

Taxonomy of the Indo-Malayan presocial potter wasp genus *Calligaster* de Saussure (Hymenoptera, Vespidae, Eumeninae)

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Abstract

The taxonomic history and current taxonomic status of the presocial potter wasp genus *Calligaster* de Saussure, 1852, at generic and species levels are reviewed. The hitherto-unknown female of *Calligaster viridipennis* Giordani Soika, 1960, is described based on specimens newly collected in Central and Southeast Sulawesi. A key to species is also provided.

Keywords

Vespidae, Eumeninae, *Calligaster*, presocial potter wasps, taxonomy, Indo-Malayan

Introduction

Since Williams (1919) described detailed natural history of *Calligaster williamsi* Bequaert, 1940, under the name of *Zethus* (*Calligaster*) *cyanopterus* de Saussure, 1852, *Calligaster* wasps have been considered to practice fully progressive provisioning, and

thus to be ones of several subsocial or presocial potter wasps (Cowan 1991). The nesting behavior of *Calligaster* wasps is unique in the Oriental potter wasps in that, as the wasps of the Neotropical subgenus *Zethoides* of the genus *Zethus* Fabricius, they make a nest with plant material (leaves cut into small pieces) and that they nest communally with sisters. All these behavioral characters of *Calligaster* allow us to consider the genus key to our better understanding of evolution of social and nesting behavior in the Vespidae (Cowan 1991).

Nevertheless, the phylogenetic position of *Calligaster* in the Eumeninae or even in the Vespidae has not yet been fully studied. *Calligaster*, in which six valid species are currently recognized, is in general considered as a genus comprising the potter wasp tribe Zethini, together with the following genera: *Argentozethus* Stange, 1979 (Neotropical in distribution), *Australozethus* Giordani Soika, 1969 (Australian), *Ctenochilus* de Saussure, 1856 (Neotropical), *Deuterodiscoelius* Dalla Torre, 1904 (Australian), *Discoelius* Latreille, 1809 (Palearctic), *Elimus* de Saussure, 1852 (Papua-Australian), *Ischnocoelia* Perkins, 1908 (Australian), *Macrocalymma* Perkins, 1908 (Australian), *Pachycoelius* Giordani Soika, 1969 (Australian), *Paramischocyttarus* Magretti, 1884 (Afrotropical, Palearctic), *Protodiscoelius* Dalla Torre, 1904 (Neotropical), *Raphiglossa* Saunders, 1850 (Afrotropical, Palearctic) and *Zethus* Fabricius, 1804 (worldwide other than Palearctic) (Richards 1962, Bohart and Stange 1965, Giordani Soika 1969, Stange 1979, Pickett and Carpenter 2010, Hermes et al. 2013). *Calligaster* is Indo-Malayan endemic, occurring from the eastern part of the Indian subcontinent in the west to Sulawesi Island of Indonesia and the Philippines in the east. The genus was not included in Hermes et al.'s (2013) detailed phylogenetic analyses using morphological characters in the Eumeninae.

Furthermore, despite such interesting aspects of *Calligaster* from the viewpoints of evolution of social and nesting behavior, phylogeny and biogeography, its taxonomy at generic as well as species levels is not yet revised even though such a taxonomic revision would provide us with robust bases for these studies. In the present paper, the history of taxonomy and current taxonomic status of *Calligaster* at generic and species levels are reviewed, together with a description of the hitherto-unknown female of *C. viridipennis* Giordani Soika, 1960, and a key to species.

Material and methods

The present study is based on specimens deposited in the collections of the Museum Zoologicum Bogoriense (MZB), Cibinong, Indonesia; Natural History Collection at Ibaraki University (IUNH), Mito, Japan; National Museum of Nature and Science (NMST), Tsukuba, Japan and the Institute of Ecology and Biological Resources (IEBR), Hanoi, Vietnam.

Each species account is accompanied by the original citation; sex(es) and locality(ies), if mentioned, are given together with the repository(ies) of name-bearing type specimen(s) in parentheses. Distributional data are summarized under "Distribution". The acronyms

of the type repositories are as follows: BMNH, The Natural History Museum, London; MCZ, Museum of Comparative Zoology, Harvard University, Cambridge, U.S.A; MSNG, Museo Civico di Storia Naturale di Genova Giacomo Doria, Genova; RMNH, Nationaal Natuurhistorisch Museum (formerly Rijksmuseum van Natuurlijke Historie), Leiden, Netherlands; USC, University of San Carlos, Cebu City, Philippines; ZMB, Zoologisches Museum der Humboldt Universität, Berlin.

