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A new species of *Calogalesus* Kieffer, 1912 (Hymenoptera: Diapriidae: Diapriinae) from Japan, with a key to world species

RYOJI KAWAI[1,2]* & YU HISASUE[3,4]
[1]*Entomological Laboratory, Graduate School of Bioresources and Bioenvironmental Sciences, Kyushu University, Motooka 744, Nishi-ku, Fukuoka 819-0395, Japan.*
kawai.ryoji.358@s.kyushu-u.ac.jp; https://orcid.org/0009-0000-8596-9942
[2]*JSPS Research Fellow (DC1), Japan Society for the Promotion of Science, Tokyo, Japan.*
[3]*Ogasawara Division of Japan Wildlife Research Center, Okumura, Chichijima, Ogasawara, Tokyo 100-2101, Japan.*
[4]*Department of Biological Sciences, Tokyo Metropolitan University, 1-1 Minami-Osawa, Hachioji-shi, Tokyo 192-0397, Japan.*
hybrizonist@gmail.com. https://orcid.org/0000-0003-4817-2357
**Corresponding author*

Abstract

The genus *Calogalesus* Kieffer, 1912 is newly recorded from Japan. *Calogalesus matris* **sp. nov.** is described as new to science based on specimens from the Ogasawara Islands and Okinawa Island, Japan. A taxonomic key to world species of *Calogalesus* is presented. New DNA barcodes allowed the recognition of size-related morphological variation.

Key words: Parasitoids, taxonomy, oceanic island, DNA-barcoding, morphological variation

Introduction

The genus *Calogalesus* Kieffer, 1912 was established for *Calogalesus parvulus* Kieffer, 1912 and the type species was described based on a single female collected from Seychelles (Kieffer 1912a). Later, two species were described: *C. malabaricus* Rajmohana & Narendran, in Rajmohana (2006) from India and *C. sinicus* Feng, Notton & Xu, 2016 from China. Moreover, unidentified species were reported from the Afrotropical, Oriental, Oceanian (Hawaiian Islands), Neotropical (US Virgin Islands) and Australian regions (Masner & García 2002; Magnacca 2025). Although *Calogalesus* shares some cephalic character with Psilusini, its wing venation and metasomal structure do not align with the diagnosis of any established tribe. Consequently, the genus has been treated as *incertae sedis* within Diapriinae (Masner & García 2002). However, the brief diagnosis presented by Feng *et al*. (2016) lacks several of these morphological characters. The authors excluded evidence for its isolated taxonomic position which limits the understanding of the morphological boundaries of the genus.

In this study, we describe a new species of the genus *Calogalesus* based on specimens from the Ogasawara Islands and Okinawa Island, which are located in the western Pacific Ocean, Japan. Additionally, we describe some intraspecific morphological variation and update the key to world species.

Material and methods

Examined material and morphological analysis

All examined specimens, including the holotype, are deposited in the Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka, Japan (ELKU). Specimens were collected by yellow pan trap (YPT) and sweep netting (sw). Prior to mounting on triangular cards, some specimens were dried using 100% isopropyl alcohol. Photographs were taken using a Canon MP-E65 mm macro lens mounted on a Sony α7R IV digital camera.

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Wings were mounted in Euparal on a cover slip glued onto a paper card and pinned under the respective specimen (Maruyama 2004). Photos of wings were taken using a Canon EOS Kiss X8i camera attached to an Olympus BX50 microscope. Individual photos were stack-combined with Zerene Stacker (Zerene Systems LLC) and processed with Canva Affinity. Morphological terminology and abbreviations follow Masner & García (2002), Yoder (2004), and Hymenoptera Anatomy Ontology Portal (Yoder *et al*. 2010).

Morphological information for known species was referenced from the original description of three species. In addition, we examined specimen photos of two species housed at the Natural History Museum, London, UK (NHMUK). The current depository of the type series of *C. sinicus* should be South China Agricultural University according to the original description (Feng *et al*. 2016), but it should be reconfirmed because most Hymenoptera collection have been moved to Zhejiang University (Toshiharu Mita, pers. comm.). The specimens compared in the photos are as follows: *C. parvulus* Kieffer, 1912 (holotype, ♀, NHMUK010264968, available at https://data.nhm.ac.uk/object/e5c08248-c879-4962-8188-413809bace7c); *C. malabaricus* Rajmohana & Narendran, 2006 (1♂, NHMUK010264967). The two specimens mentioned above were also examined by Feng *et al*. (2016).

