

Pheidole longipes (Fr. SMITH) and Two New Closely Related Species from Kinabalu Park, Sabah, Borneo (Hymenoptera, Formicidae)

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Abstract *Pheidole longipes* (Fr. SMITH) and two new species, *Pheidole multicomata* and *P. montana*, both of which are closely related to *P. longipes*, are described based on specimens from Kinabalu Park (Sabah, Borneo). *P. multicomata* and *P. longipes* occurred sympatrically in Poring (ca. 600 m alt.), while *P. montana* was collected at higher elevations and parapatric with these two species in vertical distribution.

Introduction

Pheidole longipes was originally described as *Myrmica longipes* by Fr. SMITH (1857) based on specimens from Singapore. The genus *Ischnomyrmex* was created for this species by MAYR (1862) with the following recognition features: antenna never terminating in a conspicuous club; head of minor prolonged backward to form a neck. *Ischnomyrmex* was sometimes treated as a subgenus of the genus *Pheidole* or *Aphaenogaster* (EMERY, 1895; FOREL, 1913). Finally, it was synonymized with the genus *Pheidole* (BROWN, 1973; BOLTON, 1995), the view currently being agreed by most of the ant taxonomists. The following subspecies of *P. longipes* have been hitherto recognized (CHAPMAN and CAPCO, 1951; BOLTON, 1995): *P. longipes longipes* (Fr. SMITH, 1857) from Singapore, Borneo, Sumatra, Java, and Sulawesi; *P. longipes conicollis* (EMERY, 1900) from Sumatra and Singapore; *P. longipes continentis* (FOREL, 1911) from Burma and Singapore; *P. longipes laevior* (EMERY, 1877) from Sulawesi; *P. longipes pseudola* FOREL, 1915 from Simalur (near Sumatra).

In this study I will describe *P. longipes* and two new species from Kinabalu, Borneo, together with their distributional information. Both of the new species are closely related to *P. longipes* but clearly distinguished from the latter (including above-mentioned subspecies) at species level.

Descriptions

Pheidole longipes (Fr. SMITH) (Figs. 1–5)

Myrmica longipes Fr. SMITH, 1857: 70, pl. 1, fig. 6, type locality: Singapore.

Ischnomyrmex longipes: MAYR, 1862: 739.

Aphaenogaster longipes: EMERY, 1895: 470.

Pheidole (Ischnomyrmex) longipes: FOREL, 1913: 49.

Pheidole longipes: BOLTON, 1995: 324.

Specimens examined: 16 minors, 2 majors, 1996, Poring (ca. 450–500 m alt.), colony Eg96-BOR-265, K. EGUCHI leg.; 9 minors, 4 majors, 1996, Poring (600 m alt.), colonies 6XII2306-26-Fb and 6X2906-6-1a, T. KIKUTA leg.; 10 minors, 4 majors, 1997, Poring (900 m alt.), colonies B14 and 7IV0310-5-Ga, T. KIKUTA leg.

In addition, the following specimens from other localities in Malaysia, Indonesia, Singapore and Thailand were compared with the Kinabalu specimens: 9 minors, 5 majors, 1998, Sepilok forest (nr. Sandakan, Sabah), colony Eg98-BOR-879, K. EGUCHI leg.; 1

minor, 1 major, 1994, Bt. Entimau (Sarawak, Borneo, 390 m alt.), Mahmud leg.; 2 minors, 2 majors, 1994, Bt. Lanjak (Engkari, Sarawak), K. Het leg.; 1 minor, 1 major, 1997, Lambir N. P. (Miri, Sarawak, Borneo), Sk. YAMANE leg.; 10 minors, 8 majors, 1 queen, 1998, same loc., colony Eg98-BOR-815, K. EGUCHI leg.; 1 major, 1993, Sg. Segerugok (Song, Sarawak), Abd. Rahman leg.; 1 minor, 1 major, 1993, Kutai N. P. (E. Kalimantan, Borneo, Indonesia), Sk. YAMANE leg.; 1 major, 1985, Maninjau (W. Sumatra, Indonesia), Sk. YAMANE leg.; 1 major, 1989, Ulu Gadut (nr. Padang, W. Sumatra), E. SUZUKI leg.; 1 minor, 1 major, 1995, Singapore, Sk. YAMANE leg.; 1 minor, 1 major, 1992, Ulu Gombak (W. Malaysia), colony FI92MG-555, F. ITO leg.; 1 minor, 1 major, 1997, Ton Nga Chang N. P. (Songkhla Prov., S. Thailand), Sk. YAMANE leg.

