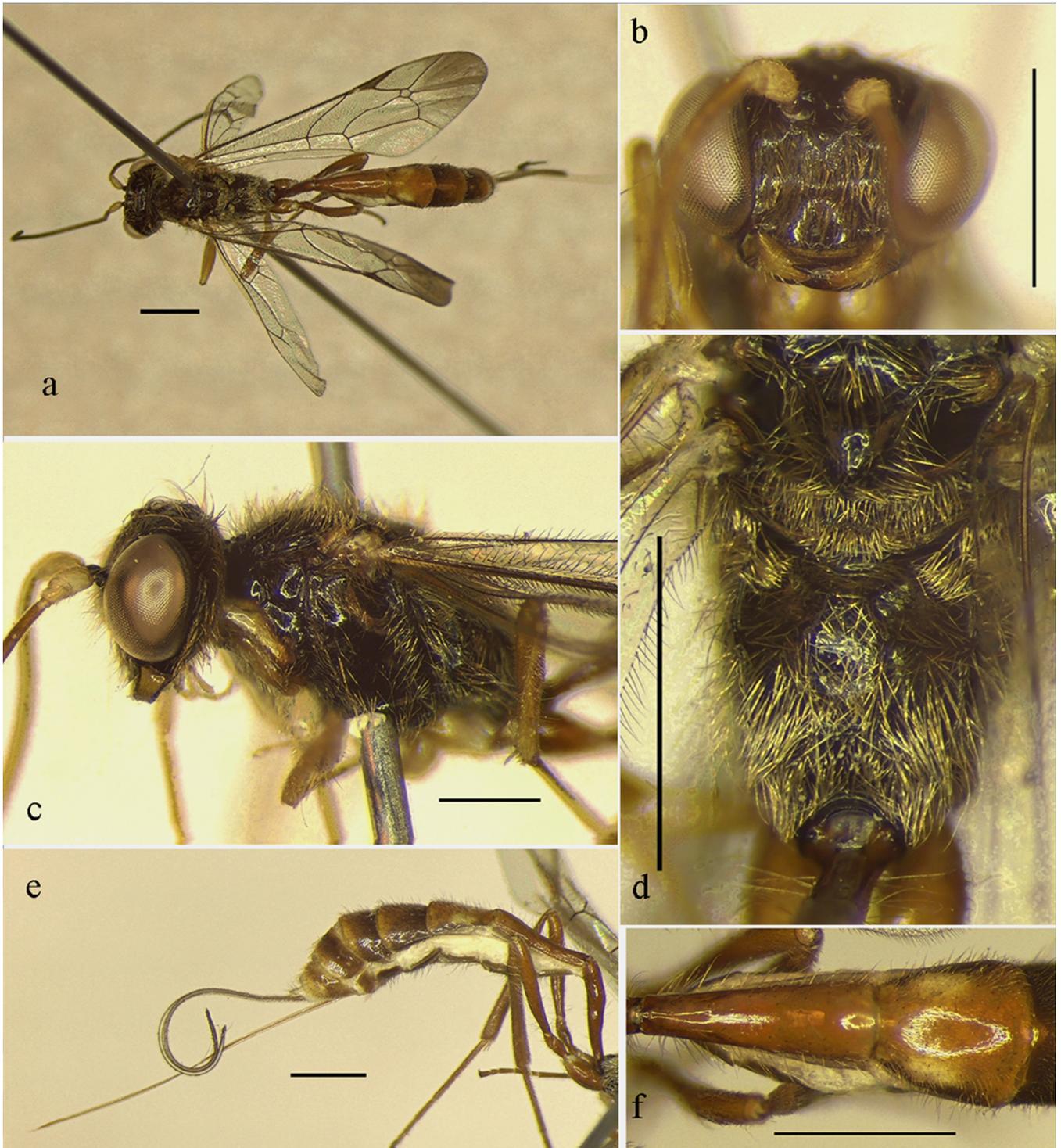


Fig. 1. *Chrysocryptus aureopilosus*, female from Trang An Landscape Complex, Ninh Binh Province, Vietnam. a, dorsal view; b, face; c, lateral view of head and mesosoma; d, dorsal view of scutellum and propodeum; e, lateral view of metasoma and ovipositor; f, dorsal view of metasomal tergites 2–3 (each scale bar = 1.0 mm).

slender, completely fused with sternite, without carinae, spiracle at or anterior to middle.

