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The *sexspinosa*-group of the ant genus *Polyrhachis* F. Smith (Hym. Formicidae)

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ABSTRACT

The *sexspinosa*-group of *Polyrhachis* is revised. Twelve species are recognised, two of which are described as new. Sixteen synonyms are recognised, mostly of infra-specific taxa. A key to the species and diagnostic notes of each species are included.

INTRODUCTION

The *sexspinosa*-group has traditionally been placed in the subgenus *Myrmhopla* Forel of genus *Polyrhachis*. It contains twelve species distributed mainly in the Indo-Australian region but also occurring in the Oriental region, in northern Queensland, and on the Solomon Islands.

The concept of *Myrmhopla* as a subgenus has recently been criticised by Hung (1967*a*), whose studies indicate that most, if not all of the subgenera of *Polyrhachis* intergrade. At present *Myrmhopla* contains some 210 named forms and is hence very large. The degree of diversity amongst these is enormous and the problem of maintaining the subgenus, as it is presently understood, becomes increasingly difficult.

Myrmhopla was originally delimited by Forel (1915) to include the contents of the old "maniple *armata*", with *Formica armata* Le Guillou itself as the type-species. At that time he did not attempt to define the subgenus but later Emery (1925) defined it as follows [translated]:

"Worker—Dorsum of alitrunk rounded, that is to say not marginate, except in some species [groups *cryptoceroides* and *viehmeyeri*]; pronotal spines shorter than propodeal, sometimes absent; metanotal groove variable. Petiole variable in shape amongst the groups and species; body of petiole in the form of an elongate node, anterodorsally angled in profile, or to the contrary a thick scale, higher than long, angled or rounded in front." He goes on to point out that the petiolar spines are also very variable.

The above is of course very confusing and reflects what had actually happened to *Myrmhopla*: it had become a catch-all, to which species not fitting any other subgenus were relegated.

The tremendous number of forms described since 1925 only added to the problem until now, when the subgenus has virtually broken down under its own weight. None of the characters given above now applies throughout the subgenus and some of them vary within a single species-group. For instance, in the *hector*- and *mucronata*-groups some

of the species have the propodeum marginate, but some have not. Some groups have the entire alitrunk marginate but some completely lack margination. The structure of the petiole varies from group to group and although in some instances one form can be derived from another, this is often not the case.

In an attempt to bring back some form of stability I have abandoned *Myrmhopla* and prefer now to recognise its former constituents as a number of related species-groups, after the removal of species in which the entire alitrunk is marginate and which do not appear to fit here. Despite this the groups included are almost certainly polyphyletic, many of them only appearing to be related by the possession of characters apparently acquired by convergence.

Measurements and indices used in this paper are as defined by Bolton (1973). The following abbreviations are used for depositories. BMNH = British Museum (Natural History), London, U.K.; CAS = California Academy of Sciences Museum, San Francisco, Cal., U.S.A.; IE = Istituto di Entomologia dell'Universita, Bologna, Italy; MCZ = Museum of Comparative Zoology, Cambridge, Mass., U.S.A.; MHN = Muséum d'Histoire Naturelle, Geneva, Switzerland; MNHU = Museum für Naturkunde der Humboldt-Universität, Berlin, Germany (D.D.R.); NM = Naturhistorisches Museum, Vienna, Austria; UM = University Museum, Oxford, U.K.; ZM = Zoological Museum, Kiev, U.S.S.R.; ZS = Zoologisches Sammlung des Bayerischen Staates, Munich, Germany.

List of species

aureovestita Donisthorpe
barnardi Clark
bubastes F.Smith
= *spinosa* Mayr **syn.n.**
= *variolosa* Emery **syn.n.**
= *variolosa* var. *waigiouensis* Forel **syn.n.**
= *variolosa* var. *curvispina* Stitz **syn.n.**
= *variolosa* var. *arcispina* Santschi **syn.n.**
= *rugousissima* Donisthorpe **syn.n.**
= *hirta* Donisthorpe **syn.n.**
= *kellyi* Hung **syn.n.**
calypso Forel **stat.n.**
= *sexspinosa* var. *malaccana* Veihmeyer **syn.n.**
= *capra* Karavaiev **syn.n.**
glabrinota Clark
magnifica Menozzi **stat.n.**
nofra **sp.n.**
osiris **sp.n.**
rhea Forel **stat.n.**
rugifrons F.Smith
sexspinosa (Latreille)
= *argentata* (Fabricius)
= *irritabilis* F.Smith
= *sexspinosa* var. *reclinata* Emery **syn.n.**
= *sexspinosa* var. *esuriens* Emery **syn.n.**
= *sexspinosa* var. *rectinota* Forel [lapsus]
= *sexspinosa* var. *sericea* Karavaiev **syn.n.**
= *arcuspinosa* Donisthorpe **syn.n.**
= *arcuspinosa* subsp. *waigeuensis* Donisthorpe **syn.n.**
= *juxtaspinosa* Donisthorpe **syn.n.**
tschu Forel

Characters of the sexspinosa-*group*

Within the genus *Polyrhachis*, members of the *sexspinosa*-group are defined by the possession of the following combination of characters:

