**Systematics**

The Genus *Minanga* Cameron (Hymenoptera: Braconidae) in China, With Description of a New Subgenus and Species

JIANG-LI TAN, JUN-HUA HE, AND XUE-XIN CHEN

State Key Laboratory of Rice Biology, Institute of Insect Sciences, Zhejiang University, Hangzhou 310029, China

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**ABSTRACT** A new species of *Minanga* Cameron (Hymenoptera: Braconidae: Sigalphinae), *Minanga brevicarinata* Tan & Chen, sp. nov., from China is described and illustrated. Previously known mainly from the Afrotropical region (eight species), with one species recently described from the Nearctic region, the genus is recorded for the first time from the boundary of Palearctic and Oriental regions. A new subgenus, *Anopliminanga* subgen. nov., is proposed to include two species (*Minanga achterbergi* Sharkey and *Minanga brevicarinata* sp. nov.). A key to species of the genus *Minanga* is updated. The distribution of *Minanga* and the new subgenus are briefly discussed.

**KEY WORDS** Sigalphinae, Minangini, Palearctic, Oriental, biogeography

*Minanga* Cameron, 1906, the sole genus in the tribe Minangini, belongs to the uncommon braconid subfamily Sigalphinae. Currently, it includes six genera and ~38 species (Sharkey 2004, Yu et al. 2005, Quicke et al. 2008) and its widespread but sporadic distribution suggests that it is a relict group. Nine species of *Minanga* have been reported, eight species from sub-Saharan Africa: *Minanga serrata* Cameron, 1906, *Minanga oryx* de Saeger, 1948, *Minanga seyrigi* Granger, 1946, *Minanga flavipes* Cameron, 1909, *Minanga capra* (Enderlein 1905), *Minanga taura* (Brues 1926), *Minanga bimaculata* Cameron, 1911, *Minanga phoebea* Quicke, 2008; and one species from northern Mexico (*Minanga achterbergi* Sharkey, 2004).

Recently, while sorting specimens in the collection of the Shanghai Entomological Museum, Shanghai, China (SHEM), we came across a specimen representing a new species of *Minanga* with a locality label indicating that it was collected in Hexi, Fujian, China, nearly half a century ago. Hexi (24°55′46″ N, 117°08′18″ E) is ≈30 km southeast of Longyan. This discovery represents the first record of this genus for both China and Eurasia. A new subgenus, *Anopliminanga* subgen. nov., is proposed to host two species (*M. brevicarinata* and *M. achterbergi*), which have distinct morphological characters such as the posterior margin of carapace without a flange, dentations or depressions, and the lateral cariniae of metasomal tergite I weakly converging posteriorly.

**Materials and Methods**

For the identification of the subfamily Sigalphinae, and the genus *Minanga*, see van Achterberg and Quicke (1990), and van Achterberg and Austin (1992); for the morphological terminology used in this article, see van Achterberg (1993) and Harris (1979). All descriptions and figures were made with a Stemi SV 6 microscope (Carl Zeiss, Jena, Germany); for the photos and measurements, an MZ APO microscope with an Image 1000 system was used (both from Leica, Wetzlar, Germany). The type specimen is deposited in SHEM.

*Anopliminanga* subgen. nov. (Figs. 1–2)

**Type Species.** *Minanga (Anopliminanga) brevicarinata* Tan & Chen, sp. nov.

**Diagnosis.** Posterior margin of carapace without flange, dentation or depression; lateral cariniae of metasomal tergite I weakly converging posteriorly; horns of head rather long and diverging, 2.4–3.7 times as long as diameter of ocellus; vein 1-SR+M of forewing strongly curved.

**Distribution.** Nearctic and the boundary of Palearctic and Oriental regions. Two species are included (*M. brevicarinata* and *M. achterbergi*).

**Etymology.** The subgenus is named from Greek *anopl-* (weaponless) + *minanga* (name of the genus), referring to its relation to *Minanga* and the posterior margin of carapace without a flange, dentations, or depressions.