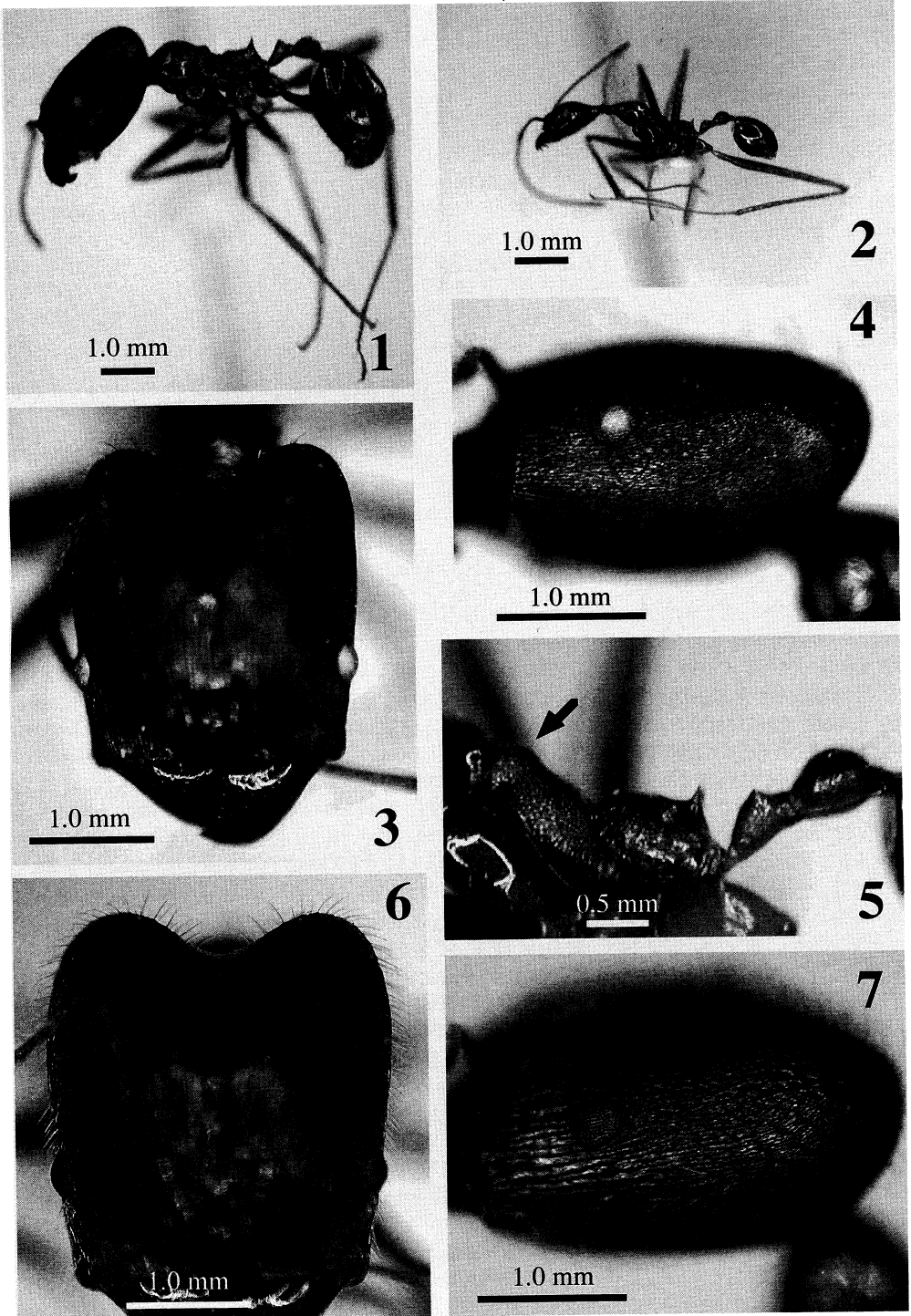
Major. HL (head length) 2.38–2.77 mm; HW (maximal head width) 2.12–2.58 mm; SL (scape length) 1.55–1.87 mm; FL (hindfemur length) 2.57–3.15 mm; CI (cranium index=HW/HL) 0.85–0.95; SI (scape index=SL/HW) 0.64–0.83; FI (hindfemur index=FL/HW) 1.06–1.36.