Distribution records of the species were mapped using SimpleMappr (Shorthouse 2010). Geographical coordinates were obtained using Google Maps software. The map was edited using Canva Affinity.

Molecular analysis

DNA was extracted from excised legs using the DNeasy Blood & tissue kit (Qiagen, Tokyo, Japan). The fragment of mitochondrial cytochrome oxidase subunit I (COI) region was amplified using the primers COI_pF2 (fwd: ACCWGTAATRATAGGDGGDTTTGGDAA) and COI_2437d (rev: GCTARTCATCTAAAWAYTTTAATWCCWG) designed by Simon *et al*. (1994) and modified by Kaartinen *et al*. (2010). The PCR reaction mixture consisted of 5 µL of KOD One® PCR Master Mix -Blue- (TOYOBO, Japan), 0.3 µL (10 pmol/µL) of each primers, and 1 µL of template DNA, with Milli-Q water added to a final volume of 10 µL. PCR amplification was performed as follows: an initial denaturing at 98°C for 10 s, followed by 40 cycles at 98°C for 10 s, 47°C for 5 s, and 68°C for 5 s. The amplified products were purified using ExoSAP-IT™ Express (Thermo Fisher Scientific Inc., USA) and sequenced using Pre-mixed Sanger sequencing services (Azenta Japan Corp., Tokyo, Japan). Sequence data are publicly available at DDBJ/EMBL/GenBank. Accession numbers are indicated with collection data for each specimen. Pairwise distances were calculated based on the K2P method using MEGA v. 12.0.9 (Kumar *et al*. 2024) to assess the genetic divergence between samples.

Taxonomy

Genus *Calogalesus* Kieffer, 1912

Calogalesus Kieffer, 1912a: 73. Type species: *Calogalesus parvulus* Kieffer, 1912, by monotypy.

Diagnosis.

A detailed diagnosis of the genus was provided by Masner & García (2002). Therefore, only a short diagnosis of the most important features is given here, with morphological terminology updated to current usage.

Head nasiform in dorsal view; antennal shelf strongly projecting, laterally sharply angled and medially divided in frontal view (Fig. 1C, F); frons with a pair of lateral keels extending posteriorly, forming a ridge above upper eye orbit, two small pointed projections in front of median ocellus; malar sulcus present; mandible opisthognathous, beak-like (Fig. 1C, D); labrum exposed, sclerotized, subtriangular; hypostomal carina moderately developed, blocking lateral movement of mandible, such that mandible extends anteriorly rather than laterally; eye large with scattered setae; flagellum 10-merous in female, gradually thickened towards tip and not forming distinct club (Fig. 1B); 12-merous with unmodified F1 in male (Fig. 2B); pronotal collar with a dense cushion of setae; notauli distinct, abbreviated posteriorly, not reaching transscutal articulation (Fig. 1F); scutoscutellar sulcus composed of two medial pits; fore wing with two elongate hairless zones basally and well-developed marginal cilia, without longitudinal fold or apical excision (Figs 1E, 2D, E); submarginal vein remote from fore margin of fore wing; marginal vein almost

perpendicular to stigmal vein; petiole elongated, remarkably arcuate in lateral view (Figs 1A, 2A, C); metasoma except petiole compressed laterally with six tergites (T2 and T3 fused) and five sternites in female, six tergites and seven sternites in male; tip of metasoma conical in female, blunt in male; S2 almost entirely concealed ventrally by sides of T2.

