

Far Eastern Entomologist

Дальневосточный энтомолог

Journal published by Far East Branch
of the Russian Entomological Society
and Laboratory of Entomology, Federal
Scientific Center of the East Asia
Terrestrial Biodiversity, Vladivostok

Number 496: 1-9

ISSN 1026-051X (print edition)
ISSN 2713-2196 (online edition)

March 2024

<https://doi.org/10.25221/fee.496.1>

<https://elibrary.ru/qghzux>

<https://zoobank.org/References/43C2B903-897A-40B0-8100-8BDA3B771D14>

A REMARKABLE NEW SPECIES FROM THE *PYGMAEA* SPECIES GROUP OF THE GENUS *CAREBARA* WESTWOOD, 1840 (HYMENOPTERA: FORMICIDAE: MYRMICINAE) FROM CAMBODIA

K. Matsuura¹⁾, S. Hosoishi²⁾, H. Sokh³⁾

1) Entomological Laboratory, Faculty of Agriculture, Kyushu University, Motooka 744, Nishi-ku, Fukuoka 819-0395, Japan. E-mail: washedup59@gmail.com

2) Institute of Tropical Agriculture, Kyushu University, Motooka 744, Nishi-ku, Fukuoka, 819-0395 Japan. E-mail: hosoishi@gmail.com

3) Forestry Administration of Cambodia, Phnom Penh, 12205, Cambodia. E-mail: sokhengpiny@yahoo.com

Summary. A new species *Carebara bokorensis* Matsuura et Hosoishi, **sp. n.** is described from Kampot Province in Cambodia based on the major and minor worker caste. This new species belong to the *pygmaea* species group. This species is distinguished from congeners by the transverse striation on the vertex in major workers and presence of well-developed subpetiolar process in minor workers.

Key words: ants, Formicidae, taxonomy, new species, Southeast Asia.

Мацуура К., Хосоиси С., Сох Х. Новый замечательный вид из группы видов *pygmaea* рода *Carebara* Westwood, 1840 (Hymenoptera: Formicidae: Myrmicinae) из Камбоджи // Дальневосточный энтомолог. 2024. N 496. С. 1-9.

Резюме. Из провинции Кампот в Камбодже по крупным и мелким рабочим особям описан новый вид *Carebara bokorensis* Matsuura et Hosoishi, **sp. n.** Этот

вид принадлежит к группе видов *pygmaea*. От других представителей рода новый вид отличается поперечной исчерченностью темени у крупных рабочих и наличием хорошо развитого субпетиолярного отростка у мелких рабочих.

INTRODUCTION

The ant genus *Carebara* Westwood, 1840 contains 225 valid species mainly from the tropics and subtropics (Bolton, 2023). Most of them are hypogaeic and show dimorphism or polymorphism. Now this genus belongs to the tribe Crematogastrini of the subfamily Myrmicinae, based on a molecular phylogenetic approach (Ward *et al.*, 2015). Taxonomic studies have been conducted in Malagasy region recently (Fischer *et al.*, 2015; Azorsa & Fisher, 2018). Also in Asia, taxonomic studies have been conducted in Japan (Terayama *et al.*, 2014), China (Li & Tang, 1986; Wu & Wang, 1995; Zhou & Zheng, 1997; Xu, 2003; Zhou *et al.*, 2006), Taiwan (Terayama *et al.*, 2012), Cambodia (Hosoishi *et al.*, 2021), Thailand (Jaitrong *et al.*, 2021), and India (Bharti & Kumar, 2013). However, the Southeast Asia, which is many species-rich areas of the Asian region still remain unclear, awaiting taxonomic study.

The *Carebara pygmaea* species group was established in Jaitrong *et al.* (2021). This species group contains 4 species from Australasia and Indomalaya, *C. pygmaea* (Emery, 1887), *C. rubra* (Smith, 1860), *C. transversalis* (Smith, 1860) and *C. panhai* Jaitrong, Pitaktunsakul et Jantarit, 2021. Both major and minor workers are characterized by the 11-segmented antennae, 5-teethed mandible, dome-shaped pronotum, distinct metanotal groove and long petiolar pedicel. Recently, we found specimens from Cambodia where no species of this species group have ever been found. These specimens belong to this group and differ from other species in having the developed scutellum and punctation on posterior surface of head. In the present paper, we describe this as a new species and discuss some remarkable morphological characters.

