

## A review of the *Polyrhachis xiphias* species-group of the subgenus *Campomyrma* Wheeler (Hymenoptera: Formicidae: Formicinae)

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**ABSTRACT.** The *Polyrhachis xiphias* species-group of the subgenus *Campomyrma* Wheeler is reviewed. Descriptions of the previously-undescribed worker of *P. xiphias* and queen of *P. shixingensis* are given. A key to workers of the group is provided. Workers of all species and queens of *P. shixingensis* and *P. xiphias* are illustrated.

**Keywords:** Formicidae, *Polyrhachis*, *Campomyrma*, *xiphias*-group, China, Vietnam, Borneo, New Guinea, taxonomy

### INTRODUCTION

The *Polyrhachis xiphias* species-group was introduced by Kohout (2007) to house three widely-distributed species of the subgenus *Campomyrma* Wheeler: *P. xiphias* Fr. Smith from New Guinea, *P. shixingensis* Wu & Wang from China and *P. hashimotoi* Kohout from Borneo. The newly-erected group was characterised by a columnar petiole with a pair of horizontal, posteriorly-directed spines, rather similar to those in species of the subgenus *P. (Hagiomyrma)* Wheeler. All three species are very similar and share a rounded pronotal dorsum and a pair of horizontal, posteriorly-directed propodeal spines. They are apparently rare, with only a handful of specimens known from all collections examined. However, in the course of my studies I have discovered the previously-unknown workers of *P. xiphias* and queens of *P. shixingensis* which are described below. An identification key to the workers of all three species of the group is also provided.

### METHODS

The present review is based on all specimens known to the author, except the type series of *P. shixingensis*, supposedly lodged in the collection of the Research Institute of Forest

Protection of the Chinese Academy of Forestry in Beijing. In lieu of the types, specimens collected by Dr J. R. Fellowes in Guangdong Province in China, and by Dr A. G. Radchenko on Dongkho Island in Vietnam, were examined. Voucher specimens based on this study were selected and lodged in QMBA, with two specimens each donated to ANIC, BMNH and MCZC, courtesy of Dr J. R. Fellowes (KFBG).

Photographs of the specimens were taken with a digital camera attached to a stereomicroscope and processed using Auto-Montage (Syncroscopy, a division of Synoptics Ltd, USA) and Adobe Photoshop CS2 (Adobe Systems Inc., USA). The photographs were produced by Dr Steve O. Shattuck (ANIC), except that of *P. hashimotoi*, photographed by Hans Peter Katzmann (UUUG), courtesy of Dr Martin Pfeiffer (presently at NUM).

The standard measurements and indices largely follow those of Kohout (2007): TL = Total length (the necessarily composite measurement of the outstretched length of the entire ant measured in profile); HL = Head length (the maximum measurable length of the head in perfect full-face view, measured from the anterior-most point of the clypeal border or teeth, to the posterior-most point of the occipital margin); HW = Head width (width of the head in perfect

full-face view, measured immediately in front of the eyes); CI = Cephalic index ( $HW \times 100/HL$ ); SL = Scape length (length of the antennal scape, excluding the condyle); SI = Scape index ( $SL \times 100/HW$ ); PW = Pronotal width (greatest width of the pronotal dorsum across the humeri in species without teeth); MTL = Metathoracic tibial length (maximum measurable length of the tibia of the hind leg). All measurements were taken using a Zeiss (Oberkochen) SR stereomicroscope at 20 $\times$  and 32 $\times$  magnifications with an eyepiece graticule calibrated against a stage micrometer. All measurements are expressed in millimetres (mm).

Abbreviations used for specimen data: acc. – accession/s; m – male/s; Prov. – Province; q – queen/s; w – worker/s.

Abbreviations for institutions (with names of cooperating curators): ANIC – Australian National Insect Collection, CSIRO Entomology, Canberra, ACT, Australia (Dr S. O. Shattuck); BMNH – The Natural History Museum, London, UK (S. Ryder); ITBC – Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah, Kota Kinabalu, Sabah, E. Malaysia (Dr Bakhtiar E. Y.); KFBG – Kadoorie Farm & Botanic Garden, Hong Kong SAR, China (Dr J. R. Fellowes); MCZC – Museum of Comparative Zoology, Harvard University, Cambridge, MA, USA (Dr S. P. Cover); NUM – National University of Mongolia, Ulaanbaatar, Mongolia (Dr M. Pfeiffer); OXUM – Hope Entomological Collections, University Museum, Oxford, UK (Dr D. Mann); QMBA – Queensland Museum, Brisbane, QLD, Australia (Dr C. J. Burwell); RIFP – Research Institute of Forest Protection of the Chinese Academy of Forestry, Beijing, China; UUUG – University of Ulm, Ulm, Germany (H. P. Katzmann).