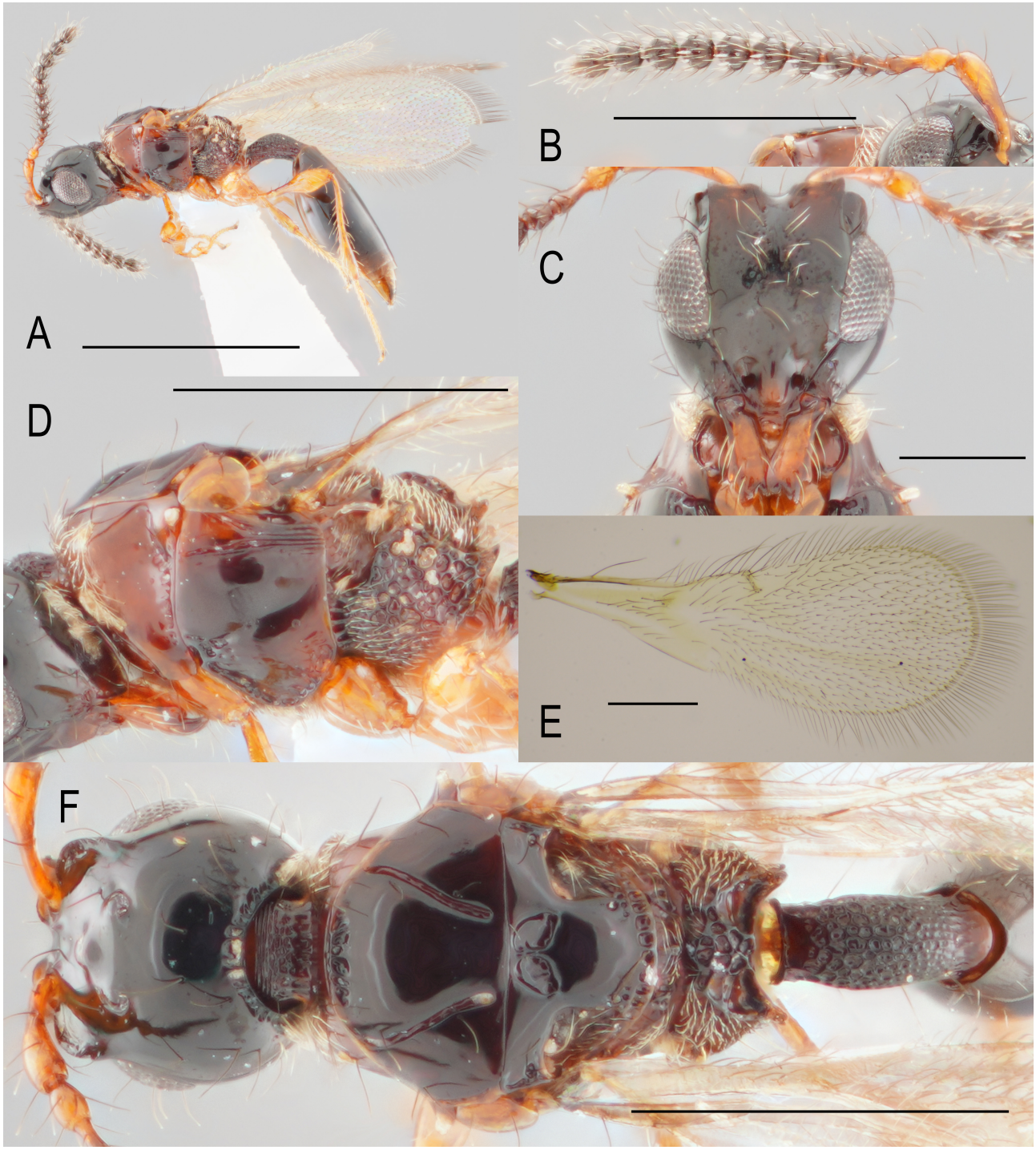

FIGURE 1. *Calogalesus matris* **sp. nov.** female, holotype (A–D, F) and paratype (E): A—whole body, lateral view; B—antennae, lateral view; C—face, frontal view; D—mesosoma, lateral view; E— fore wing; F— mesosoma and metasoma, dorsal view. Scale bars: A—1.0 mm; B, D and F—0.5 mm; E—0.3 mm; C—0.2 mm.

Remarks. Previously, many papers mentioning this genus, except Notton (2014), which clarified the correct dating and priority, referred to Kieffer (1912b) as the original description of the genus and the type species (Muesebeck & Walkley 1956; Masner 1965; Johnson 1992; Masner & García 2002; Rajmohana 2006; Feng *et al*.

2016). However, these citations are erroneous. Kieffer (1912a) shows the date "March 1912" on its cover (see: https://www.biodiversitylibrary.org/page/16419540), and the copy held in the Natural History Museum, London, has a date stamp indicating it was received on 30 March 1912 (David Notton pers. comm.). The publication date of Kieffer (1912b) is 25 May 1912 (Evenhuis 1994). Therefore, the effective publication date of Kieffer (1912a) is 30 March 1912, which predates Kieffer (1912b). Moreover, Kieffer (1912b) refers to Kieffer (1912a), confirming that the latter had already been published.

***Calogalesus matris* sp. nov.**
Figs 1A–F, 2A–E

Type material.