MATERIAL AND METHODS

Most morphological observations were done by NIKON SMZ1500. Multi-focused montage images were produced using Zerene Stacker. All source images were taken by a Sony α 7R IV and Canon MP-E 65mm. Measurements of specimens were done by Motic Images Plus 2.4S (SHIMADZU). All measurements are expressed in millimeters, recorded to the second decimal place. Measurements and indices follow Fischer *et al.* (2014) and Jaitrong *et al.* (2021). Morphological terminology follows Harris (1979) and Jaitrong *et al.* (2021).

Specimens used in this study were collected during expeditions in Cambodia under the Memorandum of Understanding (MOU) between Japan and Cambodia, Kyushu University, Japan and the Forestry Administration, Cambodia, on cooperation concerning biological resources and information. Materials are shared between Cambodia and Japan, but the present materials are deposited in Japan, on indefinite

loan from Cambodia. Type specimens were examined and they are deposited in the Institute of Tropical Agriculture, Kyushu University, Fukuoka, Japan (KUEC).

The abbreviations used for the measurements and indices are as follows: **TL** – Total length: The sum of the lengths of the head, mesosoma, waist, and gaster viewed in profile. It includes mandible and excludes sting. **HL** – Head length: maximum length of cranium in full-face view, measured from the anteriormost of the anterior clypeal margin to the posteriormost of the posterior cephalic border. **HW** – Head width: maximum width of cranium in full-face view (excluding eyes). **SL** – Scape length: maximum length of antennal scape excluding basal condylar bulb. **ML** – Mesosomal length: maximum diagonal length of the mesosoma in profile view, measured from posterodorsal border of pronotal flange to posterior margin of propodeal lobe. **MW** – Mesosomal width: maximum width of promesonotum in dorsal view. **PSL** – Propodeal spine length: distance from center of propodeal spiracle to apex of the propodeal spine in profile view. **PSD** – Propodeal spiracle diameter: diameter of the propodeal spiracle in profile view. **PL** – Petiolar length: maximum length of the petiole in profile view (excluding helcium). **PH** – Petiolar height: maximum height of the petiole in profile view (excluding subpetiolar process). **DPW** – Dorsal petiole width: maximum width of the petiole in dorsal view. **CI** – Cephalic index: $HW/HL \times 100$. **SI** – Scape index: $SL/HW \times 100$. **PI1** – Petiolar index 1: $PL/PH \times 100$. **PI2** – Petiolar index 2: $DPW/PL \times 100$.

TAXONOMY

Carebara bokorensis Matsuura et Hosoishi, sp. n.

<https://zoobank.org/NomenclaturalActs/9F1A8383-F9EE-4C51-9D94-BFD5AC006CA9>

Figs 1, 2

TYPE MATERIAL. Holotype (major worker): **Cambodia:** Bokor National Park, 663m alt., Kampot Province, N 10°36' E 104°06', 19. XII 2011, S. Hosoishi leg. SH11-Cam-55, decayed wood (KUEC, collection code KUECCRB001). Paratypes: same data as holotype, 2 major workers (KUEC, collection code KUECCRB002, KUECCRB003) and 7 minor workers (KUEC, collection code KUECCRB004, KUECCRB005, KUECCRB006, KUECCRB007, KUECCRB008, KUECCRB009, KUECCRB010).

