

A review of the subgenus *Polyrhachis* (*Campomyrma*) Wheeler from Borneo with descriptions of new species (Hymenoptera: Formicidae: Formicinae)

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Abstract. Five species of the subgenus *Campomyrma* Wheeler, 1911 of the genus *Polyrhachis* Fr. Smith, 1857 are recorded from Borneo, including *P. equina* Fr. Smith, 1857 and *P. gribodoi* Emery, 1887 and three species, *P. hashimotoi*, *P. reidi* and *P. sukarmani*, described as new. *Polyrhachis equina* and *P. gribodoi* are placed within the newly erected *equina* species-group. *Polyrhachis hashimotoi* is placed within the newly erected *xiphias* species-group together with *P. xiphias* Fr. Smith, 1863 from New Guinea and *P. shixingensis* Wu & Wang, 1995 from China and Vietnam. A key to the workers of Bornean *Campomyrma* is provided and all species are illustrated.

Keywords: Formicidae, *Polyrhachis* (*Campomyrma*), Borneo, taxonomy, new species

INTRODUCTION

The tropical rainforests of Borneo embrace a very diverse fauna of ants of the genus *Polyrhachis* Fr. Smith. I am aware of more than 74 described species from the island with perhaps as many species undescribed. In comparison with several species rich subgenera, such as *Myrma* Billberg, 1820 or *Myrmhopla* Forel, 1915, the subgenus *Campomyrma* is rather poorly represented. Five Bornean species of *Campomyrma* are known, three of which are here described as new. In contrast, *Campomyrma* is very diverse in Australia where there are probably well over 100 species. The internal classification of *Campomyrma* is badly in need of revision. Emery (1925) divided *Campomyrma* into two species-groups, with most species included in the *clypeata-femorata*-group and two species from Southeast Asia placed in the *halidayi*-group. However, this species-group classification is inadequate and I currently recognise about eight species-groups within the subgenus, most of which are endemic to Australia.

Here I propose two new species-groups to incorporate three of the Bornean species. The remaining two species will be assigned to a group when a more substantial revision of the Australian fauna is completed.

METHODS

Photographs of specimens were taken with an Olympus SZX12 stereomicroscope and Olympus DP70 digital camera. Images were then processed using Helicon Focus (Mac OSX version) software and Photoshop (Adobe Systems Inc., USA). All photographs of the new species are of the primary types. Those of *P. equina* Fr. Smith, 1857 and *P. gribodoi* Emery, 1887 are of type-compared voucher specimens. The detailed images of the clypeal margins of *P. gribodoi* and *P. sukarmani* were prepared by Geoff Thompson (QMBA).

References and synonyms of individual species are listed only where relevant to the context of this paper. For full synonymy citations, publication dates and the spelling of species epithets and authors' names see Bolton (1995) and Dorow (1995). Where a holotype specimen is mentioned as 'unique', this implies that it was the only specimen available for that species description and no syntype or paratype specimens are known to exist. The use of the words "Borneo", "New Guinea" or "Bismarck Archipelago" alone indicate the delimitation of these regions in a biogeographic sense regardless of current political boundaries.

Standard measurements and indices: 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 (excluding the condyle); SI = Scape Index ($SL \times 100/HW$); PW = Pronotal width (width of the pronotal dorsum measured at the bases of pronotal spines); MTL = Metathoracic tibial length (maximum measurable length of the tibia of the hind leg). Measurements were taken using a Zeiss SR stereomicroscope with an eyepiece graticule calibrated against a stage micrometer. All measurements are expressed in millimetres (mm).

Abbreviations used for specimen data are: Exp. = Expedition; Gn. = Gunung (= Mountain); Mt = Mount; NP = National Park; rf. = rainforest; Stn = Station; w = worker; WWF = World Wildlife Fund.