Holotype, ♀: "Japan, Ogasawara Islands,/ Haha-jima Is., Minamizaki./ [母島， 南崎],/ 26.623˚N 142.179˚E, 14 VI 2025,/ Kyotaro Goino & Sadahisa Yagi" "DNA extraction/ Sample number: RK126/ Ryoji Kawai 2025" (ELKU, accession No. LC895989). Paratypes: Japan – Tokyo Pref., Ogasawara Isls. • 1♂; Haha-jima Is., Minamizaki; 26.623˚N 142.179˚E; 14 VI 2025; Kyotaro Goino & Sadahisa Yagi leg.; accession No. LC895993 • 1♂; Chichi-jima Isl., Fukiagedani; 3 V 2024; sw; Yu Hisasue leg.; accession No. LC895990 • 1♂; same island, but Mt. Mikazuki-yama; 5 XI 2023; sw; Yu Hisasue leg.; accession No. LC895991 • 1♂; same data as for preceding; accession No. LC895992 • 1♀; Haha-jima Is., Shin-yûhigaoka, Nishiura; 13 X 2025; Shûgo Inoue leg. – Okinawa Pref. • 1♀; Nago, Inamine; 26.63068˚N 128.04938˚E; 3–5 I 2018; YPT; K. Yoshida leg.

Diagnosis. This species differs from all known *Calogalesus* in the combination of the following features: mandible tridentate (Fig. 1C); female F1 2.0–2.1 times as long as its maximum width; male F2 0.8–1.0 times as long as F1; mandible 0.7-1.1 times as long as eye height in female, 1.2-1.4 times as long as eye height in male; OOL as long as POL; stigmal vein 0.4–0.5 times as long as marginal vein.