## SYSTEMATICS

### Genus *Polyrhachis* Fr. Smith, 1857

*Polyrhachis* Fr. Smith, 1857: 58. Type species: *Formica bihamata* Drury, 1773, by original designation.

### Subgenus *Campomyrma* Wheeler, 1911

*Campomyrma* Wheeler, 1911: 860 (as subgenus of *Myrma* Billberg, 1820 = *Polyrhachis* Fr. Smith, 1857). Type species: *Polyrhachis clypeata* Mayr,

1862 (junior synonym of *Polyrhachis exercita* Walker, 1859), by original designation.

### *Polyrhachis xiphias* species-group

## DIAGNOSIS

### WORKER

Medium-sized ants (HL 1.50–1.81) with characteristics of the genus. Mandibles with 5 teeth, bases smooth or finely striate. Anterior clypeal margin arcuate, medially truncate; clypeus with more-or-less distinct median carina. Frontal carinae rather fat with relatively wide central area. Eyes fat (as in *P. shixingensis*), only weakly convex (as in *P. hashimotoi*), or convex (as in *P. xiphias*). Pronotum in dorsal view with lateral margins rounded, without distinct humeral angles; propodeal dorsum with lateral margins subparallel or only weakly divergent (as in *P. xiphias*), extending posteriorly and terminating in relatively long, dorsally or somewhat dorsomedially fattened spines; inner margins of spines continuous medially, forming an inverted 'U'-shaped ridge that divides propodeal dorsum from declivity. Petiole armed with posteriorly-directed, subparallel (as in *P. hashimotoi* and *P. shixingensis*), or divergent (as in *P. xiphias*) more-or-less horizontal spines. Head, mesosoma and petiole mostly finely reticulate-punctate, gaster smooth and polished. Closely appressed pubescence very sporadically distributed over sides of body and gaster, virtually absent from dorsa of head and mesosoma. A few, medium length, semierect hairs on front of head, coxae, and venter and apex of gaster. Body black, appendages light to medium reddish-brown.

### QUEEN

Closely similar to worker, but distinctly larger (HL >2.25 in queens versus <1.81 in workers), with characters identifying full sexuality, including three ocelli, full thoracic structure and wings). Sculpturation, pilosity and colour essentially as in worker.

Males are known only of *P. shixingensis*, but their diagnosis is beyond the scope of this paper. Immature stages unknown.

KEY TO THE WORKERS OF THE *P. XIPHIAS* SPECIES-GROUP

1. Petiolar spines widely divergent (New Guinea) ..... *P. xiphias* Fr. Smith  
- Petiolar spines subparallel ..... 2.
2. Clypeus only weakly concave in profile; eyes weakly convex (Fig. 1); dorsum of petiole in profile distinctly higher than base of spines (Fig. 5); legs medium reddish-brown (Borneo) .....  
..... *P. hashimotoi* Kohout  
- Clypeus distinctly sinuate in profile; eyes almost fat (Fig. 2); petiolar spines arising from summit of petiolar dorsum (Fig. 7); legs light yellow (China, Vietnam) ..... *P. shixingensis* Wu & Wang

***Polyrhachis hashimotoi* Kohout, 2007**  
(Figs. 1, 4, 5)

*Polyrhachis hashimotoi* Kohout, 2007: 12, Figs. 7, 8. Holotype worker. Type locality: EAST MALAYSIA, SABAH, 10 km S of Danum Valley Field Centre, Reduced-impact Logging Project Area, 20.vii-25.viii.1994, ITBC (examined).

## WORKER

Dimensions of holotype: TL c. 6.95; HL 1.75; HW 1.47; CI 84; SL 1.62; SI 110; PW 1.03; MTL 1.84 (1 measured)

Sexuals and immature stages unknown.

## REMARKS

*Polyrhachis hashimotoi* is very similar to *P. shixingensis* from China and *P. xiphias* from New Guinea, with the clypeus of all three species featuring a median carina arising from its truncate and shallowly emarginate margin. However, in *P. shixingensis* the carina is short, strongly raised and rather sharp, in *P. xiphias* it is weakly and evenly raised throughout its length and in *P. hashimotoi* it is rather fat and blunt anteriorly. The dorsum of the petiole in *P. hashimotoi* and *P. xiphias* is distinctly higher than the bases of petiolar spines which arise from below the convex summit of the petiole. In contrast, in *P. shixingensis* the spines arise from the summit of the petiolar dorsum.