1. Alitrunk not marginate, promesonotal suture present.
2. Pronotum and propodeum each with a pair of spines. Petiole nodiform and with a pair of spines, without intercalary short spines or teeth.
3. Pronotum with the dorsum characteristically swollen, humped or dome-like in profile.
4. Eyes with short erect hairs present (easily lost by abrasion).
5. All surfaces of body and usually also the appendages with pubescence and erect hairs; pubescence of first gastral tergite usually so arranged that a midline is formed which runs almost the length of the sclerite.
6. Mandibles smooth and shining, unsculptured apart from small pits from which hairs arise.
7. Ventral surface of head without a longitudinal ridge or carina at each side.
8. Head commonly contracted behind the eyes.
9. Anterior clypeal margin arcuate and entire, without lobes or notches.

Key to species

(based on worker caste)

Note: *P.tschu* is known only from the queen caste.

1 Small species with relatively short antennal scapes, HL $< 1{\cdot}75$, SI < 145. In profile the dorsum of the petiole between the spines projecting as a thick, subconical prominence (fig. 8). Sides of alitrunk obliquely striate. Gastral pubescence not forming a midline. (*Solomon Islands*: *San Cristoval Is.*) ..... **nofra**

– Larger species with relatively longer antennal scapes, HL $> 2{\cdot}00$, SI > 145. In profile the dorsum of the petiole between the spines not projecting. Sides of alitrunk not obliquely striate. Gastral pubescence forming a more or less marked midline 2

2 Petiole in profile equipped above with a pair of long, recurved, hook-like spines (fig. 9). (*Andaman Islands*, *West Malaysia*, *Borneo*, *Sumatra*, *Java*) ..... **calypso**

– Petiole in profile with the spines not developed into recurved hooks 3

3 Antennal scapes and dorsal (extensor) surfaces of middle and hind tibiae without erect hairs. (*Philippines*) ..... **magnifica**

– Antennal scapes and dorsal (extensor) surfaces of middle and hind tibiae with erect hairs, which may be short 4

4 Pronotal dorsum smooth and shining or with only a superficial fine, dense reticulate-puncturation, which may be masked by the pubescence 5

– Pronotal dorsum rugose, at least in part; rugosity not masked by pubescence 7

5 Larger species, HL $> 3{\cdot}00$, PW $> 1{\cdot}75$. Vertex of head reticulate-punctate or with sparse, weak rugosity. Pronotal dorsum finely reticulate-punctate beneath dense pubescence 6

– Smaller species, HL $< 2{\cdot}70$, PW $< 1{\cdot}60$. Vertex of head coarsely rugose. Pronotal dorsum with short, sparse pubescence, surface unsculptured, smooth and polished. (*Australia*: *Cape York Peninsula*) ..... **glabrinota**

6 Head narrowing from immediately behind eyes; in full-face view lateral occipital prominences visible (fig. 1). More slenderly built, narrower-headed species with relatively long antennal scapes, HW < 2·25, CI < 65, SI > 190. (*New Guinea, Aru and Waigio Islands, Australia: Cape York Peninsula*) ..... **sexspinosa** (in part)

– Head not narrowing from immediately behind eyes; in full-face view lateral occipital prominences not visible (fig. 2). More stockily built, broader-headed species with relatively short antennal scapes, HW > 2·35, CI > 65, SI < 185. (*New Guinea*) ..... **aureovestita**

7 Node of petiole in profile high and narrow, with approximately parallel anterior and posterior faces. Dorsal surface convex, spines projecting from behind and below apex of convexity (fig. 10). (*New Guinea, Waigio Is., Salawaty Is., Misool Is., Halmahera*) ..... **bubastes**

– Node of petiole in profile not high and narrow, dorsal surface sloping upwards posteriorly to junction with posterior face and with spines projecting from posterodorsalmost point 8

8 With head in full-face view the occipital margin with prominent projecting lateral lobes 9

– With head in full-face view the occipital margin without projecting lateral lobes 10

9 Erect hairs very numerous on dorsum of head, often curved. In profile longest hairs projecting from vertex are considerably longer than maximum vertical width of eye. Head slightly longer and narrower, CI < 64. (*New Guinea, Aru and Waigio Islands, Australia: Cape York Peninsula*) **sexspinosa** (in part)

– Erect hairs sparse on dorsum of head. In profile longest hairs projecting from vertex are shorter than maximum vertical width of eye. Head slightly shorter and broader, CI > 64. (*Indonesia: Seram and Ambon Is.*) ..... **rhea**

10 Pronotal spines short, directed laterally, not curved forward (fig. 12). Smaller species, HL < 3·0, PW < 1·75. (*Sulawesi*) ..... **rugifrons**

— Pronotal spines long, directed anteriorly and laterally, curved forward (figs. 13, 14). Larger species, HL > 3·20, PW > 1·85 11

11 Head very strongly contracted behind, so that occipital margin is scarcely wider than cervical shield in dorsal view (fig. 4). Head relatively narrower, CI 65, scapes relatively much longer, SI 205. (*Philippines*) ..... **osiris**