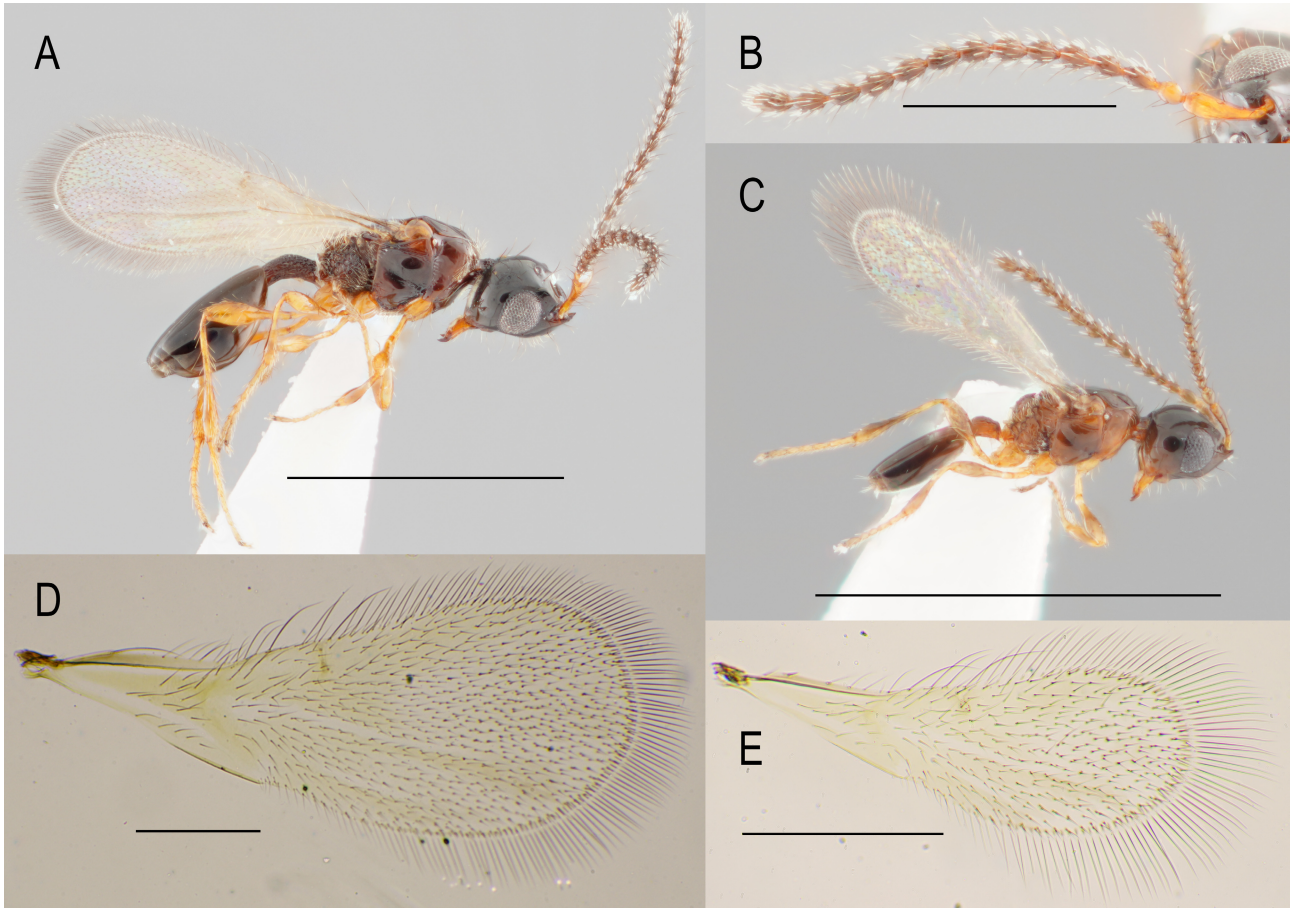

FIGURE 2. *Calogalesus matris* **sp. nov.**, male, paratypes (A–E): A and C— whole body, lateral view; B— antennae, frontal view; D and E— fore wing. Scale bars: A and C—1.0 mm; B—0.5 mm; D and E—0.3 mm.

Description. Female (Holotype). Body length 2.3 mm. Fore wing length except marginal cilia 1.3 mm. Head and flagellum black, clypeus blackish brown, mandible, labrum, scape and pedicel brown; mesosoma mainly black, pronotum, dorso-lateral and ventro-posterior part of mesopleuron blackish brown, tegula and legs brown; metasoma black.

Head. Head smooth, subrectangular, 1.2 times as long as high in lateral view. Antennal shelf below toruli with setigerous punctation (Fig. 1C). Upper face with two sharp points, covered with long scattered setae. Vertex convex in lateral view. Eye covered with sparse setae; height of eye 2.1 times as long as malar space. Tentorial pit large and bare (Fig. 1C). Malar sulcus narrow, deep and distinct. Clypeus bare, semicircular, 1.3 times as high as wide. Mandible tridentate, 1.1 times as long as pleurostomal distance, 1.1 times as long as eye height (Fig. 1C, D). Palpal formula 5–2. Pleurostomal carina absent. OOL: POL: LOL = 54: 48: 25. Gena with cushion of white setae. Occipital carina narrow and foveolate (Fig. 1F).

Antenna. Scape smooth, slightly curved, broadened apically, 3.6 times as long as wide; apical rim simple. Pedicel smooth, 1.6 times as long as wide. Flagellum moniliform, covered with long and short setae; long setae longer than width of flagellomere; short setae shorter than width of flagellomere (Fig. 1B); ratio of length to maximal width of each flagellomeres: F1 74: 35; F2 51: 44; F3 65: 56; F4 68: 62; F5 80: 68; F6 70: 66; F7 73: 60; F8 70: 70; F9 70: 64; F10 80: 58.

Mesosoma. Mesosoma 1.5 times as long as wide, 1.9 times as long as high in lateral view, 1.3 times as wide as high, 1.3 times as wide as head in dorsal view. Pronotum smooth; pronotal collar with dense cushion of setae, interrupted medially; cervix distinct, rugose and covered with sparsely setae (Fig. 1F); pronotal shoulder rounded, lateral part with posterior pronotal sulcus; mesothoracic spiracle spike-like, spiracle and surrounding margin of pronotum projecting (Fig. 1D, F); epomia absent. Acetabular carina, postacetabular sulcus, mesopleural epicoxal carina, mesopleural epicoxal sulcus developed. Mesoscutum smooth, covered with sparse setae; anterior margin of midlobe foveolate; notauli deep, convergent posteriorly, reaching 0.9 length of mesoscutum; mesoscutal humeral sulcus developed (Fig. 1F). Lateral part of axilla with two small pits; axillar depression smooth and setose; anterior scutellar pits subglobose; scutellar disk with small, globose lateral scutellar pits and row of small pits on posterior margin. Mesopleuron smooth with subalar ridges under tegula (Fig. 1D); epicnemial pit bare; sternaulus absent. Metascutellum setose, with median and lower lateral keel. Dorsal part of propodeum bare and rugose, with pair of smooth areas posteriorly, with very broad and foveolate median longitudinal keel (Fig. 1F); plica and lateral longitudinal carina distinctly projecting posteriorly; area between plica and lateral longitudinal carina covered with short setae; lateral part of propodeum foveolate, covered with long scattered setae postero-dorsally and short setae antero-ventrally; posterior margin of propodeum deeply arcuate in dorsal view. All legs slender.

Wing. Wing fully developed. Fore wing with two longitudinal, transparent hairless areas basally (Fig. 1E); costal, subcostal, marginal, stigmal veins and frenal gutter present, basal and postmarginal veins absent; venation extending to half length of fore wing. Stigmal vein 0.4 times as long as marginal vein.