***Polyrhachis shixingensis* Wu & Wang, 1995**  
(Figs. 2, 6, 7, 10, 12, 13)

*Polyrhachis shixingensis* Wu & Wang, 1995: 166, 200, Figs. 334, 348, 351. Holotype and paratype workers. Type locality: CHINA, Guangdong Prov., Shixing County, Chebaling Natural Conservation Area (Lu Chuanchuan), RIFF.

## ADDITIONAL MATERIAL EXAMINED

CHINA, Guangdong Prov., Heyuan Xinggang, c. 23 53' 30"N, 114 30' 50"E, c. 160 m, 22.iii.1997 (J. R. Fellowes #20) (w, q, m); Jiuwanshan Nature Reserve, north Guangxi, 25°18'N, 108°52'E, 27.vii.1998, 540 m, shrubland (J. R. Fellowes) (w); Niujiaoling, Shangxi Nature Reserve, Hainan, 18°47'N, 110°11'E, 20.v.1999, 290 m, tall closed shrubland (J. R. Fellowes) (w); ditto, 360 m, closed-canopy broadleaf forest (J. R. Fellowes) (w); Yangchun Baiyong Nature Reserve, Guangdong, 22°24'N, 111°38'E, 3.v.1998, 540 m, secondary forest (J. R. Fellowes) (w). VIETNAM, Dongkho I., 19 & 23.iii.1987, at light (A. G. Radchenko) (w, q).

## WORKER

Dimensions: TL c. 6.45-7.16; HL 1.56-1.81; HW 1.47-1.62; CI 88-93; SL 1.59-1.76; SI 108-112; PW 0.87-1.03; MTL 1.72-1.93 (6 measured)

## QUEEN (not previously described)

Dimensions: TL c. 9.47; HL 2.25; HW 1.87; CI 83; SL 1.87; SI 100; PW 1.50; MTL 2.18 (1 measured)

Queen very similar to worker with usual characters of full sexuality, including three ocelli, complete thoracic structure and wings. Eyes larger than in worker, in full-face view marginally exceeding lateral cephalic outline. Pronotal humeri bluntly angular with anterior margins weakly indicated for short distance towards pronotal collar. Mesoscutum in lateral view with relatively low, widely rounded anterior margin and posteriorly fat dorsum; median line indistinct; parapsides fat. Mesoscutellum weakly convex, only marginally elevated above dorsal plane of mesosoma, Propodeal dorsum weakly transversely convex with lateral margins converging posteriorly and



**Figs. 1 – 9.** *Polyrhachis* (*Campomyrma*) spp. (workers): *P. hashimotoi* Kohout (1, 4, 5); *P. shixingensis* Wu & Wang (2, 6, 7); *P. xiphias* Fr. Smith (3, 8, 9).

terminating in somewhat dorsolaterally fattened, broadly based, propodeal spines. Petiole identical to worker with marginally shorter spines.

Sculpturation of head similar to worker, finely reticulate-punctate; mesoscutum irregularly, rather coarsely rugose, sculpture somewhat longitudinally directed posteriorly; propodeal dorsum, including spines, finely reticulate-punctate. Gaster shagreened, rather highly polished.

Anterior clypeal margin with several longer, golden setae medially and numerous shorter setae fringing margin laterally. Head, including clypeus, with numerous golden, anteriorly inclined, paired hairs. Mesoscutum with only two pairs of semierect, medium length hairs. Gaster, except dorsum of first tergite, with numerous posteriorly inclined, relatively long, golden hairs along posterior margins of segments and around apex. Very short, appressed, silvery or pale golden pubescence only very sparingly distributed over most body surfaces.

Colour virtually identical to that in worker.

Males present in the KFBG collection. Immature stages unknown.

## REMARKS

I was unable to examine the types of *P. shixingensis*, however, its description and illustrations, together with the specimens collected by J. R. Fellowes and A. G. Radchenko, were sufficient to establish the identity of this species. *Polyrhachis shixingensis* is rather similar to *P. hashimotoi* and *P. xiphias*, with differences between all three species discussed in remarks section under *P. hashimotoi*.

### *Polyrhachis xiphias* Fr. Smith, 1863

(Figs. 3, 8, 9, 11, 14, 15)

*Polyrhachis xiphias* Fr. Smith, 1863: 16. Holotype queen. Type locality: NEW GUINEA, Waigiou I. (= INDONESIA, Pulau Waigeo) (A. R. Wallace), OXUM (Type HYM:1064)).

*Polyrhachis xiphias* Fr. Smith; Emery, 1925: 185. Combination in *P. (Hagiomyrma)*.

*Polyrhachis xiphias* Fr. Smith; Kohout, 2007: 7. Combination in *P. (Campomyrma)*.