Abbreviations of institutions (with names of cooperating curators): BMNH = The Natural History Museum, London, UK (B. Bolton); ITBC = Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah, Kota Kinabalu, Sabah, Malaysia (Prof. Datin Dr Maryati Mohamed); IZAS = Institute of Zoology, Ukrainian Academy of Sciences, Kiev, Ukraine (Dr A.G. Radchenko); MCZC = Museum of Comparative Zoology,

Harvard University, Cambridge, Massachusetts, USA (Dr S.P. Cover); MHNG = Muséum d'Histoire Naturelle, Geneva, Switzerland (Drs C. Besuchet, I. Löbl, B. Mertz); MNHA = Museum of Nature and Human Activities, Hyogo Pref. University, Hyogo, Japan (Assoc. Prof. Dr Hashimoto Yoshiaki); OXUM = Hope Entomological Collections, Oxford University Museum of Natural History, Oxford, UK (Drs C. O'Toole, D. Mann); QMBA = Queensland Museum, South Brisbane, Queensland, 4101, Australia (Drs C.J. Burwell, G.B. Monteith).

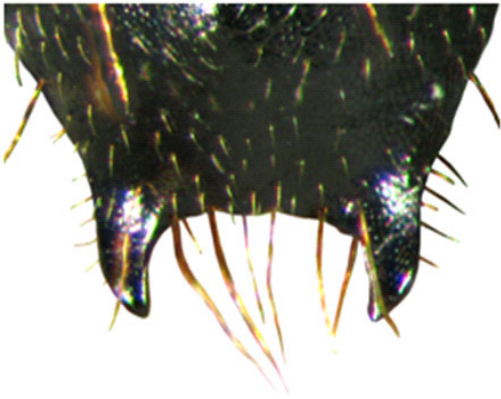
SYSTEMATICS

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.

KEY TO THE WORKERS OF *CAMPOMYRMA* FROM BORNEO

1. Anterior clypeal margin deeply emarginate medially with a pair of projecting teeth (Fig. 1) 2.
 - Anterior clypeal margin truncate medially with a weak central notch or shallow emargination (Fig. 2) 3.
2. Larger species (HL >1.90) *gribodoi* Emery
 - Smaller species (HL <1.80) *equina* Fr. Smith
3. Petiolar node columnar, armed with two, more-or-less horizontal, posteriorly directed spines *hashimotoi* sp. nov.
 - Petiolar node scale-like with dorsal margin arcuate, entire 4.
4. Smaller species (HL <1.75); pronotal dorsum distinctly transverse, wider than long (Fig. 11) *sukarmani* sp. nov.
 - Larger species (HL >2.34); pronotal dorsum only marginally wider than long (Fig. 9) *reidi* sp. nov.



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Fig. 1-6. Anterior margin of the clypeus (mandibles removed): 1 - *P. gribodoi* Emery; 2 - *P. sukarmani* sp. nov. Dorsal and lateral view: 3, 4 - *P. equina* Fr. Smith; 5, 6 - *P. gribodoi* Emery.

***Polyrhachis equina* Fr. Smith, 1857**

(Figs 3, 4)

MATERIAL EXAMINED

Polyrhachis equinus Fr. Smith, 1857: 63. Holotype worker. Type locality: BORNEO, SARAWAK (A.R. Wallace), OXUM (examined).

Polyrhachis biloba Forel, 1911: 58. Syntype workers. Type locality: BORNEO, SARAWAK (Haviland), MHNG. Synonymy by Wheeler, 1919: 122.

ADDITIONAL MATERIAL EXAMINED

EAST MALAYSIA, SABAH: Danum Valley, 29.viii.1995 (Sk. Yamane) (w); ditto, vi.1997 (E. Widodo) (w); ditto, 2.xi.1996 (K. Eguchi) (w); ditto, 5.x.2000 (F. Ito) (w); Tawau, Quoin Hill, Cocoa Research Stn, 12.ix.1962 (Y. Hirashima) (w); Tawau Hills, 8-9.vii.1996 (Sk. Yamane) (w); Tawau, Hills Park, 7.x.2000 (F. Ito) (w). SARAWAK: 4th Division, Gn. Mulu NP, 1.x.1977, lowland rf. (B. Bolton) (w); Kuching (J. Hewitt) (w); Bivang R. (E. Mjöberg) (w); Mt Dulit (E. Mjöberg) (w); Songei Tutu (E. Mjöberg) (w). INDONESIA, KALIMANTAN TIMUR: 31km N Balikpapan, 21.vi.1972, rf. (W.L. Brown) (w, male); Kapong Sotek, 23.vi.1972, at light (W.L. Brown) (queen).