MEASUREMENTS. Holotype: TL 4.23, HL 0.97, HW 0.95, SL 0.44, ML 0.89, MW 0.42, PSL 0.17, PSD 0.07, PL 0.37, PH 0.35, DPW 0.18, CI 98, SI 47, PI1 106, PI2 48. Major worker (2 paratypes): TL 4.20–4.26, HL 0.92–1.25, HW 0.93–1.02, SL 0.43–0.44, ML 0.89–0.92, MW 0.42–0.50, PSL 0.16–0.18, PSD 0.06–0.07, PL 0.34–0.37, PH 0.33–0.35, DPW 0.18–0.23, CI 98–101, SI 46–47, PI1 102–106, PI2 48–68. Minor worker (7 paratypes): TL 1.43–1.68, HL 0.33–0.41, HW 0.33–0.38, SL 0.23–0.26, ML 0.39–0.45, MW 0.16–0.22, PSL 0.04–0.05, PSD 0.03–0.04, PL 0.17–0.22, PH 0.14–0.15, DPW 0.08–0.10, CI 90–100, SI 67–71, PI1 117–152, PI2 43–54.

DESCRIPTION. Dimorphism in worker caste. **Major worker** (Fig. 1A–C). Head, in full-face view, longer than wide, almost square (CI 98–101); posterior cephalic border deeply concave in the middle, posterolateral corners rounded, posterior lateral margins weakly convex; anterior clypeal margin entirely convex with median concave portion; frontal carinae inconspicuous; frontal triangle well-defined; mandibles short, almost triangular, masticatory margins with 5 teeth; ocelli present; eyes with around 12 ommatidia, situated at anterior one-third of lateral head; antennae 11-segmented with 2-segmented club; scapes thin and clavate, its apical portion same as antennal segment X, short, less than even half of head (SI 46–47).

Mesosoma smaller than head (HL 0.92–1.25, ML 0.89–0.92); promesonotum weakly convex in profile view; promesonotal suture present; scutellum present; mesopleuron clearly demarcated from pronotum and metapleuron by deep groove; metanotal groove present and separated by elevated band; metapleuron clearly demarcated from propodeum by deep groove; propodeum declining backwards; propodeal spiracle large (PSD 0.06–0.07) and rounded; propodeal spines relatively long (PSL 0.16–0.18); promesonotum distinctly higher than propodeum in profile view.

Petiole with long peduncle and high node, broader posteriorly in dorsal view; subpetiolar process absent; postpetiole rounded and shorter than petiole, lower than petiole node, trapezoidal dorsally.

Gastral tergite larger than remaining segments.

Sculptures: Head, posterior one-third of head punctate anterior two-third with longitudinal striation, lateral (area below eye) face striated; clypeus smooth and shiny medially, lateral sides longitudinally striated; frontal triangle smooth and shiny; frontal lobes with fine longitudinal striation; mandibles smooth and shiny; anterior dorsal surface of pronotum with faintly reticulations, smooth and shiny laterally; mesonotum punctate; mesopleuron separated by deep groove, both higher and lower mesopleuron smooth and shiny except for surroundings, under part of lower mesopleuron punctate; propodeum entirely punctate, but lower lateral face longitudinally striated; legs smooth and shiny; petiolar peduncle punctate, petiolar node micropunctate laterally, anterior declivity of node with reticulation; gastral tergite I smooth and shiny.

Pilosity: Head, in full-face view, posterior cephalic border with short decumbent hairs medially and long suberect hairs laterally, short decumbent hairs over surface; frontal carinae with 3 pairs of erect hairs; anterior margin of clypeus with 2 pairs of erect hairs; mandible, masticatory margins with long decumbent hairs, short decumbent hairs over surface; scapes with dense short decumbent hairs (slightly shorter than width of apical portion of scapes); mesosoma with erect hairs and decumbent hairs; legs with decumbent hairs; petiolar node and postpetiole with erect hairs; gastral tergite I with abundant short decumbent hairs and entirely scattered long erect hairs.

Color: Head and gaster dark brown; mesosoma, petiole and postpetiole reddish brown; antennae and legs yellowish brown.