Morphological characters and marking patterns were observed on pinned-and-dried specimens under a stereoscopic dissecting microscope. Male genitalia of some species were dissected, cleared in lactic acid, and observed in glycerin under a stereoscopic dissecting microscope. Line drawings were made by using the drawing tube attached to the microscope. Terminology on morphological characters mainly follows Bohart and Stange (1965), Carpenter and Cumming (1985), that on surface sculpturing follows Harris (1979), and on male genitalia mainly follows Bitsch (2012).

Taxonomy

Genus *Calligaster* de Saussure

Calligaster de Saussure, 1852: 22. Type species: *Calligaster cyanoptera* de Saussure, 1852, by subsequent designation of Ashmead (1902: 205).

Diagnosis. The genus *Calligaster* can be differentiated from any other eumenine genera by the combination of the following characters: labial and maxillary palpus with three and six palpomeres respectively; mid tibia with two spurs; mesepisternum with horizontal suture absent; propodeum with propodeal orifice rounded dorsally, apical valvula short and rounded, and submarginal carina not projecting as pointed lobe above valvula; metasomal segment I petiolate; tergum I in dorsal view abruptly widened laterally shortly after basal slit, then nearly parallel-sided apically, with longitudinal striae; metasomal sternum II with basal fossa; male characters: terminal antennal flagellomere simple; distal lobe of gonocoxite sub-truncated; gonostyle subapically with a tuft of short and thin hairs; basivolsella long and narrow, slightly enlarged at the base, with an obliquely truncated apex.

Remarks. *Calligaster* was proposed by de Saussure (1852: 23, Pl. IX fig. 6) as a genus to accommodate his two species from “Java”: *Calligaster cyanoptera* de Saussure, 1852 and *C. hero* de Saussure, 1852. Later, he (de Saussure 1855: 115) synonymized *C. hero* under *Zethus gigas* Spinola, 1841, which is a South American *Zethus* species and is now treated as a synonym of *Zethus coeruleopennis* (Fabricius, 1798) (Bohart and Stange 1965). Although de Saussure (1855) did not refer to the type locality of *C. hero* given in de Saussure (1852) (= “Java”), it may have been certainly based on an erroneous labeling. Ashmead (1902) designated *C. cyanoptera* de Saussure as the type species of *Calligaster* de Saussure, 1852.

The taxonomic status of *Calligaster* had not been stabilized until Bequaert (1928) reinstalled its generic status; that is, de Saussure (1855) treated it as a division in the genus *Zethus*; Gribodo (1892), possibly having followed de Saussure (1855), treated *Calligaster* as a subgenus in the genus *Zethus* when he described *Zethus javanus* (= *C. cyanopterus*); Dalla Torre (1904) treated *Calligaster* as a genus; and Cameron (1904, 1909) described two species of *Zethus*, which Bequaert (1928) transferred to the genus *Calligaster*. But, establishment of the concept of *Calligaster* currently accepted by most of the vespid taxonomists was of Giordani Soika (1960).

Key to species of *Calligaster*

As no specimens were available to us, the characters for *C. etchellsii* and *C. zetteli* were extracted from Cameron (1909) and Bequaert (1928), and Gusenleitner (2006), respectively. Neither information of the male characters of *C. zetteli* nor of the female of *C. etchellsii* is available to us. In *Calligaster*, we have observed distinct morphological differences between sexes in the head characters, while characters of the mesosoma and metasoma (except for the number of metasomal segments and genital organs) are nearly the same between the sexes. In the following key, sex is specified only for the head characters.

- 1 Metasomal tergum I other than basal petiolate part in lateral view hardly convex dorsally (Fig. 4) **2**
- Metasomal tergum I other than basal petiolate part in lateral view more or less distinctly convex dorsally (Figs 1, 3, 5) **3**
- 2 Female clypeus with dense and coarse punctures. Propodeum with dorsal face smooth and barely punctured. Metasomal tergum II basally barely punctured, apically with sparse minute punctures. Female mandible entirely black ***C. williamsi* Bequaert**
- Female clypeus with sparse minute punctures. Propodeum with dorsal face coarsely punctured. Metasomal tergum II entirely with sparse minute punctures. Female mandible with yellow basal spot ***C. zetteli* Gusenleitner** [male unknown]
- 3 Male clypeus in frontal view about 1.5 times as wide as high. Body black entirely or with bright yellow markings **4**
- Male clypeus in frontal view about 2 times as wide as high; ventral margin shallowly emarginate medially. Body with pale-yellow markings ***C. etchellsii* (Cameron)** [female unknown]
- 4 Metasomal tergum I in lateral view without distinct subapical depression (Fig. 1); in dorsal view strongly convex along lateral margin (Fig. 6). Wings fuscous, with greenish-purple iridescence ***C. viridipennis* Giordani Soika**
- Metasomal tergum I in lateral view distinctly constricted subapically (Figs 3, 5); in dorsal view nearly parallel-sided, with slight subapical constriction (Figs 7, 9). Wings fuscous, with blue-green and purple iridescence **5**