WORKER

Dimensions (holotype cited first): TL c. 6.40, 6.05-6.65; HL 1.72, 1.56-1.80; HW 1.43, 1.25-1.50; CI 83, 79-83; SL (missing), 2.03-2.18; SI (missing), 159-164; PW 0.87, 0.75-0.90; MTL 2.09, 2.00-2.25 (12 measured).

REMARKS. *Polyrhachis equina* and *P. gribodoi* are very similar and share numerous characters including almost identical, bilobed anterior clypeal margins, distinctly concave mesonotal and propodeal dorsa, dorso posteriorly extended propodeal spines and similarly shaped petioles. They differ in their relative size (HL <1.80 in *P. equina* versus HL >1.90 in *P. gribodoi*) and in several other characters, including the shape of the head and the sculpturation of the mesosomal dorsum. In *P. equina*, the sides of the head in front of the eyes converge towards the mandibular bases in an almost straight line, while behind the eyes the sides round into a moderately convex

occipital margin. In *P. gribodoi* the sides of the head in front of the eyes are distinctly convex, and behind the eyes the sides round into a virtually flat occipital margin. The mesosomal dosum of *P. equina* is finely, rather irregularly, reticulate-punctate, with the reticulae on the pronotum somewhat bowed towards its lateral margins. The sculpturation of the mesosomal dorsum in *P. gribodoi* is distinctly more intense and more regularly, longitudinally striate on pronotum.

***Polyrhachis gribodoi* Emery, 1887**

(Figs 1, 5, 6)

MATERIAL EXAMINED

Polyrhachis gribodoi Emery, 1887: 221. Syntype worker, queen. Type localities: INDONESIA, JAVA (Gribodo) (for worker); BORNEO, SARAWAK (Doria & Beccari) (for queen), MCSN (worker syntype examined).

ADDITIONAL MATERIAL EXAMINED

INDONESIA, JAVA: Tjibodas, 6-7.vi.1972, 1500m, wet mountain forest (W.L. Brown) (w); ditto (W. Karawajew #3009) (w); ditto, Mt Gede, 26.viii.1909 (Bryant & Palmer) (queen); ditto (Cibodas on label), Mt Gede, i.1991 (F. Ito) (w); ditto (Cibodas on label), Botanical Gardens, 7.iii.1984 (H.T. Imai & M. Kubota) (w). BORNEO, BRUNEI: Ulu Belait, c. 2km S of Melilas Longhouse, 19.iv.1993, secondary rf. (R.J. Kohout et al. acc. 83.16) (queen & male); ditto, c. 5km S of Melilas Longhouse, 20.iv.1993, secondary rf. (R.J. Kohout et al. acc. 83.24) (w).

WORKER

Dimensions (syntype cited first): TL c. 8.62, 6.95-8.82; HL 2.28, 1.90-2.28; HW 1.93, 1.56-1.93; CI 85, 77-86; SL 2.74, 2.25-2.74; SI 142, 139-145; PW 1.22, 0.94-1.28; MTL 2.78, 2.31-2.84 (18 measured).



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11



12

Fig. 7-12. Dorsal and lateral view: 7, 8 – *P. hashimotoi* sp. nov.; 9, 10 – *reidi* sp. nov.; 11, 12 – *sukarmani* sp. nov.

REMARKS. *P. gribodoi* is very similar to *P. equina*, with the main differences between them listed above in the remarks of the latter.

***Polyrhachis hashimotoi* sp. nov.**

(Figs 7, 8)

MATERIAL EXAMINED

HOLOTYPE: EAST MALAYSIA, SABAH, 10 km S of Danum Valley Field Centre, Reduced Impact Logging Project Area, 20.vii.-25.viii.1994, ITBC coll. (worker). Type deposition: Unique holotype in ITBC.