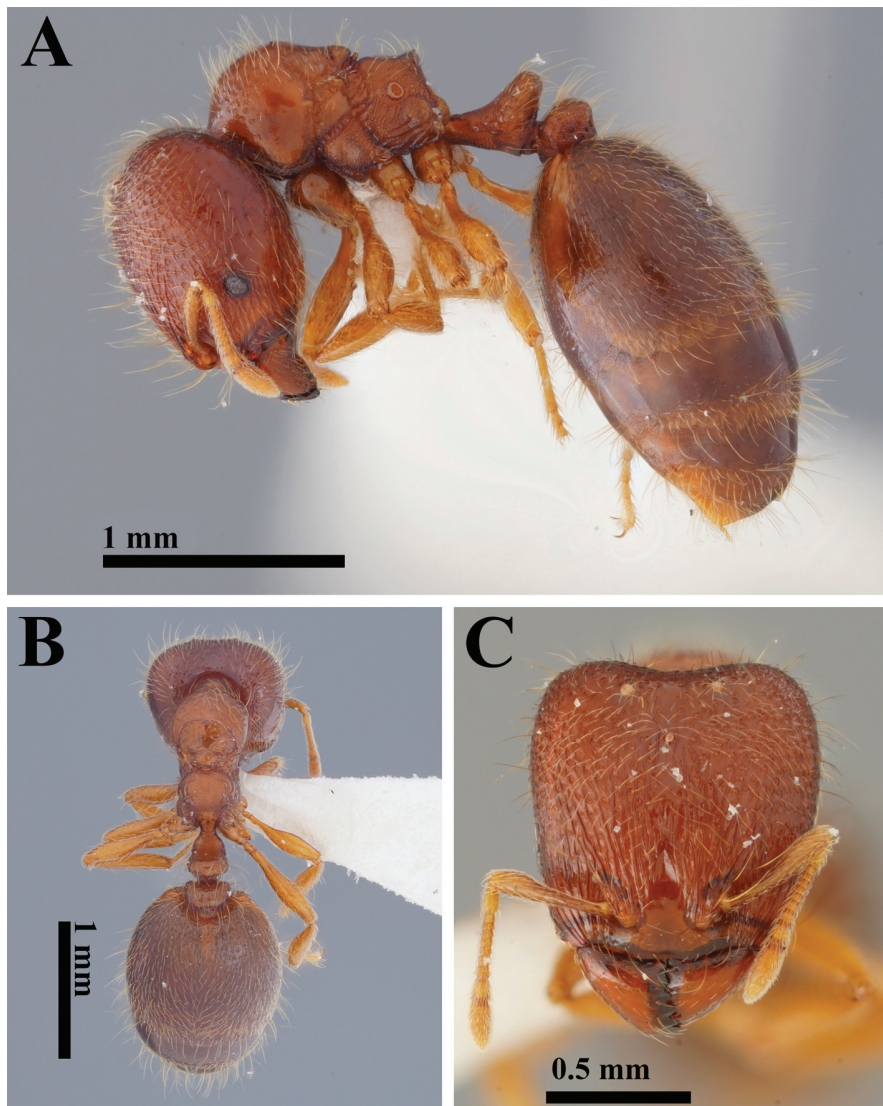


Fig. 1. A–C. *Carebara bokorensis* sp. n., holotype major worker (KUECCRB001). A – body in profile; B – dorsal view of body; C – head in full-face view.

Minor worker. (Fig. 2A–C). Head, in full-face view, wide same as long (CI 90–100), almost rectangle; posterior cephalic border slightly concave in the middle, posterolateral corners rounded, posterior lateral margins weakly convex; anterior clypeal margin convex, medially concave, frontal lobe present; frontal triangle well-defined; mandibles short, almost triangular, masticatory margins with 5 teeth; eyes