- 5 Metasomal segment I in dorsal view relatively slender, about 2.5 times as long as its maximum width (Fig. 7); tergum I hardly punctured, so that dorsal striae are more or less conspicuous ***C. cyanoptera* de Saussure**
- Metasomal segment I in dorsal view shorter and stouter, about 1.8 times as long as its maximum width (Fig. 9); tergum I with dense and distinct puncture, so that dorsal striae inconspicuous ***C. himalayanensis* (Cameron)**

***Calligaster cyanoptera* de Saussure, 1852**

Figs 3, 7, 10, 14, 17, 19–22

Calligaster cyanoptera de Saussure, 1852: 23, pl. IX figs. 7, 7a, ♀, “Java”, syntypes (?RMNH).

Zethus cyanopterus; de Saussure 1855: 115 (here called *Zethus cyanopterus* Lep. [!]), 123 (in division *Calligaster*; ♂).

Zethus (*Calligaster*) *cyanoptera*; Gribodo 1892 (1891): 260.

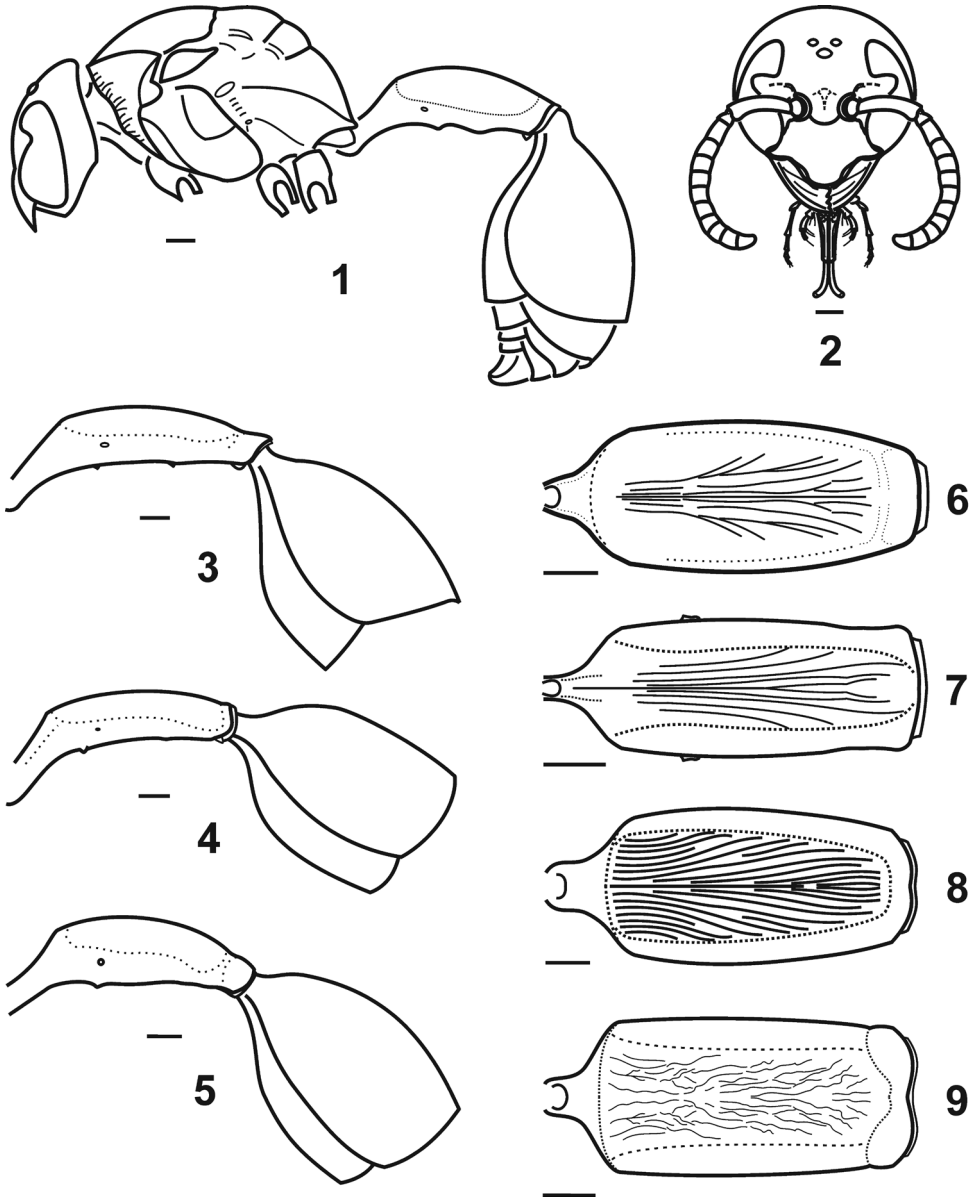
Zethus (*Calligaster*) *javanus* Gribodo, 1892 (1891): 261, ♂ (in subgenus *Calligaster*), “Kaliparè (Giava orientale)”, holotype [by monotypy] (MSNG). Synonymized under *Calligaster cyanoptera* de Saussure, 1852 by van der Vecht (1937: 262).