Head with almost straight sides, slightly broadened backward; posterior margin with a round median excavation, from which a shallow longitudinal impression running down toward eye (Fig. 3). Vertex in profile not impressed. Anteroventral margin of cranium almost straight, bearing a quite indistinct median process (or lacking any process), and armed with a small tooth just mesal to each mandibular insertion. Eye situated around 1/3 distance from anterior margin of clypeus to posterior corner of occipital lobe. Frontal carina and antennal scrobe present only around antennal insertion. Fronto-clypeal suture absent or indistinct. Antenna 12-segmented, without a conspicuous antennal club; antennal scape, when laid back in its natural resting position, passing 2/3–3/4 distance from anterior margin of clypeus to posterior corner of occipital lobe. Promesonotal suture distinct laterally below mesothoracic spiracle, and quite indistinct dorsally; promesonotum unarmed, in profile with a dome-like anterior arc followed by a distinct but small prominence (Fig. 1). Mesopleuron with an indistinct impression. Propodeal spine corniform, 3 times as long as diameter of propodeal spiracle. Petiole in profile cuneiform, approximately as long as postpetiole. Postpetiole in dorsal view twice as broad as petiole, subpentagonal, and in profile subhemispherical, convex dorsally and almost flat ventrally.

Frons longitudinally rugose; ventral face of head finely rugose; vertex, gena and the side of occipital lobe finely rugose, and the space between rugae micropunctured (or side of occipital lobe occasionally smooth and shining) (Fig. 4); promesonotum weakly transversely rugose to smooth; the remainder of alitrunk weakly punctured, or smooth and shining. Head with sparse erect or suberect hairs only dorsally; side of head bearing only appressed pubescence, and without erect or suberect hairs (Fig. 3); anterior dome of promesonotum bearing approximately 10 erect hairs. Body reddish brown to dark brown.

Minor. HL 1.04–1.39 mm; HW* (head width just behind eyes) 0.66–0.91 mm; SL 1.73–2.08 mm; AL (alitrunk length) 1.50–1.99 mm; PW (promesonotal width) 0.49–0.70 mm; FL 2.11–2.69 mm; CI* (HW*/HL) 0.58–0.69; SI 2.03–2.70; FI 2.71–3.38.

Head in full face view narrowed and prolonged behind eyes to occipital carina which forms a distinct flange. Eye situated just behind 2/5 distance from anterior margin of clypeus to occipital carina; maximal diameter of eye usually as long as or slightly shorter than the distance between lower margin of eye and mandibular base. Mandible with apical and preapical teeth, followed by several denticles; 2nd denticle larger than the next. Antenna 12-segmented, without a conspicuous antennal club, but 8–12th segments each distinctly longer than 7th. Both maxillary palp and labial palp 2-segmented. Promesonotum unarmed, in profile with a dome-like anterior arc followed by a low prominence (arrow in Fig. 5) before declining gently. Mesopleuron without any furrows. Metanotal groove present. Propodeal spine small, 2 times as long as diameter of propodeal spiracle, pointed apically (Fig. 5). Petiole in profile cuneiform, slightly shorter than postpetiole. In dorsal view



Figs. 1-7. *Pheidole* spp. — 1-5, *P. longipes* (Fr. SMITH); 6-7. *P. multicoma* sp. nov. — 1, Major, lateral view; 2, minor, lateral view; 3, 6, major, head, full face view; 4, 7, major, head, lateral view; 5, minor, alitrunk, lateral view.

postpetiole distinctly longer than broad, gently narrowed forward in its anterior 2/3, twice as broad as petiole, in profile subhemispherical.