— Head not strongly contracted behind, occipital margin notably wider than cervical shield in dorsal view (fig. 3). Head relatively broader, CI 72, scapes relatively much shorter, SI 152. (*Australia: Cape York Peninsula*) **barnardi**

TREATMENT BY SPECIES

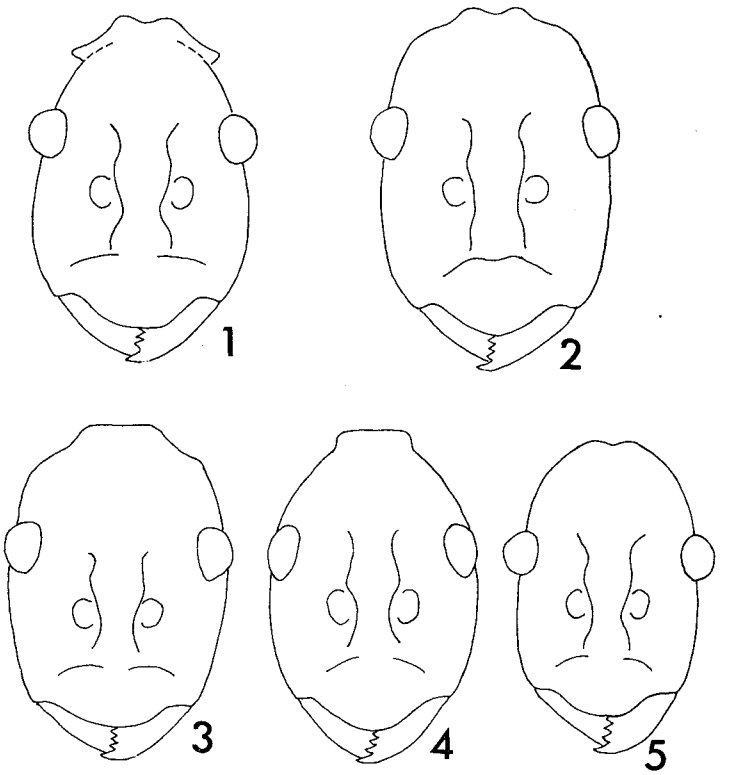
Polyrhachis aureovestita Donisthorpe (fig. 2)

Polyrhachis (*Myrmhopla*) *aureovestitus* Donisthorpe, 1937 : 274. Holotype and paratype workers, NEW GUINEA: Mt Nomo, S. of Mt Bougainville, 600–1500 ft on trees and from nest in log. Niau-limon, S. of Mt Bougainville, 300 ft, ii.1936 (*L.E.Cheesman*) (BMNH) [examined].

Worker. TL 14·2–16·3, HL 3·56–3·80, HW 2·48–2·60, CI 66–70, SL 4·44–4·68, SI 176–182, PW 1·92–2·12, MTL 5·20–5·60 (20 measured).

Head not narrowing immediately behind eyes, occipital margin broad and without angular lateral prominences (fig. 2). Pronotal spines long and usually only very slightly curved forwards; propodeal spines long, strong and recurved. Pronotum moderately convex in profile.

All surfaces of body and appendages with numerous erect, relatively short yellow-white or yellow hairs. Pubescence dense everywhere, greyish-yellow to bright yellow, usually masking the underlying sculpturation. Sculpturation everywhere of a fine, dense, superficial reticulate-puncturation.



Figs. 1–5. Outline of head in full-face view of workers (antennae and pubescence omitted): (1) *sexspinosa*; (2) *aureovestita*; (3) *barnardi*; (4) *osiris*; (5) *bubastes*.

This large, relatively broad-headed species is distinguished from its relatives by its size, distinctive fine reticulate-punctate sculpture, dense yellowish pubescence and uncontracted occipital margin. The shape of the propodeal spines is as variable in this species as in others of the group.

Additional material examined

NEW GUINEA: Jobi (*Fruhstorfer*).

Polyrhachis barnardi Clark (figs. 3, 14)

Polyrhachis (*Myrmhopla*) *barnardi* Clark, 1928 : 39, pl. 1, figs. 37, 38. Syntype workers, AUSTRALIA: Queensland, Cape York (*W.B.Barnard*) (MCZ) [examined].

Worker. TL 14·1, HL 3·40, HW 2·44, CI 72, SL 3·72, SI 152, PW 1·96, MTL 4·64

Head not strongly contracted behind eyes, occipital margin without projecting angular prominences or lobes. Pronotal spines curved forwards, long. Petiolar spines long, divergent, curved around base of gaster. All surfaces of head, body and appendages with numerous long, erect, white or silvery hairs, many of which are curved or sinuate on dorsal alitrunk.

Dorsum of head rugose. Pronotal dorsum more finely rugose, rugosity somewhat masked by the pubescence. Remainder of dorsal alitrunk with some fine rugosity which decreases in intensity posteriorly until on the propodeum only a fine puncturation is visible.