## ADDITIONAL MATERIAL EXAMINED

INDONESIA, WEST IRIAN, Waris S of Hollandia, 03°30'S, 140°55'E, 400 – 500 m, 1-20.viii.19059 (T.C. Maa) (q); PAPUA NEW GUINEA, West Sepik Prov., Hayfeld nr Maprik, 03°41'S, 143°03'E, c.150 m, 27-28.vi.1072, rainforest, ex rotting wood piece (R. W. Taylor acc. 72.498) (w); Gulf Prov., Lakekamu Basin, Ivimka Camp, 07.73°S, 146.76°E, 180 m, 26-31.x.1996, lowland rainforest, Malaise trap (R.R. Snelling) (w).

## WORKER (not previously described)

Dimensions: TL c. 6.00-6.80; HL 1.50-1.72; HW 1.40-1.59; CI 91-94; SL 1.62-1.78; SI 110-117; PW 1.06-1.18; MTL 1.72-1.96 (11 measured)

Anterior clypeal margin medially truncate with truncate portion jagged and shallowly notched. Clypeus with blunt median carina, straight in profile; basal margin only very shallowly impressed. Frontal triangle distinct. Frontal carinae sinuate, only weakly raised; central area relatively wide with shallowly impressed frontal furrow. Sides of head in front of eyes evenly rounding into mandibular bases; behind eyes sides rather abruptly and narrowly rounding onto virtually flat occipital margin. Eyes moderately convex, in full-face view clearly breaking lateral cephalic outline. Ocelli lacking. Pronotum in dorsal view with lateral margins rounded with only indication of rather blunt humeral angles in some specimens. Promesonotal suture distinctly impressed; mesonotum with lateral margins converging towards distinct metanotal groove. Propodeal dorsum with lateral margins weakly divergent, terminating posteriorly in more-or-less dorsally fattened spines; inner margins of spines continuous medially, forming an inverse 'U'-shaped carina separating propodeal dorsum from steeply descending declivity. Petiolar node with anterior and posterior faces subparallel; dorsum of petiole with a pair of blunt, posteriorly directed, intercalary teeth and relatively short, divergent spines. Anterior face of first gastral segment straight at base, only marginally higher than full height of petiole, narrowly rounding onto dorsum.

**Figs. 10 – 15.** *Polyrhachis* (*Campomyrma*) spp. (queens): *P. shixingensis* Wu & Wang (10, 12, 13); *P. xiphias* Fr. Smith (11, 14, 15).

Mandibles very finely, longitudinally striate with numerous piliferous pits. Head and dorsum of mesosoma reticulate-punctate, sides of mesosoma and petiole finely wrinkled. Gaster very finely shagreened, rather polished.

Mandibular masticatory borders with only a few relatively short, curved, golden hairs. Anterior clypeal margin with several golden setae medially; clypeus, frontal carinae and vertex with several paired, medium-length, erect hairs. Fore coxae with several semierect hairs and a few hairs on ventral surfaces of middle and hind coxae. Gaster with several longer hairs on venter

and around apex. Extremely short, much diluted, appressed pubescence distributed very sparingly over most body surfaces.

Black; narrow band at mandibular masticatory borders medium reddish-brown. Antennal scapes dark brown; funiculi dark brown at bases, with segments progressively lighter towards funicular apices; condylae light yellow. Legs light yellow with joints of femora and tibiae, and tarsi dark brown.



## QUEEN

Dimensions (holotype cited first): TL c. 10.89, 10.33; HL 2.47, 2.40; HW 1.99, 2.03; CI 80, 84; SL 2.32, 2.31; SI 116, 114; PW 1.66, 1.72; MTL 2.72, 2.65 (2 measured)

Queen very similar to worker with usual characters of full sexuality and shorter propodeal spines. Mesoscutum relatively low with fat dorsum; mesoscutellum not elevated above dorsal plane of mesosoma. Sculpturation of head distinctly finer than in worker; mesoscutum very finely, longitudinally striate anteriorly, striae somewhat less distinct posteriorly; mesoscutellum very finely striate. Propodeum very finely reticulate-punctate. Gaster shagreened, rather highly polished. Pilosity and pubescence almost identical to that in worker. Colour similar to that in worker, only legs distinctly darker, medium reddish-brown.

Males and immature stages unknown.

## REMARKS

*Polyrhachis xiphias* is quite similar to both the other species of the group, *P. hashimotoi* and *P. shixingensis*, but can be easily distinguished by the more convex eyes, more-or-less distinct, though rather blunt, humeral angles and divergent petiolar spines. In contrast, the other two species have distinctly fatter eyes, smoothly rounded pronotal humeri and subparallel petiolar spines.

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