Head and promesonotum smooth and shining; the remainder of alitrunk punctured but shining (occasionally smooth and shining). Pilosity poor. Cranium bearing 2 hairs on each frontal lobe, and a pair (rarely 2 pairs) of hairs on frons to vertex; pubescence (decumbent to appressed) scattered over the surface of head; anteroventral face of head bearing a few short hairs. Anterior dome of promesonotum bearing at most 8 hairs; the remainder of promesonotum without hairs; propodeum usually bearing a pair of hairs mediodorsally. Petiole bearing a pair of hairs on its dorsal top, and 1–2 short, thin hairs on its sides; postpetiole bearing at most 10 hairs dorsally. Gaster with scattered hairs. Body reddish brown to dark brown.

Remarks. The specimens collected from Kinabalu Park are relatively stable in the characters mentioned above. However, in the specimens from the other localities some characters are variable. For example, the head in one major specimen from Bt. Lanjak (Engkari, Sarawak) has parallel sides, bears more hairs on occipital lobes, and is more weakly sculptured on the side of occipital lobe than in majors from Kinabalu Park. Propodeal spine in one minor from Ulu Gombak (W. Malaysia) is slightly less than 4 times as long as diameter of propodeal spiracle (longer than in minors from Kinabalu Park). I have found nests of this species in fallen decayed wood (30 cm in diameter).

***Pheidole multicoma* sp. nov.**

(Figs. 6–7)

Holotype: major 15-VII-1996, Sayap Kinabalu (ca. 1,000 m alt.), bait HN-148, K. EGUCHI leg.

Paratypes: 3 minors, 3 majors, the same data as the holotype.

Other specimens examined: 4 minors, 1 major, 1996, Sayap Kinabalu (ca. 1,000 m alt.), colony Eg96-BOR-058, K. EGUCHI leg.; 1 major, 1995, Poring, Y. HASHIMOTO leg.; 1 minor, 1 major, 1994, Sayap Kinabalu (ca. 1,000 m alt.), T. KIKUTA leg.; 1 minor, 1 major, 1995, Poring (ca. 550 m alt.), Sk. YAMANE leg.

Major. HL 2.88–3.07 mm; HW 2.59–2.75 mm; SL 1.88–1.96 mm; FL 3.13–3.29 mm; CI 0.88–0.91; SI 0.70–0.75; FI 1.20–1.23.

The major of this species is distinguished from that of *P. longipes* by the following characteristics: vertex and gena distinctly rugoso-reticulate; side of occipital lobe densely rugose (Fig. 7); head bearing many erect or suberect hairs not only dorsally but also laterally (Fig. 6); anterior dome of promesonotum bearing more than 20 erect hairs.

Minor. HL 1.23–1.44 mm; HW* 0.75–0.93 mm; SL 2.03–2.21 mm; AL 1.73–2.01 mm; PW 0.54–0.62 mm; FL 2.53–2.83 mm; CI* 0.61–0.64; SI 2.39–2.70; FI 3.05–3.37.

In every character examined, the minor of this species extremely resembles that of *P. longipes*. At present it is impossible to separate this species from the latter by any morphological characteristics in the minor subcaste.

Remarks. The only colony of this species collected by me was from a column moving to a new nest site, which was not confirmed. The specimens collected by T. KIKUTA were probably from a colony in fallen wood ('wood' on the label).

***Pheidole montana* sp. nov.**

(Figs. 8–11)

Holotype: minor, 29-VI-1998, Mt. Kinabalu (nr. Park Headquarter, ca. 1,500 m alt.), colony Eg98-BOR-847, K. EGUCHI leg.