There are no host records for any species of *Chrysocryptus*. Townes (1970) placed *Chrysocryptus* in his subtribe Bathytrichina, although this relationship has not been formally tested; known hosts of *Bathytrix* Förster (better known than other ‘bathytrichines’) span a wide range of holometabolous insect pupae and, in a few cases, spider egg sacs (e.g., Schwarz & Shaw, 2010).

***Chrysocryptus aureopilosus* Cameron, 1902**

(Fig. 1)

Chrysocryptus aureopilosa Cameron, 1902. Jour. Straits Branch Roy. Asiatic Soc. Holotype: female (NHMUK): Malaysia (Sarawak); NHMUK010880751.

Material examined. Holotype female (as above); 1 female (IEBR), VIETNAM: Vinh Phuc Province, Me Linh Station for Biodiversity, 200 m a.s.l., hand net, T.P.L. Nguyen coll., 27

May 2000; 1 female (IEBR), VIETNAM: Nghe An Province, Anh Son, Phuc Son, hand net, H.X. Le coll., 22 April 2006; 1 female (IEBR), VIETNAM: Ninh Binh Province, Trang An Landscape Complex, 20°15'4.1"N, 105°53'10.8"E, 16 m a.s.l., hand net, N.T. Pham coll., 21 June 2017; 1 male (IEBR), same data, 23 June 2017; 1 male (IEBR), same data, 12 June 2018; 1 female (IEBR), same locality, 20°14'16.6"N, 105°53'15.1"E, 3 m a.s.l., N.T. Pham coll., 22 June 2017; 1 female (NHMUK), INDONESIA, West Java, Tjitalahab Vill., Mt Djampang, K.M. Walsh coll., September 1937 (NHMUK010880754); 1 male (NHMUK), INDONESIA, West Java, Radjamandula, 200ft, Djampang Wetan, K.M. Walsh coll., March 1937 (NHMUK010880755); 1 female (NHMUK), MALAYSIA, Sarawak, Retuk, G.E. Bryant coll. 15 May 1914, (NHMUK010880758); 1 male (NHMUK), MALAYSIA, Selangor, Kanching Hill, 26 March 1939 (NHMUK010880756); 1 female (NHMUK), MALAYSIA, Sarawak, Gunung Mulu, N.M. Collins coll., March–April 1978, (NHMUK010880757); 1 male (NHMUK), MALAYSIA, Sarawak, Semongoh Forest Reserve, 1°25'N, 110°17'E, Malaise trap over stream, P.S. Cranston coll., 15–19 October 1976, (NHMUK010880759); 1 male (NHMUK), MALAYSIA, Sarawak, Niah 3°49'N, 113°46'E, Malaise trap in primary forest, P.S. Cranston coll., 9–17 October 1976, (NHMUK010880760); 1 female (NHMUK), MALAYSIA, Cameron Highlands, Tana Rata, Malaise trap, O.P. Khoo coll., 2001–2002 (NHMUK010880761).

Diagnosis. Head and mesosoma (except reddish propleuron and anterior pronotum) black, metasoma reddish with brown markings; area superomedia with posterior carina straight; ovipositor sheath about 2.0 times as long as hind tibia.

Redescription of female. Head. Antenna with 33–34 flagellomeres, first flagellomere 3.8–4.0× longer than apical width, 1.3× length of second; bare deep groove between antennal sockets; face 0.5× as high as wide; clypeus separated from face by impression, about 0.5× as high as wide; malar space short, about 0.2× mandibular basal width; interocellar distance about 0.3× ocellar-ocular distance.