*Minanga* (*Anopliminanga*) *brevicarinata* Tan & Chen, sp. nov. (Figs. 1–2)

**Holotype.** Female, length of body 7.6 mm and forewing 7.9 mm.
Head (Fig. 2A–C). Head small, width 1.9× its median length in dorsal view (Fig. 2A), smooth and polished dorsally and posteriorly, setose anteriorly and laterally. Ocelli in obtuse triangle; OOL: diameter of ocellus: POL = 13:5:18; two sharp horns arising at the inner posterior side of each posterior ocellus (stigmaticum), diverging and thus forming a V-shaped structure; ≈0.5 mm (measured from dorsal border of posterior ocelli) high, 3.7× as long as maximum diameter of posterior ocellus; vertex between the two horns excavated. Frons concave, with two strong lateral carinae from antennal sockets to posterior ocelli; two medial carinae from upper part of face to lateral margins of anterior ocelli, strongly expanded between the antennal sockets into two erect lamellae; some curved keels and shallow concave patches present between the four carinae. Face sparsely setose, ≈1.5× as broad as high, and 2.0× as high as clypeus; upper part of face with dense rugae converging near the medial carinae with a narrow groove between them; lower part irregularly reticulate-rugose laterally, convex and finely wrinkled medially. Clypeus convex and finely punctate with dense setae, ventral margin strongly impressed; anterior tentorial pits round and conspicuous; height of clypeus: intertentorial distance: tentorio-ocular distance = 1.0:1.66:1.0. Eyes glabrous, length of eye 1.3× temple in dorsal view, not emarginated and 2.0× as high as broad in frontal view; temple behind eye (dorsal view) roundly narrowed. Occipital carina strong and lamelliform laterally but reduced ventrally and mediodorsally, remaining separated from hypostomal carina (Fig. 2A and C); hypostomal carina strongly expanding into a flange (Fig. 2A and C); area between the two carinae wide, smooth and polished. Gena with broad rugae or large foveae, length of malar space ≈0.41× height of eye and 1.3× basal width of mandible; malar suture absent. Mandible depressed ventrally and basally, bidentate apically.
Maxillary palp five segmented, about as long as width of head; labial palp with four segments, \( \approx 0.4 \times \) width of head.

Antennae broken, remaining 30 (right) and 17 (left) flagellomeres, respectively.

Mesosoma (Figs. 1; 2D and E). Shiny, length of mesosoma \( \approx 1.5 \times \) its height (Fig. 2A). Pronotum with a dorsal pronope and two lateral subpronopes, its lateral surface sculptured with smooth and strong curved furrows and foveae; propleuron flat, without posterior flange; prosternum hardly visible. Mesoscutum smooth; median lobe strongly convex; notauli complete, rather deep, crenulate; transscutal suture of mesonotum present; scutellar sulcus deep and broad with about two or three carinae (destroyed by pin hole), \( 0.7 \times \) as long as scutellum; scutellum smooth, slightly convex and coriaceous with crenulate subposterior depression; side of scutellum crenulate. Mesopleuron polished medially, setose anteriorly and dorsally, with numerous crossed and rather straight furrows, most furrows broad and deep basally, especially along the precoxal sulcus, tapered and shallow distally (Figs. 1B and 2C); anterior subalar depression smooth without carina; prepectal carina (=epicnemial carina) present but slender; epicnemial area setose; precoxal sulcus smooth and shallow; postpectal carina developed, complete and lamelliform; mesosternal sulcus broad and crenulate. Metanotum with a median fovea, surrounded by two short submedian carinae fused posteriorly; side of scutellum crenulate. Metapleuron shiny, coarsely longitudinally wrinkled; just below the spiracle with a deep groove; metapleural flange indistinct. Propodeum strongly convex dorsally, coarsely reticulate rugose with a large median areola extending from base to apex; areola is divided by a short median and ladder-like pattern of ridges, and median carina absent near apex.