This species is one of the three known from the Cape York Peninsula and is one of the two endemic species of the group known from Australia. It is separated from *glabrinota* by the sculpturation of the pronotum and smaller size of that species, and from *sexspinosa* by the presence of lateral angular prominences on the occipital margin, which are absent from *barnardi*.

The Australian species of the *sexspinosa*-group are either shared with New Guinea (*sexspinosa* itself) or appear to have developed from New Guinea-based stocks. *P.barnardi* appears to be derived from an *aureovestita*-like ancestor whereas *glabrinota* is almost certainly derived from the common *bubastes*.

Polyrhachis bubastes F.Smith (figs. 5, 6, 10)

Polyrhachis bubastes F.Smith, 1863 : 15. Syntypes worker and female, NEW GUINEA: Waigio Island (*A.R.Wallace*) (UM) [examined].

Polyrhachis spinosa Mayr, 1867 : 11, pl. 2, figs. 2a, 2b. Syntypes worker and female, INDONESIA: Halmahera Island (types presumed lost) **syn.n.**

Polyrhachis variolosa Emery, 1887 : 236, fig. 24. Syntype workers, NEW GUINEA: Fly River, Mansinam (*L.M.D'Albertis*) (MHN) [examined] **syn.n.**

Polyrhachis variolosa var. *waigiouensis* Forel, 1911*a* : 299. Holotype worker, NEW GUINEA: Waigio Island (*Bates*) (ZS) [examined] **syn.n.**

Polyrhachis variolosa var. *curvispina* Stitz, 1911 : 379. Syntype workers, NEW GUINEA: (Kaiser-Wilhelmsland) (*Lauterbach*) (MNHU) [examined] [junior homonym of *curvispina* Forel, 1908 : 8] **syn.n.**

Polyrhachis variolosa var. *arcispina* Santschi, 1916 : 243 [replacement name] **syn.n.**

Polyrhachis (*Myrmhopla*) *rugousissima* Donisthorpe, 1943 : 468. Holotype and paratype workers, NEW GUINEA: Waigio Island, Camp Nok, 2500 ft, iii–iv. 1938 (*L.E.Cheesman*) (BMNH; MCZ) [examined] **syn.n.**

Polyrhachis (*Myrmhopla*) *hirta* Donisthorpe, 1949 : 418. Holotype and paratype workers, NEW GUINEA: Maffin Bay 10.x.1944 (*E.S.Ross*) (BMNH) [examined] [junior homonym of *hirta* Viehmeyer, 1913 : 59] **syn.n.**

Polyrhachis kellyi Hung, 1967*b* : 201 [replacement name] **syn.n.**

Worker. TL 10·0–12·8, HL 2·24–3·08, HW 1·40–2·20, CI 63–77, SL 2·88–3·54 SI 180–205, PW 1·16–1·96, MTL 3·28–4·40 (20 measured)

Head strongly convex behind, with weakly developed lateral occipital lobes which are usually only visible in full-face view in larger individuals. Pronotum in profile strongly swollen, often dome-like above. Metapleural tooth with all grades between a well-defined dentiform structure (arrow in fig. 6) and a simple, non-dentiform lobe. Pronotal spines curved forwards, only weakly so in some specimens. Node of petiole high and relatively narrow in profile, with virtually parallel anterior and posterior faces. Dorsal surface convex, apex of convexity situated posteriorly and with spines projecting from below and behind apex (fig. 10).

All surfaces of body and appendages with numerous brown or black, erect hairs. Vertex of head and usually all of the dorsal alitrunk coarsely rugose, most coarse on vertex. Head in front of eyes less strongly sculptured but usually with a few longitudinal rugae which may be somewhat masked by the pubescence. On dorsal alitrunk the intensity of rugosity may diminish posteriorly.

Characters diagnostic of this, one of the more common species of the group include the shape of the petiole and the head coupled with the strong, rugose sculpturation. The main variations in the species include the intensity of sculpture upon the alitrunk, and the shape, size, degree of elevation, divergence and curvature of the propodeal spines. In the majority of specimens these are quite strongly elevated, weakly recurved and somewhat divergent (fig. 6) but numerous variations are known.

Dr M.Fischer (NM) informs me that the types of *spinosa* cannot be found in the Mayr collection. However, Mayr's original description and figures are sufficient to fix this name in the synonymy of *bubastes*.

Additional material examined

NEW GUINEA: Mimika Riv. (*A.F.R.Wollaston*); Salawaty Is. (*A.R.Wallace*); Waigio Is. (*A.R.Wallace*); no loc. (*A.R.Wallace*); Waigio Is., Camp Nok (*L.E.Cheesman*); Mt Nomo (*L.E.Cheesman*); Papua, Bisianumu nr Sageri (*E.O.Wilson*); Misool Is. (*A.R. Wallace*); Mamberamo (*W.Docters van Leeuwen*); Motorbivak (*W.Docters van Leeuwen*); Mentawei Is. (*H.H.Karny*).