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.

Mandibles with 5 teeth, reducing in length towards base. Anterior clypeal margin truncate, with truncate portion somewhat jagged, notched medially and laterally flanked by distinct denticles. Clypeus in profile weakly concave, with blunt carina that is more raised posteriorly; basal margin shallowly impressed medially, laterally represented by thin line. Frontal triangle distinct. Frontal carinae sinuate, with margins only weakly raised anteriorly; carinae flat, short and weakly converging posteriorly; central area relatively wide, almost flat with weakly marked frontal furrow. Sides of head in front of eyes rounding into mandibular bases; behind eyes rounding abruptly and narrowly onto virtually flat occipital margin. Eyes rather flat, breaking lateral cephalic outline in full face view. Ocelli lacking; their relative positions indicated by shallow punctures in cephalic sculpturation. Pronotum in dorsal view with lateral margins rounded without indication of humeral angles, margins very narrowly, but distinctly upturned; mesonotal dorsum with lateral margins converging posteriorly, their posterior angles distinctly raised and continuous medially, forming a transverse ridge that divides dorsum of mesonotum from somewhat stepped propodeum. Lateral margins of propodeal dorsum subparallel, extending posteriorly and forming relatively long, somewhat dorso-medially flattened spines, their inner margins continuous medially, forming, in dorsal view, a reverse, 'U'

shaped ridge, that separates propodeal dorsum from concave declivity. Petiole with anterior face convex, posterior face weakly concave; dorsum rather acute, extending laterally and posteriorly and forming posteriorly directed, subparallel spines with their extreme tips bent weakly outwards. Anterior face of first gastral segment relatively low, weakly concave at base, narrowly rounding onto dorsum of segment.

Dorsum of head and mesosoma finely reticulate-punctate; sides of mesosoma very finely reticulate-wrinkled. Gaster very finely shagreened, rather polished.

Mandibles with numerous, rather short, curved, golden hairs near masticatory margins and piliferous pits towards their bases. Anterior clypeal margin with two long setae medially and few short setae fringing margin laterally. Clypeus with a few pairs of erect, medium length, golden hairs near anterior and basal margins. Frontal carinae and vertex each with a pair of shorter erect hairs. Fore coxae with several long, anteriorly directed, erect hairs; a few short, erect hairs fringing subpetiolar process anteriorly. Gaster apex and ventral apical segments with numerous, rather long, erect hairs. Closely appressed pubescence distributed sporadically over most of body, distinctly more abundant on gastral dorsum. Somewhat longer, semierect and curved, rather dense pubescence on anterior gastral venter.

Black; anterior portion of mandibles, except teeth, and legs, including coxae, medium to dark reddish-brown. Funiculi dark reddish brown at base, with subsequent segments progressively lighter and apical segments rather light yellow. Condylae and apical tarsal segments light yellow. Dorsum of gaster very dark reddish-brown with apical segments and venter blotched light to medium reddish-brown.

Sexuals and immature stages unknown.

ETYMOLOGY. Named in honour of Assoc. Prof. Dr Hashimoto Yoshiaki of the Museum of Human Activities, University of Hyogo, Japan, in appreciation of his excellent work in producing digital images of Bornean, Southeast Asian and Australian *Polyrhachis* for my ongoing work on taxonomy of the genus.

REMARKS. *Polyrhachis hashimotoi* is very similar to *P. xiphias* Fr. Smith, 1863 from New Guinea and *P. shixingensis* Wu & Wang described in 1995 from Shixing County of Guangdong Province, China and also collected on Dongkho I., Vietnam, by A.G. Radchenko (IZAS). The clypeus of all three species has a median carina arising from the truncate and shallowly emarginate clypeal margin. However, in *P. shixingensis* the carina is short, strongly raised and sharp, in *P. xiphias* it is weakly and evenly raised throughout its length and in *P. hashimotoi* it is rather flat and blunt anteriorly. The dorsum of the petiole in *P. hashimotoi* is distinctly higher than the bases of petiolar spines, which are situated below the convex summit of the petiole (Fig. 8). In contrast, in *P. xiphias* and *P. shixingensis* the petiolar spines arise from the summit of the petiole.