Metasoma. Petiole shiny, rugose, without longitudinal striae, covered with scattered long setae (Fig. 1F), 2.2 times as long as its maximum width in dorsal view; ventral part with white cushion of setae. Metasoma except petiole smooth, covered with short and scattered setae, moderately compressed laterally; 2.9 times as long as its maximum width in dorsal view. T2 enlarged, 2.1 times as long as its maximum width in dorsal view; anterior margin of T2 straight, without furrow or emargination, rest tergites smooth and bare, compressed laterally. Visible part of sternite smooth. S2 with two long setae in posterior half. S3–5 concealed laterally and ventrally by tergites; S6 smooth and bare. Ovipositor and ovipositor sheath excluding the tip not exposed.

Variation (3 females). Fore wing length 1.3–1.4 mm; F1 2.0–2.1 times as long as its maximum width; mandible 0.7–1.1 times as long as eye height; stigmal vein 0.4–0.5 times as long as marginal vein; ovipositor and ovipositor sheath exposed or concealed.

Male. Body length 0.9–1.9 mm (n = 3); fore wing length 0.6–1.3 mm (n = 4); height of eye 2.4–2.9 times as long as malar space; mandible 1.0–1.2 times as long as pleurostomal distance, 1.2–1.4 times as long as height of eye; F2 not modified (Fig. 2B); pedicel 1.4–1.7 times as wide as long; each flagellomere longer than its maximum width. Male specimens from the Ogasawara Islands show distinct size-related variation and are divided into two groups: large specimens (larger than 1.0 mm, accession No. LC895990, No. LC895993) and small specimens (less than 1.0 mm, accession No. LC895991, No. LC895992). Flagellomeres more elongate in larger specimens. Pronotal sulcus, lateral scutellar pit, postacetabular sulcus, mesopleural epicoxal sulcus and subalar ridges not developed in small specimens. Other characteristics as for female.

Etymology. The species name matris is the Latin word mater (mother) in the genitive case and is indeclinable. It refers to the island where the holotype was collected: the type locality, Haha-jima means mother island in Japanese.

Distribution. Japan: Ogasawara Islands, Okinawa Island.

Host. Unknown.

Remarks. Pairwise comparisons of COI sequences of four males and one female from the Ogasawara Islands showed no divergence among the five sequences (0 bp differences in 696 bp; accession No. LC895989–LC895993). The diagnostic characters of *Calogalesus matris* **sp. nov**., such as the tridentate mandible, the proportional length of female F1 and the shape of a median propodeal keel were stable among the examined specimens. Two smaller male specimens showed reduced sculpture and shortened flagellomeres. Thus, reliable identification of this species requires a combination of multiple characters.

FIGURE 3. Worldwide distribution map of the *Calogalesus* Kieffer, 1912. In addition to the locations illustrated, it is known from various parts of Africa, the Orient, and Australia (Masner & García 2002).

Key to world species of *Calogalesus*

Male of *C. parvulus* unknown.

1. Mandible tridentate 2
- Mandible bidentate. 3

2. Female F1 2.5 times as long as its width; both sexes mandible 0.5 times as long as eye height; both sexes OOL 2.5 times as long as POL . . . . . ….*C. sinicus* Feng, Notton & Xu, 2016.
- Female F1 2.0–2.1 times as long as its width; mandible 0.7–1.1 times as long as eye height in female, 1.2–1.4 times as long as eye height in male; both sexes OOL as long as POL . . . . . *C. matris* **sp. nov.**

3. Female F6–F8 as long as wide; both sexes mandible 0.8 times as long as eye height . . . . . *C. malabaricus* Rajmohana & Narendran, 2006.
- Female F6–F8 distinctly shorter than wide; both sexes mandible 0.6 times as long as eye height. . . . . *C. parvulus* Kieffer, 1912.

Discussion

Distribution of *Calogalesus*

The genus *Calogalesus* was previously known from one described species each from the Seychelles, India, and China, and from several unidentified specimens reported from Hawaii, Africa, Australia, India and the US Virgin Islands (Kieffer 1912a, b; Masner & García 2002; Rajmohana 2006; Rajmohana *et al*. 2013; Feng *et al*. 2016; Theertha *et al*. 2023; Magnacca 2025). We describe a new species, *Calogalesus matris* **sp. nov.**, based on specimens from the

Ogasawara Islands and Okinawa Island. The discovery of this new species fills a distributional gap between the records in the Eastern Indian Ocean and the Central Pacific Ocean (Fig. 3). Considering that the known species of *Calogalesus* are distributed in tropical and subtropical regions, and the poorly understood species diversity of small parasitic wasps in these areas (e.g. Eagalle & Smith 2017; Saunders & Ward 2018), it is possible that undiscovered species of the genus *Calogalesus* exist in the currently unrecorded regions. While the genus has been recorded from the US Virgin Islands in the Neotropical region, no records exist from the South American mainland. It is probable that *Calogalesus* is distributed across Southeast Asia and Continental South America.