Polyrhachis calypso Forel **stat.n.** (fig. 9)

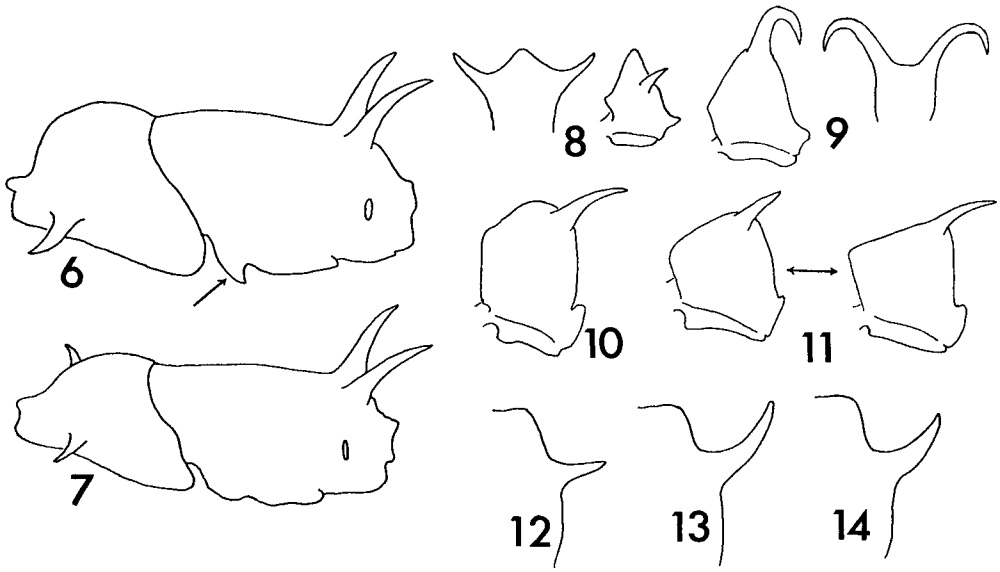
Polyrhachis spinosa subsp. *calypso* Forel, 1911*b* : 394. Syntype workers, SUMATRA (*Moesch*) (MHN) [examined].

Polyrhachis (*Myrmhopla*) *sexspinosa* var. *malaccana* Viehmeyer, 1915 : 167 fig. 15. Holotype worker, SINGAPORE: Gunong Angsi (*H.Overbeck*) (MNHU) [examined] **syn.n.**

Polyrhachis (*Myrmhopla*) *capra* Karavaiev, 1927 : 27, fig. 14. Holotype worker, JAVA: Buitenzorg, xii.1912 (no. 2985) (probably in ZM) **syn.n.**

Worker. TL 10·1–11·2, HL 2·36–2·52, HW 1·56–1·68, CI 64–68, SL 3·00–3·16, SI 188–202, PW 1·24–1·48, MTL 3·44–3·96 (13 measured)

This species is easily recognisable within the *sexspinosa*-group from the structure of the petiole (fig. 9). In profile the steeply sloping dorsal surface of petiole converges with posterior face dorsally and is surmounted by a pair of long, divergent, recurved and hook-like spines. Head narrowed behind eyes, sometimes small lateral lobes or prominences present on occipital margin. Pronotal spines usually long, quite narrow, strongly curved forwards, pronotum noticably convex, but not as strongly convex as in *bubastes*



Figs. 6–14. (6–7) Outline of alitrunk: (6) *bubastes*; (7) *rugifrons*. (8–9) Petiole in front view and profile: (8) *nofra*; (9) *calypso*. (10–11) Petiole in profile: (10) *bubastes*; (11) *sexspinosa*. (12–14) Shape of right pronotal spine in dorsal view: (12) *rugifrons*; (13) *osiris*; (14) *barnardi*.

(fig. 6). Mesonotal tooth appears undeveloped in all specimens examined, always represented as a simple lobe.

Erect hairs present on all surfaces of body and appendages, usually white or greyish, more rarely yellow or pale brown. Vertex of head, pronotal dorsum and usually also mesonotal dorsum coarsely rugose. In some individuals mesonotum less strongly sculptured than pronotum.

This very distinctive species represents the furthest westerly penetration of the *sexspinosa*-group and is distributed from Sumatra to the Andaman Islands, although it does not appear to be present upon the Indian subcontinent. The species *tschu* Forel (see below) may be the female of this species but associated workers and females are not yet known for *calypso*.

Additional material examined

ANDAMAN ISLANDS: Baratang Is. (*G.Rogers*). WEST MALAYSIA: Kuala Lumpur (*?*); Penang (*H.T.Pagden*). BORNEO: Kuching, Mt Serambu (*H.Smith*). JAVA: Soekaboemi (*M.K.Walsh*), Java (no further data); Dungus Iwul (*A.M.R.Wegner*).

Polyrhachis glabrinota Clark

Polyrhachis (*Myrmhopla*) *glabrinotum* Clark, 1930 : 13, fig. 1 nos. 11, 11a. Syntype workers, AUSTRALIA: Queensland, Cape York, xi.1927 (*W.B.Barnard*) (BMNH; MCZ) [examined].