Paratypes: 19 minors, 2 majors, the same data as the holotype.

Other specimens examined: 22 minors, 1 major, 1998, Poring (ca. 1,200 m alt.), colony 123B, B137, 133B, T. KIKUTA leg.; 71 minors, 2 majors, 2 queens, 1997, nr. Kinabalu Park Headquarter (1,500 m alt.), colonies 167A, 297A, 116Aa, 592A, 116b, 152A, 130A, 126L, 169A, 212A, 184A, 7IV11147-7A4 and 207, T. KIKUTA leg.; 19 minors, 1 major, 1997–1998, nr. Kinabalu Park Headquarter (ca. 1,800 m alt.), colonies Eg97-BOR-387, 407 and Eg98-BOR-846, K. EGUCHI leg.; 10 minors, 2 majors, 1997, same loc., colony 676A, T. KIKUTA leg.; 15 minors, 1995, same loc., Sk. YAMANE leg.

Major. HL 2.37–2.70 mm; HW 2.32–2.53 mm; SL 1.60–1.72 mm; FL 2.63–2.87 mm; CI 0.93–1.00; SI 0.64–0.71; FI 1.08–1.17.

The major of this species is distinguished from that of *P. longipes* by the following characteristics: antennal scape, when laid back in its natural resting position, passing $4/5$ distance from anterior margin of clypeus to posterior corner of occipital lobe; mesopleuron with a furrow between anepisternum and katepisternum; propodeal spine corniform, more than 3 times as long as diameter of propodeal spiracle; postpetiole in dorsal view more than twice as broad as petiole; frons and vertex longitudinally rugose; gena and the side of occipital lobe finely but distinctly rugose; alitrunk slightly punctured partly but shining; head with sparse erect or suberect hairs dorsally; side of head bearing appressed pubescence (occasionally with erect to suberect hairs posteriorly) (Fig. 9); anterior dome of promesonotum bearing approximately 20 erect hairs dorsally; body yellowish brown to brown.

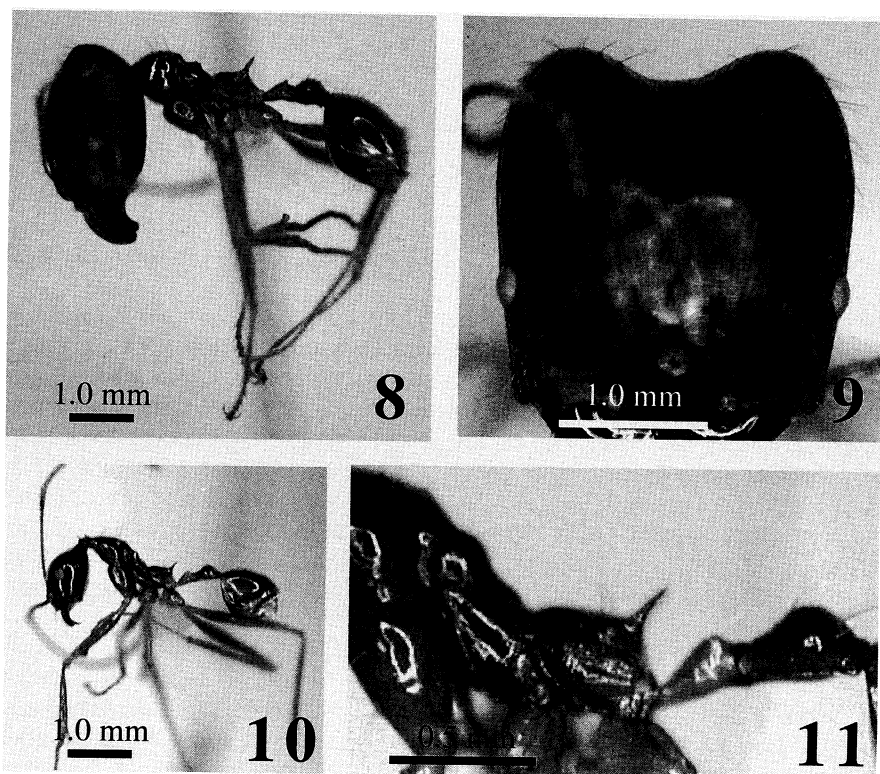
Minor. HL 0.92–1.42 mm; HW* 0.62–0.99 mm; SL 1.28–1.95 mm; AL 1.27–1.93 mm; PW 0.42–0.65 mm; FL 1.57–2.51 mm; CI* 0.64–0.73; SI 1.72–2.27; FI 2.26–2.80.