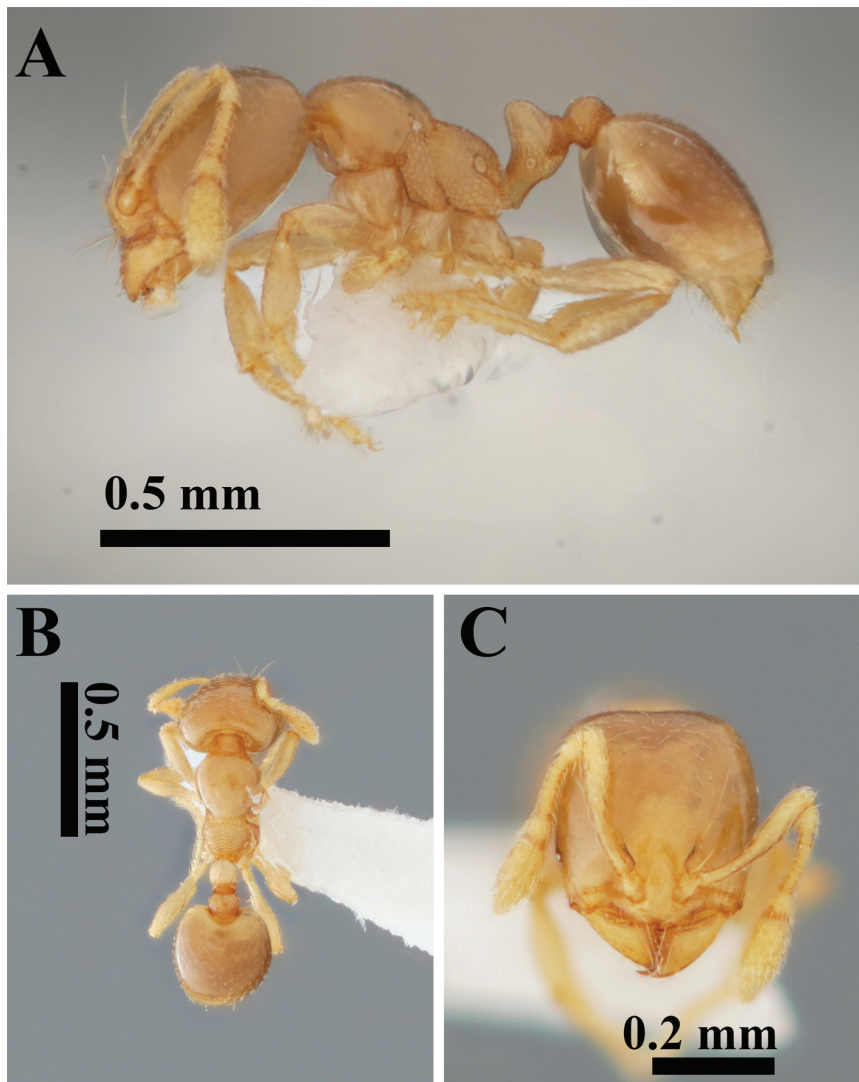


Fig. 2. A–C. *Carebara bokorensis* sp. n., paratype minor worker (KUECCRB004). A – body in profile; B – dorsal view of body; C – head in full-face view.

relatively small, present as dots, situated at anterior one-fourth of lateral head; antennae 11-segmented with 2-segmented club; scapes thin and clavate, width of apical portion same as antennal segment X, relatively long, reaching posterior one-third of head length.

Promesonotum convex and entirely dome-shaped in profile view; promesonotal suture absent; mesopleuron clearly demarcated from metapleuron and pronotum;

metanotal groove distinct; in profile view, declivity of propodeum with lamellae, maximum length of lamellae same as a diameter of propodeal spiracle; propodeal spines absent; propodeal spiracle large (PSD 0.03–0.04) and rounded; dorsal outline of propodeum entirely rounded; mesosoma almost same length as head (ML 0.39–0.45, HL 0.33–0.41).

Petiole with relatively short peduncle and high node, spread posteriorly in dorsal view; subpetiolar process developed like triangle; postpetiole rounded and lower than petiolar node in profile view, rectangle in dorsal view; postpetiole smaller than petiole.

Gastral tergite larger than remaining segments.

Sculptures: Head, mandibles, promesonotum, legs, petiolar node and gaster smooth and shiny; mesopleuron, propodeum, petiolar peduncle punctate.