Worker. TL 10·7–11·0, HL 2·56–2·64, HW 1·68–1·69, CI 63–66, SL 3·20–3·32, SI 190–197, PW 1·44–1·48, MTL 3·80–3·88 (2 measured)

In general body form and structure of the petiole, *glabrinota* resembles *bubastes*. Vertex of head coarsely rugose, with a few weak, longitudinal rugae extending to head in front of eyes. Pronotal dorsum completely smooth and shining or at most with a few weak, scattered, longitudinal rugules. Mesonotum usually retaining some rugosity but propodeal dorsum not rugose. Erect hairs numerous on all surfaces of body and appendages, usually white but may be darker, especially on head.

This is the second endemic Australian species of the group (the other is *barnardi*) and appears to be restricted in distribution to the Cape York Peninsula. Characters separating *glabrinota* from the other Australian species are noted under *barnardi*. The general resemblance of *glabrinota* to the more widely distributed *bubastes* is obvious, but the lack of strong pronotal sculpturation in the former appears to show that *glabrinota* should be treated as a distinct species and not merely as an isolated population of *bubastes*.

Polyrhachis magnifica Menozzi **stat.n.**

Polyrhachis sexspinosa subsp. *magnifica* Menozzi, 1925 : 98. Holotype worker, PHILIPPINES: Sibuyan Is. (*Baker*) (IE) [examined].

Worker. TL 14·6–17·3, HL 3·40–3·60, HW 2·00–2·24, CI 60–62, SL 4·44–4·72, SI 210–222, PW 1·52–1·92, MTL 5·80–6·20. (3 measured)

Head strongly narrowed behind eyes, occipital margin very short and without lateral angular prominences. Pronotum in profile only shallowly convex, not markedly swollen as in some other members of the group. Propodeum in profile with dorsum very shallowly concave. Pronotal spines long and curved; propodeal spines long, curved and divergent. Node of petiole long and low, with an anteriorly sloping dorsal face and a pair of short, curved, divergent spines. Mesopleural tooth strongly developed.

Erect hairs white, relatively sparse on the dorsal surfaces of head and alitrunk, longest hairs on vertex about equal to maximum vertical diameter of eye. With the head in full-face view only relatively few hairs break the outline of the side of the head in front of eye. Erect hairs absent from antennal scapes and dorsal (extensor) surfaces of middle and hind tibiae; sometimes also absent from dorsa of femora. Pubescence usually bright golden, densest and brightest on head, most dilute and duller on gaster. More rarely pubescence everywhere silvery.

Sculpturation below pubescence very fine, superficial reticulate-puncturation; rugosity completely absent from head and dorsal alitrunk.

This is the only species of the *sexspinosa*-group which lacks erect hairs on the scapes and extensor surfaces of the tibiae, and this character alone renders *magnifica* easily identifiable.

Additional material examined

PHILIPPINES: Luzon Is., Mt Makiling (*Baker*); Negros Is., Cuernos Mts (*Baker*); Negros Is., Dumaguete (*J.W.Chapman*).

Polyrhachis nofra sp.n. (fig. 8)

Holotype worker. TL 6·1, HL 1·52, HW 1·12, CI 72, SL 1·52, SI 135, PW 0·84, MTL 1·88

With characters of the group, plus: Head not contracted behind eyes, occipital margin without angular lateral prominences. Sides of head in front of eyes more or less straight and virtually parallel. Pronotal spines short, quite broad, flattened and not curved forwards. Propodeal spines short and stout, only very weakly recurved. In profile the pronotum distinctly swollen, strongly convex above. Petiole with a pair of short spines directed strongly outwards and very weakly upcurved. Median portion of petiole between the spines strongly projecting; in profile this projection appearing subconical, in front view very broadly triangular.

All surfaces of body and appendages with numerous short, erect hairs and with short but quite dense pubescence, which has a brassy tint on dorsum of head, alitrunk and gaster. Pubescence on first and second gastral tergites is not so directed as to form a midline.

Vertex and head in front of eyes not sculptured, smooth and shining apart from pits giving rise to hairs. Pronotal dorsum with weak, arched rugulose sculpture which is fine, quite dense, and has apices of arches anterior. Mesonotum and propodeal dorsum with shallowly arched transverse rugulation, apices of arches posterior; this sculpturation stronger than that on the pronotum. Sides of alitrunk obliquely and densely striate, this sculpture stronger than that on the dorsum.

Holotype worker, SOLOMON ISLANDS: San Cristoval Is., Wainoni. 1965 (*T.Whitmore*) (BMNH).
Paratypes. 3 workers, same data as holotype (BMNH; MCZ).
Paratypes as holotype, with range of dimensions. TL 6·0–6·1, HL 1·52–1·53, HW 1·12, CI 71–73, SL 1·44–1·52, SI 128–135, PW 0·80–0·84, MTL 1·88–1·92.

This species is the smallest and one of the most easily recognisable members of the *sexspinosa*-group. The size, structure of the petiole and the form of sculpturation are very distinctive, and render the species immediately identifiable. *P.nofra* represents the furthest easterly penetration of any member of the group and with its small size and other peculiarities is one of its most specialised members.

The affinities of *nofra* within the group are not easily discernable, but the shape of the head suggests relationship to the much larger *aureovestita*.