The minor of this species is distinguished from that of *P. longipes* described above by the following characteristics: eye situated $2/5$ – $1/2$ distance from anterior margin of clypeus to occipital carina; the maximal diameter of eye shorter than the distance between lower margin of eye and mandibular base; propodeal spine more than 4 times as long as the diameter of propodeal spiracle (Fig. 11); body smooth and shining (mesopleuron and propodeum sometimes weakly punctured and shining); cranium bearing 2 hairs on each frontal lobe, and 1–4 pairs of hairs on frons to vertex; anterior dome of promesonotum bearing at most 8 hairs, and remainder of promesonotum with 0–1 pair of hairs; body yellowish brown to brown.

Queen. HL 2.28–2.33 mm; HW 2.42–2.70 mm; SL 1.65–1.67 mm; FL 2.83–2.86 mm; scutum length 2.05–2.07; scutum width 2.43–2.45; CI 1.06–1.16; SI 0.62–0.68; FI 1.05–1.18.

Head subtrapezoidal, straight laterally, slightly concave posteriorly, broadest just before posterior corner. Anteroventral margin of cranium almost straight, bearing a quite indistinct median process (or lacking any process), and armed with a small tooth just mesal to each mandibular insertion. Eye situated around $2/5$ distance from anterior margin of clypeus to posterior corner of head. Median ocellus situated just behind midlength of head. Frontal carina and antennal scrobe present only around antennal insertion. Fronto-clypeal suture indistinct. Antenna 12-segmented, without a conspicuous antennal club; antennal scape, when laid back in its natural resting position, reaching just before posterior corner of head. Alitrunk in dorsal view round anteriorly and laterally. Mesoscutum without parapsidal furrow. Mesopleuron with a distinct mesepisternal groove; propodeal spine slightly less than 4 times as long as diameter of propodeal spiracle. Petiole in profile cuneiform, slightly longer than postpetiole. Postpetiole in dorsal view slightly less than twice as broad as long, slightly more than twice as broad as petiole, angulate laterally.

Frons and gena longitudinally rugose; vertex reticulate; pronotum rugose laterally; scutum (excluding axillae) rugoso-reticulate but smooth and shining anteromedially; axilla and scutellum reticulate; mesopleuron almost smooth and shining; propodeum rugose laterally; petiole and postpetiole rugose; first gastral tergite finely rugose around its base,



Figs. 8–11. *Pheidole montana* sp. nov. — 8, Major, lateral view; 9, major, head, full face view; 10, minor, lateral view; 11, minor, alitrunk, lateral view.

finely and weakly punctured over its basal half; remainder of gaster almost smooth and shining. Body bearing erect or suberect hairs over the surface. Body dark brown.

Remarks. One major from Poring at 1,200 m in altitude, however, showed the following characteristics: head distinctly longer than broad, bearing densely erect or suberect hairs over the surface; vertex and gena distinctly rugoso-reticulate; side of occipital lobe strongly rugose; propodeal spine stouter than in the specimens collected at 1,500 m and 1,800 m in altitude; petiole slightly shorter than postpetiole. In contrast to the major, the minor has quite stable conditions for the characters mentioned above through different altitudes from 1,200 to 1,800 m. However, in the small specimens from young colonies, the propodeal spine is sometimes less than 4 times as long as the diameter of propodeal spiracle, and postpetiole less than twice as broad as petiole. Wide range in each measurement and index in the minor is due to the inclusion of specimens from initial or young colonies. The queen is distinguished from that of *P. longipes* from Lambir N. P. of which gaster distinctly microreticulate and mat over the surface.