Pilosity: Head and mandibles with sparse decumbent hairs; scapes with sparse decumbent hairs (slightly shorter than width of apical portion of scapes); anterior margin of clypeus with 2 pairs of erect hairs; mesosoma, petiole and postpetiole without erect hairs; legs with decumbent hairs; gastral tergite I with decumbent hairs.

Color: Head, postpetiole and gaster brown; mesosoma, petiole, legs and antennae pale brown.

DIAGNOSIS. *C. bokorensis* sp. n. can be distinguished from the other species in the genus by the following characters: 11-segmented antennae, punctation on posterior surface of head, long petiolar pedicel, well-developed scutellum and metanotal groove separated by elevated band in the major worker subcaste; 11-segmented antennae, median concavity of anterior clypeal margin, entirely rounded promesonotum, short petiolar pedicel and presence of subpetiolar process in the minor worker subcaste.

REMARKS. *Carebara bokorensis* sp. n. shares most features except for promesonotal suture with the *C. pygmaea* species group. Jaitrong *et al.* (2021) defines promesonotal suture of major workers as indistinct in definition of *C. pygmaea* species group, and this is thought to be due to the exceptionally partial presence of promesonotal suture in *C. panhai*. This new species has a distinct promesonotal suture in major workers, but other morphological characters are consistent with the definition of the species group. Therefore, it is appropriate to include this new species in the species group. Furthermore, the major workers of this species also have scutellum, which is not found in the species group. Developed scutellum in major workers are found in some species such as *C. oni* (Terayama, 1996), *C. phragmotica* (Fischer, Azorsa & Hita Garcia, 2015) and *C. aberrans* (Santschi, 1937). Although it is beyond this study to infer it, such character state can be found in different lineages of *Carebara*.

The *Carebara pygmaea* species group includes five species, *C. bokorensis* sp. n., *C. pygmaea*, *C. rubra*, *C. transversalis* and *C. panhai*. The major workers of *C. bokorensis* are distinguished from the other four species in the species group by the presence of punctation on posterior surface of head, presence of scutellum and projection in the metanotal groove. The minor workers of *C. bokorensis* sp. n. are distinguished from the three species, *C. pygmaea*, *C. rubra* and *C. panhai* (minor

worker of *C. transversalis* is unknown), in the species group by the presence of a well-developed subtriangular subpetiolar process and medial concavity of anterior clypeal margin.

HABITAT. Type series specimens were collected from decayed wood (Fig. 3).

DISTRIBUTION. Cambodia (Bokor National Park, Kampot).

ETYMOLOGY. The species is named after the name of the Bokor National Park.



Fig. 3. *Carebara bokorensis* sp. n. nesting in decayed wood (S. Hosoishi).

ACKNOWLEDGMENTS

We would like to thank Phourin Chhang and Choeung Hong Narith (Forestry Administration of Cambodia, Phnom Penh, Cambodia) for providing permission to conduct research in Cambodia, issuing a specimen export permit to Kyushu University, Japan, and suggesting the type depository of new species. We also express our thanks to Tsuyoshi Kajisa (Kagoshima University), Nobuya Mizoue (Kyushu University), Tetsukazu Yahara (Kyushu University) for helping our field surveys in this study. We would like to thank ANeT members for encouragement. This work was supported in part by JSPS KAKENHI (Grant-in-Aid for Scientific Research © Grant Number 21K05616, 19K06824, and Global COE Program (Center of Excellence for Asian Conservation Ecology as a basis of Human-Nature Mutualism), MEXT, Japan.

REFERENCES

- Azorsa, F. & Fisher, B.L. 2018. Taxonomy of the ant genus *Carebara* Westwood (Formicidae, Myrmicinae) in the Malagasy Region. *Zookeys*, 767: 1–149. DOI: 10.3897/zookeys.767.21105