Polyrhachis osiris sp.n. (figs. 4, 13)

Holotype worker. TL 15·0, HL 3·44, HW 2·24, CI 65, SL 4·60, SI 205, PW 1·92, MTL 4·12.

With characters of the group, plus: Head contracted behind eyes, occipital margin narrow and neck-like, without lateral angular prominences. Eyes not as strongly protuberant as in other members of group (fig. 4). Pronotal spines long, quite narrow and strongly curved forward; propodeal spines long and recurved. Pronotum moderately swollen and convex in profile, mesopleural tooth developed into a free lobe with an acute ventral angle. Dorsum of petiole shallowly sloping in profile, spines projecting laterally, scarcely elevated and curved round extreme base of first gastral segment. Dorsum of petiole with a weakly raised median longitudinal ridge, running from anterior margin to between spines.

White or off-white erect hairs present on all surfaces of the body and appendages. Vertex of head with weak, superficial rugulation. Eyes with a number of irregular circumocular rugulae which are broken and missing anteriorly. Entirety of dorsal alitrunk weakly rugose, strongest on pronotum, weakest on propodeum.

Holotype worker, PHILIPPINE ISLANDS (*E.M.Ledyard*) BM. 1925–491 (no further data) (BMNH).

One of the two species of the *sexspinosa*-group known from the Philippines, *osiris* is certainly closely related to *magnifica* but the two are easily distinguished as *magnifica* lacks hairs on the antennal scapes and the dorsal surfaces of the tibiae, and has no rugose sculpturation on the vertex or the dorsal alitrunk.

Polyrhachis rhea Forel **stat.n.**

Polyrhachis sexspinosa subsp. *rhea* Forel, 1911*a* : 299. Holotype worker, INDONESIA: Seram Island (*Bates*) (ZS) [examined].

Worker. TL 13·6–14·7, HL 3·00–3·40, HW 1·96–2·20, CI 64–67, SL 3·92–4·16, SI 189–198, PW 1·60–1·88, MTL 4·72–4·92 (6 measured)

Head contracted posteriorly and with angular lateral prominences on occipital margin which are visible in full-face view as in *sexspinosa*, but usually less strongly developed. Pronotum moderately convex above and spines weakly curved forward. Vertex of head and pronotal dorsum rugose, rugae low, broad and rounded. Rugosity decreasing in intensity behind pronotum so that propodeal dorsum lacks rugose sculpturing. Erect hairs present on all surfaces of body and appendages, very short or minute on antennal scapes and shorter and much more sparse on dorsal head and pronotum than in *sexspinosa*. In profile the longest hairs projecting from vertex of head are shorter than the maximum vertical ocular diameter, whereas in *sexspinosa* they are considerably longer.

Apparently restricted in distribution to the islands of Seram and Ambon, *rhea* seems to be directly descended from *sexspinosa* but is consistently separable in the material examined by its reduced and much shorter pilosity.

Additional material examined

INDONESIA: Seram Is., Piroe (*W.M.Mann*); Seram Is. (*A.R.Wallace*); Ambon Is. (*A.R.Wallace*).

Polyrhachis rugifrons F.Smith (figs. 7, 12)

Polyrhachis rugifrons F.Smith, 1860 : 70. Syntypes workers and female, SULAWESI: Makassar (*A.R.Wallace*) (BMNH; UM) [examined].

Worker. TL 12·1–12·8, HL 2·60–2·84, HW 1·72–1·92, CI 64–67, SL 3·36–3·56, SI 185–195, PW 1·40–1·68, MTL 3·88–4·12 (5 measured)

Head not strongly contracted posteriorly, occipital margin usually without lateral lobiform prominences, but these may be weakly developed in some larger specimens; however, they are never so large as to be visible in full-face view. Pronotum moderately convex, spines short and acute and projecting almost or quite at right-angles to the long axis of alitrunk, not curved forwards. Vertex of head and pronotal dorsum rugose, usually also with distinct but not so strong rugosity on mesonotum. Propodeal dorsum

not rugose. Erect hairs numerous on all surfaces of body and appendages, off-white or white.

This species appears to be the only representative of the *sexspinosa*-group in Sulawesi and its distribution, as far as is known, is restricted to that island.

Additional material examined

INDONESIA: Sulawesi (*A.R.Wallace*); Sulawesi, Bantimoerong (*W.M.Mann*).

Polyrhachis sexspinosa (Latreille) (figs. 1, 11)

Formica sexspinosa Latreille, 1802 : 126, pl. 4, fig. 21. Holotype (?) female, "EAST INDIES" (*Labillardière*) (location of type not known).

Polyrhachis sexspinosa (Latreille); F.Smith, 1858*b* : 59.

Formica argentata Fabricius, 1804 : 413. Worker?, NEW CALEDONIA [synonymy by Roger, 1863 : 6].

Polyrhachis irritabilis F.Smith, 1858*a* : 141. Holotype female, INDONESIA: Aru Islands (*A.R.Wallace*) (UM) [examined] [synonymy by Roger, 1863 : 6].