Morphological variation of *Calogalesus matris* sp. nov.

The examined specimens of *Calogalesus matris* **sp**. **nov**. were divided into two morphological groups based on body length and surface sculpture: large specimens (larger than 1.0 mm, accession No. LC895990, No. LC895993) and small specimens (less than 1.0 mm, accession No. LC895991, No. LC895992). These two groups likely represent the observation of discrete points within a continuum of size-dependent variation rather than distinct dimorphism. Similar correlations between body size and external morphology have been reported in other parasitic wasps (e.g. Ganjisaffar *et al*. 2020). Moreover, this morphological variation is known to be associated with host age, size and species (e.g. da Rocha *et al*. 2007; Liu *et al*. 2011; Ranjbar *et al*. 2021). Some interaction between size variation and host was also suggested in Diapriidae (Chen *et al*. 2018; Pang *et al*. 2024). Therefore, the morphological differences observed in this study are considered to result from body size variation caused by differences in host quality. Recognition of such size-dependent variation highlights the need to review diagnostic characters for species identification, and suggests that integrative approaches combining morphological, molecular, and ecological data will be essential to avoid taxonomic over-splitting.

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References

Chen, J., Zhou, S., Wang, Y., Shi, M., Chen, X. & Huang, J. (2018) Biocontrol characteristics of the fruit fly pupal parasitoid *Trichopria drosophilae* (Hymenoptera: Diapriidae) emerging from different hosts. *Scientific Reports*, 8 (1), 13323. https://doi.org/10.1038/s41598-018-31718-6

da Rocha, L., Kolberg, R., de Mendonça, M.S. & Redaelli, L.R. (2007) Body size variation in *Gryon gallardoi* related to age and size of the host. *BioControl*, 52, 161–173. https://doi.org/10.1007/s10526-006-9024-6

Eagalle, T. & Smith, M.A. (2017) Diversity of parasitoid and parasitic wasps across a latitudinal gradient: Using public DNA records to work within a taxonomic impediment. *FACETS*, 2, 937–954. https://doi.org/10.1139/facets-2016-0061

Evenhuis, N.L. (1994) The publication and dating of P. A. Wytsman's Genera Insectorum. *Archives of Natural History*, 21 (1), 49–66. https://doi.org/10.3366/anh.1994.21.1.49

Feng, J., Notton, D. & Xu, X.F. (2016) A new species of *Calogalesus* Kieffer from China (Hymenoptera, Diapriidae) with a key to world species. *ZooKeys*, 626, 57–65. https://doi.org/10.3897/zookeys.626.9771

Ganjisaffar, F., Talamas, E.J., Bon, M.C. & Perring, T.M. (2020) First report and integrated analysis of two native *Trissolcus* species utilizing *Bagrada hilaris* eggs in California. *Journal of Hymenoptera Research*, 80, 49–70. https://doi.org/10.3897/jhr.80.57024

Johnson, N. (1992) Catalog of world Proctotrupoidea excluding Platygastridae. *Memoirs of the American Entomological Institute*, 51, 1–825.

Kaartinen, R., Stone, G.N., Hearn, J., Lohse, K. & Roslin, T. (2010) Revealing secret liaisons: DNA barcoding changes our understanding of food webs. *Ecological Entomology*, 35, 623–638. https://doi.org/10.1111/j.1365-2311.2010.01224.x

Kieffer, J.J. (1912a) Hymenoptera, Proctotrupoidea. *Transactions of the Linnean Society of London, 2nd series*, 15 (1), 45–80. https://doi.org/10.1111/j.1096-3642.1912.tb00089.x

Kieffer, J.J. (1912b) Hymenoptera fam. Diapriidae. *In*: Wytsman, P. (Ed.), *Genera Insectorum*, 124. Desmet-Verteneuil, Bruxelles, pp. 1–75.