Fig. 2. *M. brevicarinata* Tan & Chen, sp. nov., \( \delta \), holotype. (A) Head, dorsal aspect. (B) Head, front aspect. (C) Habitus, lateral aspect. (D) Meso- and metanotum, dorsal aspect. (E) Propodeum and carapace, dorsal aspect (shaded portion representing dark reddish brown, others are yellow). Scale bar = 0.5 mm.
Wings (Fig. 1A). Forewing: length \(\approx 2.8 \times \) as long as maximum width; pterostigma 3.6 \(\times \) as long as maximum width; parastigma distinct; vein M + CU1 slightly bent; crossvein r arising at approximately basal third length of pterostigma; length of r \(\approx 0.56 \times \) the maximum width of pterostigma; r: 2-SR: SR1: 3-SR: r-m = 1.0: 2.0: 3.7: 5.4: 1.8; vein 1-SR + M strongly sinuate; vein 2-SR + M about half length of r, vein 3-CU1 curved downwards, about equal to length of m-cu; vein m-cu postfurcal, somewhat converging to 1-M anteriorly; vein 1-M \(\approx 2.0 \times \) as long as vein 1-SR; vein cu-a postfurcal, straight and strongly inclivous; 1-CU1: 2-CU1: 3-CU1 = 10: 45: 17; vein CU1b very short, sclerotized; vein CU1a sclerotized basally, weakly pigmented apically.

Hind wing. Vein 1-SC + R terminating near half of wing; vein 2-SC + R very short, \(\approx 0.15 \times \) as long as 1r-m; vein M + CU, vein 1-M and vein 2-M at same level; length of vein M + CU 1.56 \(\times \) vein 1-M; crossvein r unsclerotized and completely unpigmented, arising at basal 0.38 \(\times \) of marginal cell; vein SR and vein 2-M terminating to the apical margin of wing, but weakly pigmented distally; vein 2-M straight, vein 1-CU vertical; vein 2-CU long and tubular, not terminating to the wing margin; crossvein cu-a very short, unpigmented apically; vein 1-1A slender, with a row of distinct setae; vein 2–1A weakly pigmented; four hamuli.

Legs (Figs. 1B and E; 2C). All claws with pointed basal lobe (Figs. 1E and 2C). Fore leg robust, fore tibial spur and the basitarsus each with a row of short stiff spines (Fig. 2C). Middle leg similar to hind leg, but shorter than the latter; with two tibial spurs and without a row of stiff spines on basitarsus; basitarsus columnar without curvature or spines (Fig. 2C). Hind coxa smooth; length of femur, tibia and basitarsus of hind leg 3.3, 5.7 and 6.0 \(\times \) their width, respectively; length of hind tibial spurs 0.41 \(\times \) and 0.53 \(\times \) hind basitarsus (Figs. 1B and 2C).

Metasoma (Figs. 1B and D; 2C and E). Carapace composed of three segments; roughly clavate in dorsal aspect, narrow basally, gradually broadened distally. Median length of tergite I \(\approx 0.73 \times \) its apical width, dorsal carinae complete, strong and converging posteriorly; a medial carina present from base to apex with transverse rugae basally and reticulated rugae apico-laterally, two lateral carinae strongly converging posteriorly with transverse rugae basally, reticulate-rugose apically between dorsal carinae. Tergites II and III mostly densely reticulate-rugose; second suture narrow, striate, indistinct medially; median length of tergite II \(\approx 0.68 \times \) its apical width, with a pair of large depressions anteriorly, with longitudinal rugae; divided by a median area with two short submedian carinae (as long as \(\approx 0.3 \times \) median length of tergite III) and a long median carina (as long as 0.8 \(\times \) middle length of tergite III), surrounded by reticulate-rugosity; tergite III comparatively very short in dorsal view for its posterior two-thirds part bent and extending ventrally; posterior margin smoothly rounded, not lamelliform, dentate or depressed. Ventral surface of metasoma relatively flat, narrowly open basally and widely open apically, ending at \(\approx 0.7 \times \) length of carapace. Remaining abdominal segments (4+) retracted under the carapace; ovipositor sheath wide, nearly parallel-sided; ovipositor acute apically.

Color (Fig. 1). Blackish brown to black, but apex of horn of head, labium, palpi and mandible distally yellowish brown; wings evenly tinged with brown, pterostigma and most veins dark brown; carapace yellow basally and laterally to about basal 0.67 \(\times \) length of carapace, i.e., a little beyond second suture.

Holotype. Female, Hexi, FUJIAN, CHINA, 10-V-1962, coll. Lin Shu-Cheng, no. 34011962 (SHEM).

Distribution. The boundary of Palaearctic and Oriental (Fujian province, China).

Etymology. The new species is named from Latin “brevi-”, short and “carina,” referring to two very short sub-median carinae of the basal tergum II.