Polyrhachis sexspinosa var. *reclinata* Emery, 1887 : 236. Syntype workers, NEW GUINEA: Fly River (*L.M.D'Albertis*) (MHN) [examined] **syn.n.**

Polyrhachis sexspinosa var. *esuriens* Emery, 1897 : 591. Syntype workers, NEW GUINEA (*L.Loria*) (MHN) [examined] **syn.n.**

Polyrhachis sexspinosa var. *rectinota* Forel, 1911*a* : 299 (attributed to Emery) [lapsus for *reclinata* Emery].

Polyrhachis (*Myrmhopla*) *sexspinosa* var. *sericea* Karavaiev, 1927 : 26, fig. 13. Syntypes workers, females and males, INDONESIA: Aru Islands, Wammer. 24.iii.1913 (probably in ZM) **syn.n.**

Polyrhachis (*Myrmhopla*) *arcuspinosa* Donisthorpe, 1941 : 140, fig. 1. Holotype and paratype workers, NEW GUINEA: Mt Nomo, S. of Mt Bougainville, 600–1500 ft, ii.1936 (*L.E.Cheesman*) (BMNH; MCZ) [examined] **syn.n.**

Polyrhachis (*Myrmhopla*) *arouspinosa* subsp. *waigeuensis* Donisthorpe, 1943 : 467. Holotype and paratype workers, NEW GUINEA: Waigio Island, Camp Nok, 2500 ft, iv.1938 (*L.E.Cheesman*) (BMNH; MCZ) [examined] **syn.n.**

Polyrhachis (*Myrmhopla*) *juxtaspinosa* Donisthorpe, 1949 : 417, fig. 2. Holotype worker, NEW GUINEA: Maffin Bay, ix.1944 (*E.S.Ross*) (CAS) [examined] **syn.n.**

Worker. TL 14·00–15·4, HL 3·04–3·60, HW 1·76–2·20, CI 51–64, SL 3·88–4·60, SI 194–238, PW 1·76–2·08, MTL 4·64–5·60 (25 measured)

Head contracted behind eyes, often strongly so; head usually noticeably narrower behind eyes than in front. Occipital margin very short, with a pair of lateral angular prominences or lobes which are visible with the head in full-face view. Pronotum strongly convex, spines long and curved forwards, very strongly so in some individuals. Propodeal spines very variable in length, degree of elevation and degree of curvature. Spines may be vertical and almost parallel, inclined forwards or backwards. In the last case they are usually curved and somewhat divergent. In some specimens they are strongly curved backwards and strongly divergent. Shape of petiole in profile variable (see fig. 11).

Vertex of head usually rugose, intensity of sculpturation variable, ranging from faint to coarse but absent only in some Australian representatives. Pronotum similarly sculptured, but usually showing at least a few rugae.

Erect hairs white or off-white, long and fine, dense on all surfaces of body and appendages. On vertex longest hairs considerably longer than maximum vertical diameter of eye.

P.sexspinosa appears to be a New Guinea based species which is reasonably common and which has successfully extended its range to northern Australia, where it is found on the Cape York Peninsula along with the endemic species *barnardi* and *glabrinota*. The Australian populations of *sexspinosa* tend to have their sculpturation more reduced than their New Guinea counterparts, especially upon the head, but otherwise they are similar.

Additional material examined

NEW GUINEA: Huon Peninsula, Lower Busu Riv. (*E.O.Wilson*); Setakwa (*C.B.Kloss*); Kokoda (*L.E.Cheesman*); Maffin Bay (*K.V.Krombein*); Aru Is. (*A.R.Wallace*); Morotai Is. (*A.R.Wallace*); Waigio Is. (*A.R.Wallace*); Waigio Is., Camp Nok (*L.E.Cheesman*); Humboldt Bay (*L.E.Cheesman*); Mimika Riv. (*A.F.R.Wollaston*); Finschhafen (*E.S.Ross*); Mt Nomo (*L.E.Cheesman*); Dory (*A.R.Wallace?*); Mamberamo (*W.Docters van Leeuwen*); Rattan Camp (*L.J.Toxopeus*); Bernhard Camp (*L.J.Toxopeus*).

AUSTRALIA: Queensland, Cape York, Iron Range (*Darlingtons*); Cape York, Lockerbie (*Darlingtons*); Cape York, Bamaga (*Darlingtons*).

Polyrhachis tschu Forel

Polyrhachis tschu Forel, 1879 : 122. Holotype female, CHINA [probably Indo-China] (MHN) [examined].

Female. TL 11·6, HL 2·52, HW 1·72, CI 68, SL 3·24, SI 1·88, PW approx. 1·60, MTL 3·68

The unique female holotype may be the queen of *calypso*. The sculpture and pilosity of the species are similar to *calypso* as is the shape of the petiole node, but the development of the petiolar spines is different. Whereas in *calypso* the spines are long, strongly raised, recurved and hook-like, in *tschu* they are strongly divergent, curved posteriorly and not strongly raised.

The question of whether *tschu* is the female of *calypso* will thus have to wait until collections containing both castes can be obtained.

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