Calligaster javana; Dalla Torre 1904: 17 (cat.).

“*Zethus erythrostomus* Cameron” Meade-Waldo, 1914: 404, “Java”, holotype [by monotypy] (BMNH), as a synonym of *Calligaster cyanopterus* de Saussure. Available under Article 11.6.1 of the International Code of Zoological Nomenclature.

Diagnosis. *Calligaster cyanoptera* is distinguished from its congeners by the combination of the following characters: metasomal tergum I in lateral view moderately convex dorsally, with distinct preapical depression (Fig. 3), in dorsal view nearly parallel-sided, relatively slender, about 2.5 times as long as its maximum width (Fig. 7); female clypeus in frontal view about 1.5 times as wide as high, with ventral margin more or less truncated rather than broadly rounded (Fig. 10); male clypeus in frontal view about 1.5 times as wide as high, with semi-elliptic emargination at ventral margin (Fig. 14); tergum I hardly punctured, so that dorsal striae are more or less conspicuous (Fig. 7).

Material examined. JAVA: 1♂ (MZB), Tjikadjang, Bandarwangi, alt. 8–900 m, 7–10.iv.1939, M.A. Lieftinck; 1♂ (MZB), Priangan, Gn. [= “Mt.”] Limboeng, alt. 1000 m, 28.vii.1934, M.A. Lieftinck; 1♀ (MZB), Priangan, Gn. Limboeng, 1000 m, 28.vii.1934, M.A. Lieftinck; 2♂ (MZB), Djampang, Gn. Tjimerang, xii.1932, M. E. Walsh; 1♀ (MZB), Djasinga, 4.xii.1938, M. A. Lieftinck; 1♂ (MZB), Djampang Tengah, G. Tjisoeroe, alt. 600–800 m, 1933, M. E. Walsh; 1♂ (MZB), G. Gedeh, Tjiboenar, 14.xi.1929, F.C. Drescher; 1♂ (MZB), Tjipanas, 19.xii.1930; 3♀ (MZB), Soekanegara, alt. 400–1000 m, ii.1940, native coll.; 1♂ (MZB), Pelaboean Ratoe, 16–17.iv.1933, M.A. Lieftinck; 1♂ 2♀ (MZB), Priangan, Mt. Limboeng, alt. 900 m, 30.vii.1934, M.A. Lieftinck; 1♂ (MZB), Cikaniki, Gn. Halimun, Sukabumi, alt.



Figures 1–9. *Calligaster* species. 1–9 Female 1, 2, 6 *C. viridipennis* 3, 7 *C. cyanoptera* 4, 8 *C. williamsi* 5, 9 *C. himalayensis* 1 Body, lateral view 2 Head, frontal view 3–5 Metasomal segments I–II, lateral view 6–9 Metasomal tergum I, dorsal view. Scale 1 mm.

950 m, 8.viii.1997, Zamilah et al.; 1♀ (MZB), Cikaniki, Gn. Halimun, Sukabumi, alt. 950–1000 m, 26.iv–2.v.1999, T. Ueno, M.R. Sofyan; 1♀ 1♂ (MZB), 2.v.1937, Mt. Salak; 1♀ (MZB), Mt. Gede, i.1935; 1♂ (MZB), Djasinga, 2.viii.1952, Amsari; 1♀ (MZB), Gn. Tjimerang, 600 m, Bodjongkulong, Djampang Tengah, iii.1941,

native coll.; 5♀ 3♂ (MZB), Mt. Gede, 1000 m, i.1935, native coll.; 1♂ (MZB), Gn. Halimun Nat. Park, Cikaniki, 06°45'04"S 106°31'31"E, alt. 925 m, 15.ix.1999, W.A. Noerdjito; 1♀ (MZB), Sukabumi, Jampang, Bojong Pari, 07°10'S 106°37'E, 29.iii.2002, R. Ubaidillah; 1♂ (MZB), Penandjoeng bay, Kalipoetjang, alt. 300 m, vi.1936, M.A. Lieftinck; 1♀ 1♂ (MZB), Batoerraden, Gn. Slamet, Java, 23.xii.1928, F.C. Drescher; 1♀ (MZB), Batoerraden, Gn. Slamet, Java, 9.vii.1939, F.C. Drescher; 3♀ 1♂ (MZB), Cisompet, Garut, W. Java, 4.vii.2013, H. Nugroho & J. Kojima. BALI: 2♀ (MZB), Baturiti, Tabanan, 13.ix.2013, H. Nugroho et al.