The colonies collected by me were found in the soil along observation trails and streams. The colonies collected by T. KIKUTA were mainly from fallen wood. This species, like *P. longipes* and *P. multicoma*, is highly attracted to honey baits.

Discussion

Separation of *P. multicoma* from *P. longipes* is at present impossible in the minor subcaste. Unfortunately, the original description of *P. longipes* by Fr. SMITH (1857) was based on the minor. I, however, considers that *P. longipes* is a lowland species widely

distributed in Southeast Asia, including Singapore (type locality). On the other hand, *P. multicoma* has hitherto been collected only at elevations between 550–1,000 m in Kinabalu Park. These two species are sympatric in at least Poring (ca. 600 m alt.), where the majors of the two species are clearly separated from each other in hair density and sculpture on the side of occipital lobe, in spite of high variability of *P. longipes* in several characters.

P. montana is parapatric (or allopatric) with *P. longipes* and *P. multicoma* in vertical distribution. *P. montana* is quite distinctive in the long propodeal spine in the minor. Thus, the three species are more easily identified when both the minors and majors are examined. With the high variability in *P. longipes* over its distribution range, further detailed comparisons of specimens in a given locality and from different localities are required to solve the confusion in this group, including subspecies problems.

Key to the species of *P. longipes* group from Borneo

- 1a. Antenna never terminating in a conspicuous 3-segmented club in both the subcastes; head of minor prolonged backward behind eyes to occipital carina (Figs. 2 and 10) (*P. longipes* group). 2
- 1b. Antenna usually terminating in a conspicuous 3-segmented club in both the subcastes; if antenna not as above, head of minor never prolonged backward to form a neck. other Bornean *Pheidole*
- 2a. Minor: Propodeal spine more than 4 times as long as the diameter of propodeal spiracle; maximal diameter of eye shorter than the distance between lower margin of eye and mandibular base; body yellowish brown to brown.
Major: Anterior dome of promesonotum bearing approximately 20 erect hairs; propodeal spine more than 3 times as long as the diameter of propodeal spiracle; body yellowish brown to brown. *P. montana* sp. nov.
- 2b. Minor: Propodeal spine usually 2 times as long as the diameter of propodeal spiracle; maximal diameter of eye usually as long as or slightly shorter than the distance between lower margin of eye and mandibular base; body reddish brown to dark brown.
Major: Anterior dome of promesonotum bearing approximately 10 erect hairs (*P. longipes*), if it bearing more than 20 erect hairs (*P. multicoma* sp. nov.), propodeal spine at most 2.5 times as long as the diameter of propodeal spiracle; body reddish brown to dark brown. 3
- 3a. Major: Head densely bearing erect hairs over the surface (Fig. 6); vertex and gena distinctly rugoso-reticulate; side of occipital lobe distinctly rugose; anterior dome of promesonotum bearing approximately 20 erect hairs. *P. multicoma* sp. nov.
- 3b. Major: Head with sparse erect hairs on frons and vertex only (Fig. 3); gena and side of occipital lobe weakly and finely rugose; anterior dome of promesonotum bearing approximately 10 erect hairs. *P. longipes* (Fr. SMITH)

Specimen depository

The holotype and 1 paratype (minor) of *P. multicoma*, and the holotype, 3 paratypes (minor) and 1 other specimen examined (major) of *P. montana* are deposited in the collection of the Tropical Biology and Conservation Unit, Universiti Malaysia Sabah. Two paratypes (major and minor) of *P. multicoma*, and 1 paratype (minor) and 2 other specimens examined (major and minor) of *P. montana* are in the collection of the Museum of Nature and Human Activities, Hyogo. The other paratypes of both new species and other specimens examined will be kept temporarily in the collection of the Faculty of Science, Kagoshima University.

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