***Polyrhachis reidi* sp. nov.**

(Figs 9, 10)

MATERIAL EXAMINED

HOLOTYPE: INDONESIA, KALIMANTAN BARAT, Gn. Nahaloh, 00°58'N, 113°43'E, 27.xii.1996, C. Reid (WWF Exp.) (worker). Type deposition: Unique holotype in QMBA.

WORKER

Dimensions of holotype: TL c.9.17; HL 2.34; HW 1.75; CI 75; SL 3.12; SI 178; PW 1.37; MTL 3.38.

Mandibles with 5 teeth, distinctly reducing in length towards base. Anterior clypeal margin widely truncate medially, with truncate portion flanked by acute denticles. Clypeus in profile weakly concave anteriorly, with blunt median carina that is particularly distinct near anterior and basal margins; basal margin strongly impressed medially,

laterally indicated by a clearly defined line breaking sculpturation. Frontal triangle indistinct. Frontal carinae sinuate, medially with margins distinctly raised; central area moderately wide, weakly concave with frontal furrow rather short and flat. Antennal scapes and funicular segments relatively long and distinctly slender. Sides of head in front of eyes almost straight, only weakly converging towards mandibular bases; behind eyes sides rounding into medially shallowly emarginate occipital margin. Eyes convex, in full face view clearly breaking lateral cephalic outline. Ocelli lacking. Mesosomal dorsum with deeply impressed promesonotal suture and metanotal groove. Pronotal dorsum wider than long; humeri narrowly rounded, with weakly raised margins; mesosomal dorsum with lateral margins converging posteriorly. Margins of propodeal dorsum anteriorly narrowly rounded and distinctly raised, margins terminating posteriorly in upturned, dorsally rounded, inward and somewhat downward directed ridges that form a narrowly open 'v' when viewed from behind; propodeal dorsum descending into oblique declivity through narrow gap between ridges. Petiole scale-like with anterior face straight, posterior face weakly convex; dorsal margin arcuate, acute, narrowly and shallowly emarginate medially, laterally with weakly upturned subacute teeth. Anterior face of first gastral segment straight at base, widely rounding onto dorsum of gaster.

Mandibles finely, mostly longitudinally striate with numerous piliferous pits. Clypeus, sides of head and central area reticulate-punctate; rest of head with reticulae more longitudinal with sculpturation becoming finely and regularly, longitudinally striate in front of eyes and on vertex. Mesosomal dorsum with more-or-less regular, longitudinal striae, those on mesonotum and propodeum somewhat converging posteriorly; sides of mesosoma and petiole finely reticulate. Gaster very finely shagreened. Whole of body with rather polished appearance.

Mandibular masticatory borders with numerous curved golden hairs. Anterior clypeal margin with several medium length setae medially and shorter setae fringing margin laterally. Clypeus near

anterior margin with a single pair of rather short erect hairs. One or two hairs on anterior face of fore coxae and a few shorter hairs on ventral surfaces of middle and hind coxae, trochanters and femora. Gaster dorsally with only a few, medium-length hairs lining apical segments; hairs more abundant on gastral venter. Extremely short, closely appressed pubescence rather diluted on dorsum of head and gaster.

Black; narrow band at mandibular masticatory borders and legs medium reddish-brown. Antennal scapes and tarsi very dark brown; funiculi dark brown at their bases, with subsequent segments progressively lighter reddish-brown towards funicular apices; condylae very light yellow. Gaster black, distinctly blotched with reddish-brown laterally, ventrally and apically.

Sexuals and immature stages unknown.

ETYMOLOGY. Named in honour of the collector, Dr Chris Reid of the Australian Museum, Sydney and member of the 1996 WWF Expedition to Kalimantan Barat in Indonesian Borneo.