Distribution. Sumatra Is. (Marang), Java Is., Bali Is. (new record).

Remarks. In his monograph on solitary vespid wasps, de Saussure (1852) described *Calligaster cyanoptera* based on at least two (the body length was mentioned as "20 á 25 mill. [20 to 25 mill.]") females from "Java". The syntypes were indicated to be in "Musée de Leyde" (de Saussure 1852: 24), but no one has referred to the syntypes. Gribodo (1892: 261) described *Zethus (Calligaster) javanus* based on a single male from "Kaliparè [in Malang] (Giava orientale [East Java])", and van der Vecht (1937: 262) synonymized it under *C. cyanoptera*, stating "... GRIBODO's species is undoubtedly conspecific with *C. cyanopterus* ... the shape of the clypeus is very different in the two sexes". Meade-Waldo (1914: 204) published, as a synonym of *C. cyanopterus* de Saussure, 1852, "*Zethus erythrostomus* Cameron", which was actually an unpublished Cameron's manuscript name for a female specimen from Lawang, East Java (Bequaert 1928: 157).

This species have so far been recorded from Sumatra Is. (Gribodo 1892: 260) and Java Is. (de Saussure 1852, Gribodo 1892, van der Vecht 1937, 1938; our own data as listed below), and we herewith firstly record the species from Bali Is. We also collected a couple of nests made on tree twigs along the creek at Baturiti, Bali; their structure is basically the same as that from the south of Garut, West Java, described by van der Vecht (1938).

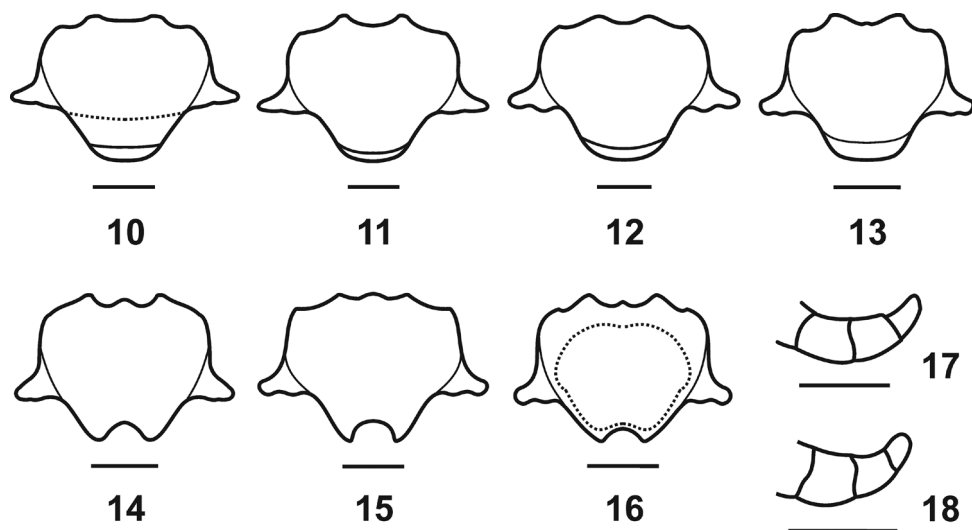
Calligaster etchellsii (Cameron, 1909)

Zeuthus [!] *etchellsii* Cameron, 1909: 206, ♂, "Kuching, Borneo", holotype [by monotypy] (BMNH).

Calligaster etchellsii; Bequaert 1928: 157 (holotype examined; notes).

Remarks. This species was described based on a single male specimen from "Kuching, Borneo" in combination with *Zethus* (Cameron 1909: 206) and Bequaert (1928: 157) moved it to the genus *Calligaster*. Neither other records of this species have so far been published nor have we collected any wasps of this species in our rather intensive field collection at several places in Kalimantan.