Mesosoma. Epomia moderately strong, angled medially, as long as mandibular basal width; scutellum dorsally polished with moderately dense punctures; mesopleuron with sternaulus strong, extending to posterior margin; propodeum with posterior transverse carina of area superomedia straight, posterior width about 1.5× as long as anterior width, spiracle round, placed in center of area spiracularis; fore basitarsus slightly shorter than tarsomeres 2–5 combined; mid basitarsus about 1.1× tarsomeres 2–5 combined; hind basitarsus 1.1× tarsomeres 2–5 combined. Fore wing length 6.7–8.5 mm, vein *M&Rs* opposite *1cu-a*, vein *2rs-m* equal to *3rs-m*, vein *1m-cu&M* slightly angled medially, without ramulus, hind wing with first abscissa of vein *CU* about 1.7–1.8× vein *cu-a*; distal ends of *RS* and *M* obsolete, present as traces.

Metasoma. First tergite smooth and polished, about 6.0–6.5× as long as posterior width, laterally with long setae, spiracle at anterior 0.4; second tergite equal in length to first tergite, 5.6–6.4× as long as anterior width, 3.0–3.2×

as long as posterior width, anterolaterally without short oblique impression but with a callus between anterior edge and spiracle; second tergite polished with sparse punctures, metasoma with tergite 3 onward densely minutely punctate, with short setae; ovipositor sheath 2.0–2.1× as long as hind tibia.

Colour. Head and mesosoma black, mandible except teeth, anterior margin of pronotum and entire propleuron reddish yellow. Fore leg yellow. Mid and hind legs and metasomal tergites reddish, hind tarsomere 5 and gaster with tergite 3 onwards with brown markings. Antenna reddish, distally black. Wings hyaline with apex of fore wing light brown.

Male. Similar to female except long stiff setae present on all metasomal tergites.

Distribution. Previously known only from Sarawak (Malaysia) (Yu et al., 2012). These are the first records of this species from Vietnam and Indonesia.

Chrysocryptus brevis, new species

(Fig. 2)

Material examined. Holotype: female (IEBR), VIETNAM: Tuyen Quang Province, Na Hang District, Giang Chi village, 22°35'2.7"N, 105°19'41.7"E, 862 m a.s.l., hand net, V.T. Hoang coll., 13 September 2017. Paratype: 1 male (IEBR), VIETNAM: Phu Tho Province, Xuan Son National Park, hand net, V.T. Hoang coll., 19 September 2005.

Diagnosis. Head and mesosoma black, except prothorax reddish, metasoma reddish brown; area superomedia with posterior transverse carina strongly arched; ovipositor about as long as hind tibia.

Description of holotype. Head. Antenna with 40 flagellomeres, first flagellomere 4.3× longer than wide, 1.2× length of second; between antennal sockets with bare deep groove separated from shallow median groove of frons; face 0.5× as high as wide; clypeus separated from face by impression, about 0.55× as high as wide; malar space short, about 0.3× mandible basal width; interocellar distance about 0.2× ocellar-ocular distance.

Mesosoma. Epomia strong, sinuous ventrally, as long as mandibular basal width; scutellum polished with sparse punctures; mesopleuron with sternaulus strong, extending to posterior margin; propodeum with posterior transverse carina strongly arched at posterior of area superomedia, posterior width about 2.1× as long as anterior width, spiracle round, close to anterior transverse carina; fore basitarsus slightly shorter than tarsomeres 2–5 combined; mid basitarsus about 1.1× tarsomeres 2–5 combined; hind basitarsus 1.2× tarsomeres 2–5 combined. Fore wing length 7.1 mm, vein *M&RS* opposite *1cu-a*, vein *2rs-m* about 1.1× *3rs-m*, vein *1m-cu&M* with a short ramulus, hind wing with first abscissa of vein *CU* about 1.7× vein *cu-a*; distal ends of *RS* and *M* obsolete, present as traces.



Fig. 2. *Chrysocryptus brevis* Pham, Broad & van Achterberg, new species, holotype female. a, dorsal view; b, face; c, dorsal view of head and mesosoma; d, dorsal view of scutellum and propodeum; e, lateral view of metasoma and ovipositor; f, dorsal view of metasomal tergites 2–3 (each scale bar = 1.0 mm).

Metasoma. First tergite smooth and polished, about 5.4× as long as posterior width, laterally with long setae, spiracle at middle; second tergite 0.8× as long as first tergite, 3.7× as long as anterior width, 1.9× as long as posterior width, anterolaterally with two short oblique impressions; metasoma with second tergite onward densely minutely punctate, with short setae; ovipositor sheath 1.0× as long as hind tibia.