REMARKS. *Polyrhachis reidi* is somewhat similar to *P. sukarmani* described below, with both having the dorsum of the head and mesosoma rather regularly, longitudinally striate. However, *P. reidi* is larger (HL 2.34 in *P. reidi* versus HL <1.75 in *P. sukarmani*), has distinctly longer appendages and has a more slender, rather elegant body.

***Polyrhachis sukarmani* sp. nov.**

(Figs 2, 11, 12)

MATERIAL EXAMINED

HOLOTYPE: EAST MALAYSIA, SABAH, Meliau Range, 05°49'N, 117°07'E, 95m, viii. 2004, Sukarman & Sarina (ITBC-USM 2004 Exp.) (worker). PARATYPES: data as for holotype (12 workers). Type deposition: Holotype and 7 paratypes in ITBC; 2 paratypes in QMBA; 1 paratype each in ANIC, BMNH and MCZC.

ADDITIONAL MATERIAL EXAMINED

EAST MALAYSIA, SABAH: Maliau Basin Conservation Area, Maliau Falls, 04°46'S, 116°55'E, c. 470m, 3.iii.2005, rf. (Effazilla Waty & R.J. Kohout acc. 05.42) (queen); Kinabalu Park, Poring, 550m, 17.iii.1995 (S. Yamane) (w). INDONESIA, KALIMANTAN BARAT, Gn. Palung NP, Cabang Panti Research Stn, 01°15'S, 110°5'E, 100-400m, 15.vi.-15.viii.1991, primary forest, Darling, Rosichon & Sutrisno (w).

WORKER

Dimensions (holotype cited first): TL c. 6.55, 6.30-6.80; HL 1.72, 1.56-1.75; HW 1.56, 1.40-1.59; CI 91, 88-91; SL 1.84, 1.68-1.87; SI 118, 117-122; PW 1.37, 1.22-1.37; MTL 1.81, 1.55-1.87 (6 measured).

Mandibles with 5 teeth. Anterior clypeal margin widely truncate medially, with truncate portion obtusely angulate. Clypeus in profile almost straight with blunt median carina; basal margin only shallowly impressed, laterally indicated by a clearly defined line breaking sculpturation. Frontal triangle distinct. Frontal carinae sinuate, medially with margins weakly raised, posteriorly somewhat converging; central area wide, very weakly convex medially with frontal furrow rather short and flat. Sides of head in front of eyes weakly convex; behind eyes sides rounding abruptly into medially emarginate occipital margin. Eyes distinctly convex, almost protuberant, in full face view clearly breaking lateral cephalic outline. Ocelli lacking. Mesosomal dorsum with deeply impressed promesonotal suture and metanotal groove. Pronotal dorsum transverse, distinctly wider than long, with distinct median depression anteriorly just behind pronotal collar; humeri armed with obtuse teeth and weakly raised anterior margins; lateral margins weakly rounding into promesonotal suture; mesosomal dorsum with lateral margins strongly converging posteriorly. Propodeal dorsum transverse, lateral margins posteriorly terminating in upturned, inward directed ridges that meet medially and form a continuous transverse carina separating propodeal dorsum from relatively high, virtually vertical declivity. Petiole scale-like, rather slim in profile

and narrow in dorsal view; dorsal margin arcuate, obtusely angular laterally. Anterior face of first gastral segment concave, with rather narrow antero-dorsal margin rounding onto dorsum of gaster.

Mandibles finely, mostly longitudinally striate with numerous piliferous pits. Clypeus and central area anteriorly reticulate-punctate; sides of head and vertex distinctly, more-or-less regularly, longitudinally striate. Pronotal and propodeal dorsa rather regularly, longitudinally striate with striae on mesonotum distinctly converging posteriorly; sides of mesosoma and petiole finely reticulate. Gaster very finely shagreened.