Diagnosis. This new species is peculiar for the short two submedian carinae at the base of tergum II which are approximately as long as 0.3 \(\times \) median length of tergite II (far beyond half length of tergite II in all its congeners). It can be easily separated from other congeners by the characters indicated in the key below.

Discussion

After the first species of Minanga was published in 1906 and De Saeger (1948) revised the genus, only two new species [M. (A.) achterbergi Sharkey and M. (M.) phoebea Quicke] have been added, bringing the total described species to nine (Sharkey 2004; Quicke et al. 2008). The discovery of M. achterbergi resulted in a very rare disjunct distribution pattern, with species restricted to the Afrotropical and Nearctic realms. Sharkey (2004) mentioned that two hypotheses (Pan-tropics and Boreotropics hypothesis) could explain the formation of this distribution pattern but admitted that both are weakly supported for paucity of known distributional data. The discovery of M. brevicarinata in the boundary of Palaearctic and Oriental regions seems to favor the Boreotropics hypothesis, which implies that species of this genus were widespread in Pangaea, including areas presently in the Northern Hemisphere, but became extinct in the Palaearctic with global cooling. This finding probably illustrates that we are far from fully understanding the diversity and history of this group.

Southeastern China is an important interface between two great realms, the Palaearctic and Oriental (or Palaeoatropical), but there are different perspectives on where the boundary lies. Vegetation maps conventionally define a coastal tropical belt within the Palaearctics up to 23–24\° N, and a broader parallel subtropical one outside it, to 33–34\° N (Hou 1988). Hoffmann (2001) placed the boundary for mammals as a transitional zone between 33\° N and 28\° N. Fellows (2006) suggested that the biological center of the Palaearctic–Oriental boundary is around 25\° N for the Chinese ant fauna with the extreme northern limit of Oriental genera north to 40\° N and the extreme southern limit of Palaearctic taxa south to 22\° N. Wher-
ever the winter temperature drops below around 3°C, most Oriental genera cannot survive, whereas most Palearctic genera are absent in areas with a winter low above 0°C. As the locality, Hexi, is \( \approx 25^\circ \) N, the locality of the sole specimen of *M. brevicarinata* lies within the southern boundary of Palearctic according to Fellowes (2006). Because *M. brevicarinata* shares most characters with the Nearctic species *M. achterbergi* Sharkey rather than the Afrotropical species (subgenus *Minanga* s. str.), it may suggest that this new species probably belongs to the Palearctic, and if so then the subgenus *Anoplominanga* would have a Holartic distribution. Interestingly, the locality of *M. achterbergi* in Mexico is also very close to the southern boundary of the Neartic realm.

The new species of *Minanga* described here also has a distinct complete postpectal carina as *Minanga phoebea* Quicke, 2008. This feature is functionally linked to the possession of a metasomal carapace which requires a specialized mechanism for its control (Quicke et al. 2008).

**Key to Species of Genus Minanga Cameron**

1. Posterior margin of carapace without flange, dentation or depression; lateral carinae of metasomal tergite I weakly converging posteriorly; horns of head rather long, 2.4–3.7× diameter of ocellus, diverging; vein 1-SR+M of fore wing strongly curved (subgenus *Anoplominanga* subg. nov., Mexico and China) ............ 2

   - Posterior margin of carapace lamelliform and dentate; lateral carinae of metasomal tergite I sharply converging posteriorly; horns short, \( \approx 1.5 \times \) diameter of ocellus, erect and parallel; vein 1-SR+M of fore wing straight (subgenus *Minanga* s. str., Afrotropical) ............ 3

2. Occipital carina absent; postpectal carina indistinct and vestigial; basal submedian carina rather long (far beyond 0.5× median length of tergite II); tergites II and III of carapace tapering to blunt apical point, mostly striate dorsally and rugose apically; northern Mexico

   - Occipital carina present laterally; postpectal carina distinct and complete; apex of carapace broadened posteriorly, tergite II and III reticulate-rugose; basal submedian carina short (0.3× median length of tergite II). China

   - Postpectal carina distinct and complete; mesosoma black entirely. Uganda

   - Postpectal carina indistinct; mesosoma mostly reddish orange. South Africa

   - Postpectal carina accessory; mesosoma mostly reddish brown. South Africa

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