Bequaert (1928: 157), having examined the holotype (by monotypy), stated "... quite a distinct species in the shape of the clypeus, which is unusually wide (twice as broad as high) and ends in a deep semi-elliptic emargination." Such a deep semi-



Figures 10–18. *Calligaster* species. 10–13 Female. 14–18 Male 10, 14, 17 *C. cyanoptera* 11 *C. viridipennis* 12, 15, 18 *C. williamsi* 13, 16 *C. himalayensis* 10–13 Female clypeus 14–16 Male clypeus 17, 18 Apex of male antenna. Scale 1 mm.

elliptical emargination at the ventral margin of the male clypeus is also found in *C. cyanoptera*, while the male clypeus in the latter is about 1.5 times as wide as high.

Material examined. No specimen examined.

Distribution. Only the type locality [Kuching in Sarawak, Borneo Is.].

Calligaster himalayensis (Cameron, 1904)

Figs 5, 9, 13, 16

Zethus himalayensis Cameron, 1904: 13, ♀, “Sikkim” (BMNH).

Calligaster himalayensis; Bequaert 1928: 157 (holotype examined; possibly a valid species).

Zethus himalayensis [!]; Giordani Soika 1941: 216 (incorrect spelling of *Zethus himalayensis* Cameron; syn. of *C. cyanopterus* de Saussure).

Diagnosis. The characters which may allow us to differentiate *C. himalayensis* from *C. cyanoptera* are as follows [characters for *C. cyanoptera* are given in the brackets]: Metasomal segment I in dorsal view shorter and stouter (Fig. 9), about 1.8 times as long as its maximum width [slender, about 2.5 times as long as its maximum width (Fig. 7)]; tergum I with dorsal striae inconspicuous, in consequence of strong and distinct punctures [dorsal striae conspicuous; tergum with nearly no punctures]; mesoscutum strongly punctured, also in areas along notauli [strongly punctured, but areas along notauli with no punctures]; scutellum and metanotum with denser, larger and deeper punctures than those in *C. cyanoptera*; dorsal face of propodeum with strong

punctures along the border with the posterior face [glossy, nearly without punctures]; lateral face of propodeum with denser and deeper punctures [punctures sparser, interspaces between punctures wider than diameter of a puncture]; male antennal scape yellow ventrally [black entirely]; interantennal space with paired yellow spots [usually absent in female, rarely absent in male]; female clypeus black entirely [black with wide reddish-brown transverse band ventrally]; male clypeus with large yellow spot occupying nearly entire disk of clypeus [closely paired yellow spots in ventral part, but occasionally lacking].

Material examined. VIETNAM: 1♂ (IUNH), Me Linh, emerged from a nest collected on 9.iii.2005, F. Saito et al. [the nest, in its structure, is similar to that of *C. cyanoptera* we observed and that of *C. williamsi* described by Williams (1919)]; 1♀ 1♂ (IEBR), Kim Hy National Park, Bac Kan, 5.viii.2012, L.T.P Nguyen et al.

Distribution. Sikkim, China, Laos, northern parts of Vietnam.

Remarks. Cameron (1904: 13) proposed *Zethus himalayensis* for a single female from “Sikkim [India]” and Bequaert (1928: 157) moved it to the genus *Calligaster*. Bequaert (1928: 157), having examined the holotype, mentioned that “Although similar to *C. cyanopterus*, it appears to differ in the shape of the clypeus and is possibly a valid species.” Based on the comparison of our specimens from Vietnam [given under “Material examined”] with those of *C. cyanoptera* from Java and Bali, we recognized that *C. himalayensis* differs from the latter in having stronger and more distinct punctures.

Other than the locality given in the original description (Sikkim in India), *C. himalayensis* has been recorded from China (Giordani Soika 1960; without giving any specific localities). We have herein firstly recorded the species from northern parts of Vietnam (new record), suggesting that *C. himalayensis* may occur along the eastern slope of the Himalayas from Sikkim to northern parts of Vietnam, and probably to southeastern parts of China.