Mandibular masticatory borders with numerous curved, golden hairs. Anterior clypeal margin with several long setae medially and fringe of very short setae lining margin laterally. Numerous, medium length, erect hairs on clypeus; several paired, medium length, erect hairs along frontal carinae; one pair of anteriorly directed hairs on vertex. Fore coxae with a few long, somewhat curved hairs on anterior face and several short hairs on posterior face; one or two longer hairs on ventral surfaces of middle and hind coxae, trochanters and femora. Gaster dorsally with only a few medium length hairs lining apical segments; hairs more abundant on gastral venter. Very short, closely appressed, rather diluted pubescence distributed over most of head and gaster.

Black; narrow band at mandibular masticatory border, antennal scapes and legs dark to very dark reddish-brown; funiculi dark brown at their bases, with subsequent segments progressively lighter towards funicular apices; condylae yellow. Ventral gastral apex blotched reddish-brown.

QUEEN

Dimensions: TL c. 8.52; HL 2.00; HW 1.68; CI 84; SL 2.00; SI 119; PW 1.65; MTL 2.18 (1 measured).

A single queen similar to worker with usual differences indicating caste, including three ocelli and complete thoracic structure. Sculpturation of head and body virtually identical to worker with direction of striae following structural characteristics of fully developed mesosoma. Pilosity and colour identical to that in worker.

Males unknown; pupae in ITBC collection.

ETYMOLOGY. Named in honour of the collector of the type series, Sukarman Sukimin of the ITBC, Universiti Malaysia Sabah.

REMARKS. Like most *Campomyrma* species, *P. sukarmani* nests in the ground with the type series specimens 'hand collected from the ground nest' (Sukarman Sukimin, pers. comm., 2006). *Polyrhachis sukarmani* resembles *P. creusa* Emery from Australia and New Guinea but differs in several characters. In *P. sukarmani* the central area between the frontal carinae is distinctly wider and the pronotal dorsum, in lateral view, is weakly convex. In dorsal view, the lateral margins of pronotal and mesonotal dorsa strongly converge posteriorly while the lateral margins of propodeal dorsum are subparallel or only weakly convergent. The petiole of *P. sukarmani* has the lateral spines reduced to blunt angles and the dorsal margin arcuate and entire. In contrast, the central area between frontal carinae in *P. creusa* is distinctly narrower and the pronotal dorsum in lateral view is rather flat. In dorsal view, the lateral margins of the mesosomal dorsum, including the propodeum, are strongly posteriorly convergent. The petiole of *P. creusa* has short and acute lateral spines and its dorsal margin is shallowly but distinctly notched medially.

DISCUSSION

Two of the Bornean species, *P. equina* and *P. gribodoi*, are very similar to each other and quite distinct from other known species of *Campomyrma*. Both have a deeply emarginate anterior clypeal margin bordered by a pair of projecting teeth (Fig. 1). Typically other species of *Campomyrma* have the anterior clypeal margin truncate medially, usually with a weak central notch or shallow emargination (Fig. 2). In addition the dorsal surfaces of the mesonotum and propodeum of *P. equina* and *P. gribodoi* are concave, while they are generally flat or weakly convex in other *Campomyrma* species. Consequently I am placing these two species within the *equina* species-group. *Polyrhachis equina* is currently known only from the island of Borneo while *P. gribodoi* also occurs on Java. Some specimens of *P. equina* were apparently collected foraging on tree trunks and specimens of *P. gribodoi* were taken around the bases of rainforest trees and it is possible that, like species of the *femorata*-group of *Campomyrma*, they are lignicolous, nesting in hollow branches.

Polyrhachis hashimotoi from Borneo, *P. xiphias* from New Guinea and *P. shixingensis* from China and Vietnam also form a very distinct group within *Campomyrma* that I call the *xiphias* species-group. This group is characterised by the columnar petiole that has a pair of horizontal, posteriorly directed spines. Nothing is known of the nesting habits of either species.

Polyrhachis sukarmani and *P. reidi* are most closely allied to a group of species known from eastern Indonesia, the Philippines, New Guinea, the Bismarck Archipelago and especially Australia. This species-group will be characterised during a treatment of the Australian species of the subgenus.

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