Kumar, S., Stecher, G., Suleski, M., Sanderford, M., Sharma, S. & Tamura, K. (2024) Molecular Evolutionary Genetics Analysis Version 12 for adaptive and green computing. *Molecular Biology and Evolution*, 41, 1–9. https://doi.org/10.1093/molbev/msae263

Liu, Z., Xu, B., Li, L. & Sun, J. (2011) Host-size mediated trade-off in a parasitoid *Sclerodermus harmandi*. *PLoS One*, 6 (8), e23260. https://doi.org/10.1371/journal.pone.0023260

Magnacca, K.N. (2025) New records of non-native insects (especially Hymenoptera) from the Hawaiian Islands. *Bishop Museum Occasional Papers*, 163, 11–53.

Maruyama, M. (2004) A permanent slide pinned under a specimen. *Elytra (Tokyo)*, 32 (2), 276.

Masner, L. (1965) The types of Proctotrupoidea (Hymenoptera) in the British Museum (Natural History) and in the Hope Museum, Department of Entomology, Oxford. *Bulletin of the British Museum (Natural History) Entomology*, Supplement 1, 1–154. https://doi.org/10.5962/p.97756

Masner, L. & García, J.L. (2002) The genera of Diapriinae (Hymenoptera: Diapriidae) in the New World. *Bulletin of the American Museum of Natural History*, 268, 1–138. https://doi.org/10.1206/0003-0090(2002)268<0001:TGODHD>2.0.CO;2

Muesebeck, C.F.W. & Walkley, L.M. (1956) Type species of the genera and subgenera of parasitic wasps comprising the superfamily Proctotrupoidea (order Hymenoptera). *Proceedings of the United States National Museum*, 105, 319–419. https://doi.org/10.5479/si.00963801.3359.319

Notton, D.G. (2014) A catalogue of the types of Diapriinae (Hymenoptera, Diapriidae) at the Natural History Museum, London. *European Journal of Taxonomy*, 75, 1–123. https://doi.org/10.5852/ejt.2014.75

Pang, L., Fang, G., Liu, Z., Dong, Z., Chen, J., Feng, T., Zhang, Q., Sheng, Y., Lu, Y., Wang, Y., Zhang, Y., Li, G., Chen, X., Zhan, S. & Huang, J. (2024) Coordinated molecular and ecological adaptations underlie a highly successful parasitoid. *eLife*, 13, RP94748. https://doi.org/10.7554/eLife.94748.3

Rajmohana, K. (2006) Studies on Proctotrupoidea and Platygastroidea (Hymenoptera: Insecta) of Kerala. *Memoirs of the Zoological Survey of India*, 21 (1), 1–153.

Rajmohana, K., Poorani, J., Shweta, M. & Malathi, C. (2013) A pictorial guide to Diapriinae genera of India. Zoological Survey of India, Calicut, Kerala. [http://www.nbair.res.in/Diapriinae/index.php]

Ranjbar, F., Jalali, M.A., Ziaaddini, M., Gholamalizade, Z. & Talamas, E.J. (2021) Stink bug egg parasitoids (Hymenoptera, Scelionidae) associated with pistachio in Iran and description of a new species: *Trissolcus darreh* Talamas. *Journal of Hymenoptera Research*, 87, 291–308. https://doi.org/10.3897/jhr.87.72838

Saunders, T.E. & Ward, D.F. (2018) Variation in the diversity and richness of parasitoid wasps based on sampling effort. *PeerJ*, 6, e4642. https://doi.org/10.7717/peerj.4642

Shorthouse, D.P. (2010) SimpleMappr, an online tool to produce publication-quality point maps. Available from: http://www.simplemappr.net

Simon, C., Frati, F., Beckenbach, A., Crespi, B., Liu, H. & Flook, P. (1994) Evolution, weighting, and phylogenetic utility of mitochondrial gene sequences and a compilation of conserved polymerase chain reaction primers. *Annals of the Entomological Society of America*, 87, 651–701. https://doi.org/10.1093/aesa/87.6.651

Theertha, P.V., Rajmohana, K. & Patra, S. (2023) First record of subfamily Diapriinae (Diaprioidea: Diapriidae) from Odisha, with generic level distribution in rice ecosystems. *Records of the Zoological Survey of India*, 123 (2), 165–170.

Yoder, M.J. (2004) Revision of the North American species of the genus *Entomacis* (Hymenoptera, Diapriidae). *Canadian Entomologist*, 136, 323–405. https://doi.org/10.4039/n03-061

Yoder, M.J., Mikó, I., Seltmann, K.C., Bertone, M.A. & Deans, A.R. (2010) A gross anatomy ontology for Hymenoptera. *PLoS One*, 5 (12), e15991. https://doi.org/10.1371/journal.pone.0015991