Colour. Head and mesothorax black, except clypeus, mandible except teeth and prothorax reddish yellow. Fore leg yellow. Mid and hind legs and metasomal tergites reddish brown.

Male. Similar to female except antenna with 41 flagellomeres, mesoscutum with notauli not convergent posteriorly, propodeum with posterior transverse carina slightly arched, first tergite about 6× as long as posterior width.



Fig. 3. *Chrysocryptus pilosellus* (Cameron), female from New Guinea. a, dorsal view; b, face; c, lateral view of head and mesosoma; d, dorsal view of scutellum; e, dorsal view of scutellum and propodeum; f, lateral view of metasoma and ovipositor; g, dorsal view of metasomal tergites 2-3 (each scale bar = 1.0 mm, except scale bar for Fig. 3d = 0.5 mm).

Comparative notes. The new species can be distinguished from *C. aureopilosus* Cameron by its shorter ovipositor sheath (1.0× as long as hind tibia versus 2.0×) and by its broader metasomal tergite 2 (3.7× as long as anterior width versus 6.4×, 1.9× as long as posterior width versus 3.0×). In addition, the new species has a reddish clypeus and yellow pronotum (versus black clypeus and black pronotum posteriorly in *C. aureopilosus*).

Etymology. The new species is named after its short ovipositor.

Distribution. Currently known only from Tuyen Quang and Phu Tho provinces, northern Vietnam.

Chrysocryptus pilosellus Cameron, 1911
(Fig. 3)

Anunda pilosella Cameron, 1911. Nova Guinea. Holotype: male, missing, not examined (see 'remarks').

Material examined. 1 female (RMNH), NEW GUINEA [= Indonesia: Papua]: Bernhard Camp 50 m, J. Olthof coll., October 1938; 1 female (RMNH): NEW GUINEA: Araucaria Camp 800 m, L. J. Toxopeus coll., 15 March 1939; 1 male (NHMUK), 'NEW GUINEA' (NHMUK010880763); 1 male (NHMUK), 'NEW GUINEA', labelled as 'male homotype Morley det. ii.1914', September 1911, (NHMUK010880763); 1 female (NHMUK), PAPUA NEW GUINEA, Morobe, Wau, 1000 m, I.D. Gauld coll., October 1979 (NHMUK010880762).

Diagnosis. Body reddish, except reddish brown last tergites; fore wing with apical third to half dark brown; scutellum with spine posteriorly; ovipositor sheath about 2.1 times as long as hind tibia.

Description of female. Head. Antenna with 37 flagellomeres in one intact specimen, first flagellomere 3.3× longer than width, 1.2× length of second; frons evenly punctate, setose; face 0.5× as high as wide; clypeus separated from face by impression, about 0.55× as high as wide; malar space short, about 0.2× mandibular basal width; interocellar distance about 0.2× ocellar-ocular distance.

Mesosoma. Epomia strong, sinuous posteriorly, 1.2× as long as mandibular basal width; scutellum densely punctate, setose, posteriorly with short spine/projection medially; mesopleuron subpolished, with fine, sparse punctures, sternaulus strong, extending to posterior margin, epicnemial carina present, extending to anterior margin; propodeum with posterior transverse carina straight across posterior of area superomedia, posterior width of area superomedia about 1.2× as long as anterior width, spiracle round, closer to lateral longitudinal carina than to anterior transverse carina; fore basitarsus 0.9× as long as tarsomeres 2–5 combined; mid basitarsus slightly longer than tarsomeres 2–5 combined; hind basitarsus 1.1× tarsomeres 2–5 combined. Fore wing length 8.1–8.9 mm, vein *M&RS* opposite *1cu-a*, vein *2rs-*

m about 0.9× *3rs-m*, vein *1m-cu&M* without ramulus, hind wing with first abscissa of vein *CU* about 1.2× vein *cu-a*; distal ends of *RS* and *M* obsolete, present as traces.

Metasoma. First tergite subpolished, about 6.0× as long as posterior width, laterally with long setae, spiracle at anterior 0.4; second tergite 0.8× as long as first tergite, 4.6× as long as anterior width, 1.8× as long as posterior width, anterolaterally with callus between anterior edge and spiracle; ovipositor sheath 2.1× as long as hind tibia.