***Calligaster viridipennis* Giordani Soika, 1960**

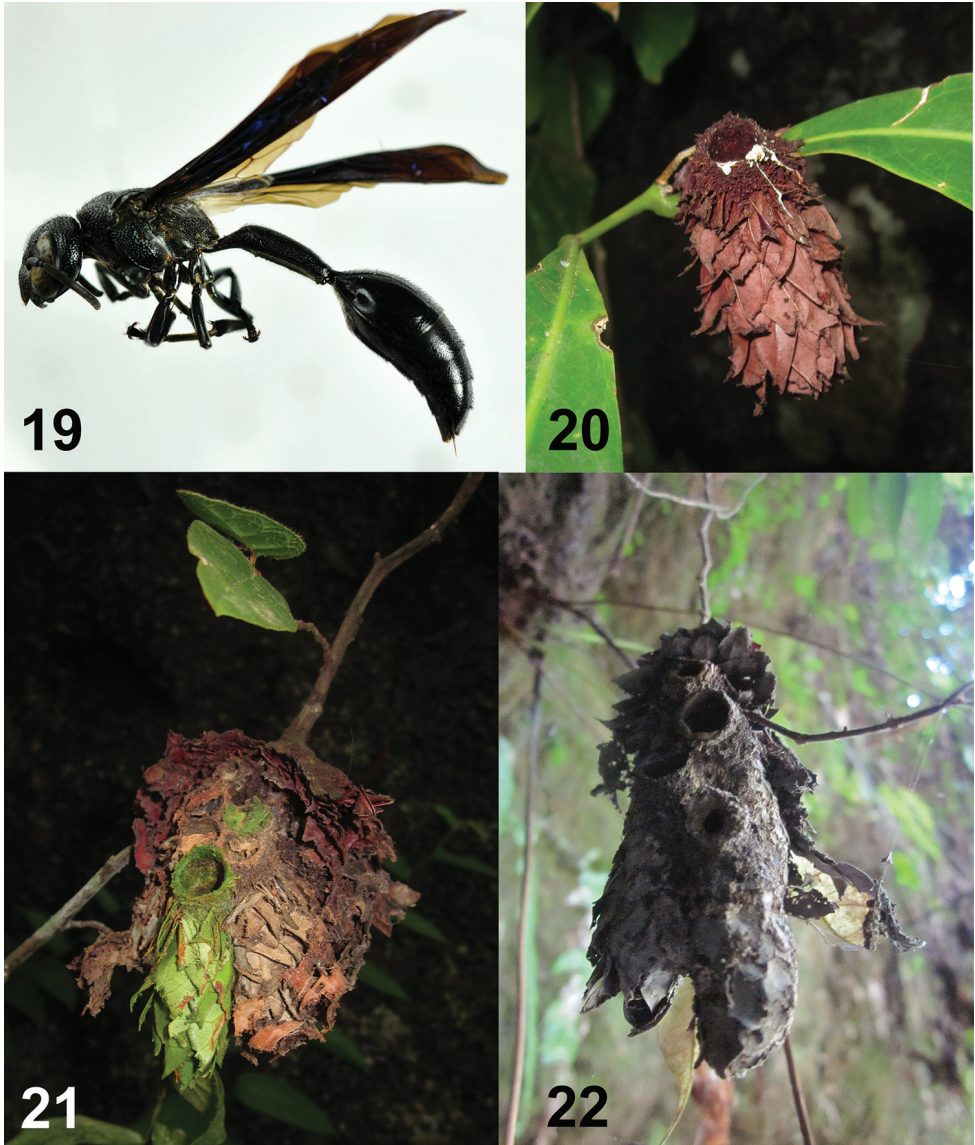
Figs 1, 2, 6, 11

Calligaster viridipennis Giordani Soika, 1960: 72, fig. 11 (nos. 7–8), 74, ♂, “Celebes: Enrekang”, holotype (ZMB).

Remarks. Giordani Soika (1960: 72, 74) proposed *Calligaster viridipennis* for a single male from “Celebes: Enrekang”. Since then, no information on this species has been added.

Based on the specimens recently collected in Central and Southeast Sulawesi we describe below the female of this Sulawesi-endemic *Calligaster* wasp for the first time.

The female can be associated with the male by the combination of the following characters: posterior face of propodeum strongly and reticulately punctured; basal fossa of metasomal sternum II deep and distinct, with dense fulvous hairs; wings fuscous, with strong greenish-purple iridescence.



Figures 19–22. *Calligaster cyanoptera*. **19** Female from Garut, West Java **20** Single cell nest from Garut, West Java **21** Nest with a newly constructed cell (made of cuts of fresh leaves) from Garut, West Java **22** Nest from Bali.

Female characters. Body length (head + mesosoma + metasomal segments I and II) 21–22 mm; fore wing length 20 mm. Head in frontal view subcircular, slightly wider than high, 1.2 times as wide as high (Fig. 2). Clypeus in profile smoothly and weakly convex; in frontal view about 1.5 times as wide as high (Fig. 11), with dorsal margin deeply emarginate medially and ventral margin slightly convex.

Mesosoma flattened dorsoventrally, 1.5 times as long as high in lateral view (Fig. 1); in dorsal view 1.4 times as long as wide. Propodeum with posterior face strongly and reticulately punctured (instead of rugosely striated). Metasomal segment I shorter than mesosoma, 0.8 times as long as mesosoma; tergum I strongly convex dorsally (Fig. 1) [moderately convex in *cyanoptera*]; tergum in dorsal view strongly convex along lateral margins, with faint oblique striae (Fig. 6). Metasomal sternum II with basal fossa as in *C. cyanoptera*, but distinct and deeper, with dense fulvous hairs.