- Bharti, H. & Kumar, R. 2013. Six new species of *Carebara* Westwood (Hymenoptera: Formicidae) with restricting of world species group and a key to Indian species. *Journal of Entomological Society*, 15(1): 47–67.
- Bolton, B. 2023. An online catalog of the ants of the world. <http://antcat.org> [accessed 20 December 2023]
- Emery, C. 1887. Catalogo delle formiche esistenti nelle collezioni del Museo Civico di Genova. Parte terza. Formiche della reguine Indo-Malese e dell’Australia (continuazione e fine). *Annali del Museo civico di storia naturale di Genova*, 25[=(2)(5)]: 465–473.
- Fischer, G., Azorsa, F., Hita Garcia, F., Mikheyev, A.S. & Economo, E.P. 2015. Two new phragmotic ant species from Africa: morphology and next-generation sequencing solve a caste association problem in the genus *Carebara* Westwood. *ZooKeys*, 525, 77–105. DOI: 10.3897/zookeys.525.6057
- Hosoishi, S., Yamane, Sk. & Sokh, H. 2022. Discovery of a new phragmotic species of the ant genus *Carebara* Westwood, 1840 (Hymenoptera: Formicidae) from Cambodia. *Journal of Hymenoptera Research*, 91: 357–374. DOI: 10.3897/jhr.91.82490
- Jaitrong, W., Pitaktunsakul, P. & Jantarit, S. 2021. A new species of the genus *Carebara* Westwood, 1840 (Hymenoptera: Formicidae: Myrmicinae) inhabits a cave in Thailand. *Far Eastern Entomologist*, 425: 7–20. DOI: 10.25221/fee.425.2
- Li, S. & Tang, J. 1986. The ant genus *Pheidologeton* of Guangxi and the description of a new species (Hymenoptera: Formicidae). *Journal of Zhejiang Agricultural University*, 12(2): 160–165. [In Chinese]
- Santschi, F. 1937. Résultats de la Mission scientifique suisse en Angola (2me voyage) 1932–1933. Fourmis angolaises. *Revue Suisse de Zoologie*, 44: 211–250.
- Smith, F. 1860. Descriptions of new species of hymenopterous insects collected by Mr. A. R. Wallace at Celebes. *Journal and Proceedings of the Linnean Society of London, Zoology*, 5(17b) (suppl. to vol. 4): 57–93.
- Smith, F. 1860. Catalogue of hymenopterous insects collected by Mr. A. R. Wallace in the islands of Bachian, Kaisaa, Amboyna, Gilolo, and at Dory in New Guinea. *Journal and Proceedings of the Linnean Society of London, Zoology*, 5(17b) (suppl. to vol. 4): 93–143.
- Terayama, M., Lin, C. & Eguchi, K. 2012. Additions to knowledge of the ant fauna of Taiwan (Hymenoptera, Formicidae, Solenositini): genera *Anillomyrma* and *Carebara*. *Japanese Journal of Systematic Entomology*, 18: 1–6.
- Terayama, M., Kubota, S. & Eguchi, K. 2014. Encyclopedia of Japanese Ants. *Asakura Press*, Tokyo, 278 pp. [In Japanese]
- Ward, P.S., Brady, S.G., Fisher, B.L. & Schultz, T.R. 2015. The evolution of myrmicine ants: phylogeny and biogeography of a hyperdiverse ant clade (Hymenoptera: Formicidae). *Systematic Entomology*, 40: 61–81. DOI: 10.1111/syen.12090
- Wu, J. & Wang, C. 1995. The ants of China. *China Forestry Publishing House*, Beijing. 214 pp. [In Chinese]
- Xu, Z.-H. 2003. A systematic study on Chinese species of the ant genus *Oligomyrmex* Mayr (Hymenoptera, Formicidae). *Acta Zootaxonomica Sinica*, 28(2): 310–322.
- Zhou, S.-Y., Zhao, S. & Jia, F.-L. 2006. A taxonomic study of the ant genus *Pheidologeton* Mayr (Hymenoptera, Formicidae, Myrmicinae) from China. *Acta Zootaxonomica Sinica*, 31(4): 870–873.
- Zhou, S. & Zheng, Z. 1997. A taxonomic study on the ant genus *Pheidologeton* Mayr in Guangxi (Hymenoptera: Formicidae). *Zoological Research*, 18(2): 163–170.