Colour. Reddish. Fore wing with dark brown area extending from apical to basal 0.4 of discusubmarginal cell medially, ventrally extending nearly to the claval notch or *2cu-a*, narrowly hyaline around veins comprising areolet and around bullae in *2m-cu*. Hind wing dark brown apically. Posterior metasomal tergites reddish brown.

Male. Similar to female but dark brown part extends slightly further along the wings, to *2cu-a*. One male with antennae intact with 36 flagellomeres.

Distribution. Currently known only from Papua (Indonesia, Papua New Guinea) (Yu et al., 2012).

Remarks. The identity of the specimens identified as *C. pilosellus* is uncertain. A syntype (probably a holotype as there is no reason to suppose Cameron had more than one specimen when he described the species) is supposed to be in RMNH, transferred with the entomological collections from Amsterdam, but is missing. We base our interpretation of the species on Cameron's (1911) original description and on a male specimen in NHMUK identified as *Anunda pilosella* by Claude Morley and labeled by Morley as a 'homotype' (Morley, 1914, unpublished data). This has no nomenclatural standing but by definition implies that Morley directly compared this male with the holotype or a syntype male. Cameron's (1911) original description is not of the highest quality, being brief, without diagnosis and lacking illustrations, and does not mention a projection on the scutellum. However, the rest of the description, including the black markings on the fore wing, agrees. This is the first description of the female of *C. pilosellus*.

Chrysocryptus romani Cushman, 1922

Chrysocryptus romani Cushman, 1922. Philippine Jour. Sci. 20: 586. Holotype: female: Mt. Makiling on Luzon (USNM).

Material examined. None.

Diagnosis. Body bright ferruginous, face slightly paler, flagellomeres blackish, paler at base; wings hyaline; ovipositor nearly as long as metasomal tergites (based on original description).

Distribution. Currently known only from its type locality (Yu et al., 2012).