Body densely covered with dense whitish pubescence; tibia and tarsi with golden pubescence. Head strongly punctured, but vertex and gena only sparsely with smaller punctures. Mesosoma strongly punctured; mesoscutum, scutellum and metanotum with punctures sparser and smaller, as those on vertex and gena. Metasomal segment I with punctures slightly stronger than those on *C. cyanoptera*; tergum I with punctures smaller than those on mesonotum; tergum II with small and superficial punctures, regularly arranged from base to apex.

Body black, without markings. Wings fuscous, with greenish-purple iridescence.

Material examined. SULAWESI: 3♀ 1♂ (NMST), Palu, Palolo, [2♀ 1♂, vii.1995; 1♀, i.1991], Mokuyosha; 1♀ (MZB), North Kolaka, Tinukari, Mekongga, 03°38'17"S, 121°11'31"E, alt. ca. 1430 m, 17.vii.2011, R. Ubaidillah et al.; 1♀ (MZB), Luwuk timur, Towuti, Soroako, 03°35'10"S, 121°24'06"E, alt. ca. 450 m, 1–5.i.2007, A. Suwito & E. Cholik.

Distribution. Sulawesi Is. (central, south, and southeast Sulawesi).

Calligaster williamsi Bequaert, 1940

Figs 4, 8, 12, 15, 18

Zethus (*Calligaster*) *cyanopterus*; Williams 1919: 157–164 (natural history).

Calligaster n. sp.; van der Vecht 1937: 263.

Calligaster williamsi Bequaert, 1940: 124, fig. 1 A–D, ♀♂, “Los Baños, Luzon, Philippine Is.”, holotype female (MCZ).

Diagnosis. *Calligaster williamsi* can be distinguished from its congeners by the combination of the following characters: metasomal tergum I in lateral view barely convex dorsally, with preapical dorsal depression weakly produced (Fig. 4), in dorsal view weakly and evenly convex laterally (Fig. 8); longitudinal striae on tergum I strong, more or less regularly arranged (Fig. 8); apex of male terminal antennal flagellomere rounded [Fig. 18; bluntly pointed in *C. cyanoptera* (Fig. 17)].

Material examined. LUZON: 1♀ (IUNH), Los Banos, Laguna, 31.iii.1978, T. Murota; 2♀ 1♂ (IUNH), Los Banos, Laguna, 2–5.viii.1978, H. Kurokawa; 1♀ (IUNH), Univ. Phil. Los Banos, Laguna, 21.iii.1980, J. Kojima; 1♂ (IUNH), Univ. Phil. Los Banos, Laguna, 10.iii.1980, J. Kojima; 1♂ (IUNH), Univ. Phil. Los Banos, Laguna, 15.iii.1980, J. Kojima; 1♂ (NSMT), Mt. Maquilang, Laguna Province, 17–

18.vi.1977, Y. Kurosawa. MINDANAO: 1 ♀ (NSMT), N. Zamboanga, 5.xii.1994, J. Abella, Nagase coll.; 1 ♀ (NSMT), Aras-asan, Surigao, S. Mindanao, x.1978.

Distribution. Philippines: Luzon Is., Mindoro Is., Mindanao Is.

Remarks. Van der Vecht (1937: 262) pointed out that the Philippine species of *Calligaster*, of which life history was described by Williams (1919) under the name of *Zethus (Calligaster) cyanopterus*, was “not conspecific with *C. cyanopterus*” and mentioned that the species “will be described in a forthcoming paper by Prof. J. Bequaert.” Bequaert (1940: 124–126) proposed *Calligaster williamsi* for the females and males from several places on Luzon Is. and Mindoro Is., with designation of a female from “Los Baños, Luzon” as the holotype.

As listed above, we examined specimens also from Mindanao Is., suggesting this species would be distributed throughout the Philippines Islands except for Palawan Is.

Calligaster zetteli Gusenleitner, 2006

Calligaster zetteli Gusenleitner, 2006: 1353, ♀, “Philippinen ... Bais Forest, Negros-Oriental Province”, holotype (USC).

Material examined. No specimen examined.

Remarks. Gusenleitner (2006: 1353–1355) proposed *Calligaster zetteli* for females from Negros, Bohol, and Mindanao Islands, as a species similar to *C. williamsi*. According to Gusenleitner (2006), this species may be differentiated from *C. williamsi* by the characters given in the key to *Calligaster* species [for complete comparison see Gusenleitner (2006: 1354)].

Distribution. Philippines: Negros Is., Bohol Is., Mindanao Is.

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