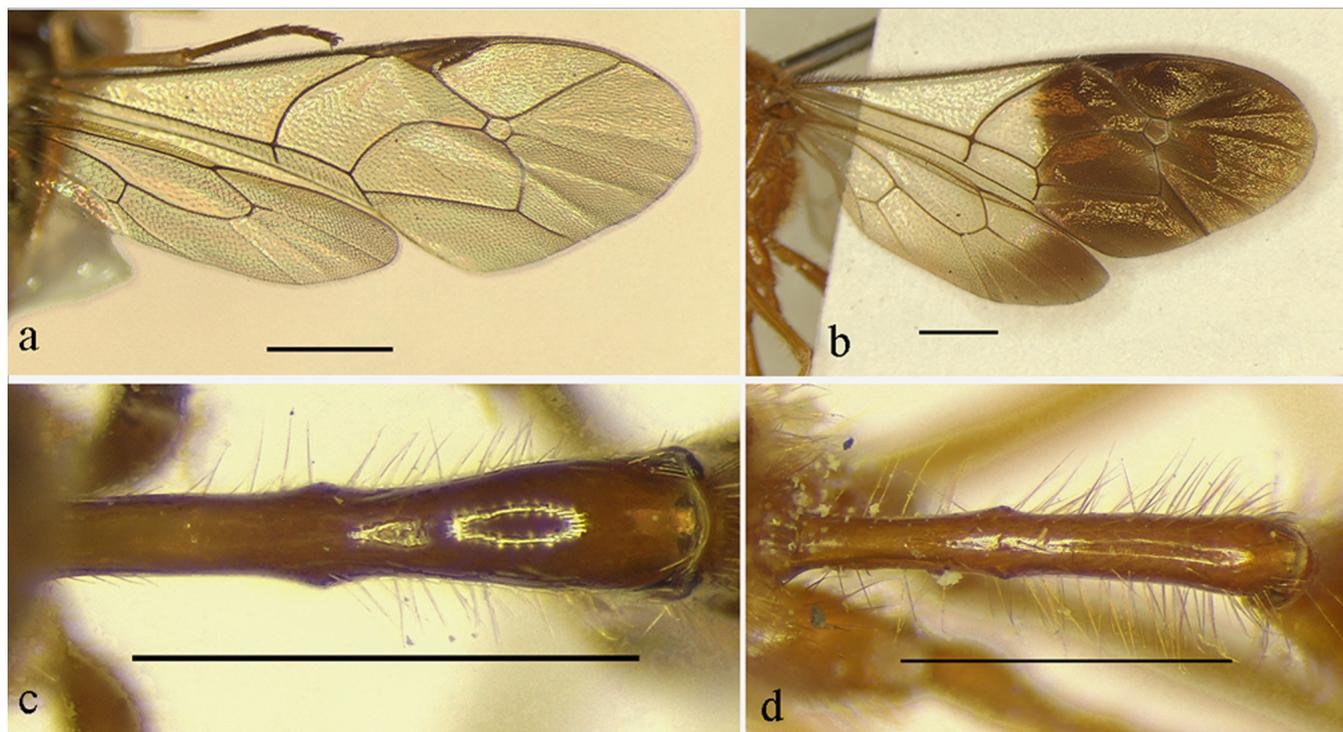


Fig. 4. Wings and and metasomal tergite 1, a & c. *Chrysocryptus brevis*, new species, b & d. *Chrysocryptus pilosellus* (Cameron) (each scale bar = 1.0 mm).

**KEY TO SPECIES OF *CHRYSOCRYPTUS*
CAMERON**

1. Fore wing extensively dark brown apically; scutellum with a short spine or projection; New Guinea.....
..... *Chrysocryptus pilosellus* (Cameron, 1911)
- Fore wing hyaline or with a brown spot apically; scutellum without a projection2
2. Head and mesosoma reddish; the Philippines.....
..... *Chrysocryptus romani* Cushman, 1922
- Head and mesosoma largely black3
3. Ovipositor sheath shorter, about as long as hind tibia; clypeus and pronotum entirely reddish; wings hyaline without light brown spot apically; Vietnam.....
..... *Chrysocryptus brevis*, new species
- Ovipositor sheath longer, about twice as long as hind tibia; clypeus and pronotum posteriorly black, wings with light brown spot apically; East Malaysia (Sarawak), Indonesia, Vietnam..
..... *Chrysocryptus aureopilosus* Cameron, 1902

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LITERATURE CITED

Broad GR, Shaw MR & Fitton MG (2018) Handbooks for the Identification of British Insects, Vol. 7, Part 12: Ichneumonid Wasps (Hymenoptera: Ichneumonidae): Their Classification and Biology. Royal Entomological Society, vi + 418 pp.

Cameron P (1902) On the Hymenoptera collected by Mr. Robert Shelford in Sarawak, and on the Hymenoptera of the Sarawak Museum. Journal of the Straits Branch of the Royal Asiatic Society, 37: 29–131.

Cameron P (1911) Hymenoptera (except Anthophila and Formicidae). Nova Guinea, 9: 185–248.

Cushman RA (1922) New Oriental and Australian Ichneumonidae. Philippine Journal of Science, 20: 543–597.

Santos BF (2017) Phylogeny and reclassification of Cryptini (Hymenoptera, Ichneumonidae, Cryptinae), with implications for ichneumonid higher-level classification. Systematic Entomology, 42: 650–676.

Schwarz M & Shaw MR (2010) Western Palaearctic Cryptinae (Hymenoptera: Ichneumonidae) in the National Museums of Scotland, with nomenclatural changes, taxonomic notes, rearing records and special reference to the British check list. Part 4. Tribe Phygadeuontini, subtribes Mastrina, Ethelurgina, Endaseina (excluding *Endasys*), Bathytrichina and Cremnodina. Entomologist's Gazette, 61: 187–206.

Townes H (1970) The genera of Ichneumonidae, part 3. Memoirs of the American Entomological Institute 13: 1–307.

Townes HK, Townes M & Gupta VK (1961) A catalogue and reclassification of the Indo-Australian Ichneumonidae. Memoirs of the American Entomological Institute, 1: 1–522.

Yu DS, van Achterberg C & Horstmann K (2012) Taxapad 2012, Ichneumonoidea 2011. Database on flash-drive. Ottawa, Ontario, Canada. www.taxapad.com. (Accessed 25 October 2018).