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The ant genus *Liomyrmex*: a review (Hymenoptera Formicidae)

Abstract - The myrmicine ant genus *Liomyrmex* Mayr is considered as monotypic after critical reexamination of relevant type-material and other specimens. The single species recognized, *Liomyrmex gestroi* (Emery), has the following synonyms: *Myrmica caeca* F. Smith, *Liomyrmex aurianus* Emery **n. syn.**, *Liomyrmex carinata* Stitz **n. syn.**, *Promyrma butteli* Forel **n. syn.**, *Liomyrmex tagalanus* Menozzi **n. syn.**, *Liomyrmex froggatti* Donisthorpe **n. syn.**, *Liomyrmex froggatti* ssp. *major* Donisthorpe **n. syn.**, *Liomyrmex reneae* Donisthorpe **n. syn.**, *Liomyrmex taylori* Tiwari & Jonathan **n. syn.**
A revised generic diagnosis of the three castes, measurements for workers and queens and comments on variations are also given.

Riassunto - *Il genere* Liomyrmex*: una revisione (Hymenoptera Formicidae)*
Il genere mirmicino *Liomyrmex* Mayr viene considerato come monotipico sulla base di un esame critico del materiale tipico e di altri esemplari. L'unica specie considerata valida, *Liomyrmex gestroi* (Emery), ha i seguenti sinonimi: *Myrmica coeca* F. Smith, *Liomyrmex aurianus* Emery **n. syn.**, *Liomyrmex carinata* Stitz **n. syn.**, *Promyrma butteli* Forel **n. syn.**, *Liomyrmex tagalanus* Menozzi **n. syn.**, *Liomyrmex froggatti* Donisthorpe **n. syn.**, *Liomyrmex froggatti* ssp. *major* Donisthorpe **n. syn.**, *Liomyrmex reneae* Donisthorpe **n. syn.**, *Liomyrmex taylori* Tiwari & Jonathan **n. syn.**
Vengono inoltre fornite una nuova diagnosi generica delle tre caste, misurazioni per operaie e regine e una discussione sulla variabilità.

Key Words: Formicidae, Myrmicinae, *Liomyrmex*, review, synonyms.

INTRODUCTION

Samples of *Liomyrmex* have been collected several times from scattered localities in the Indo-Australian and Oriental zoogeographical Regions (as defined by Bolton, 1994). The most recent review of the genus was by Ettershank (1966), who excluded *Liomyrmex* from the tribe Solenopsidini where earlier authors had placed it. Kugler (1978) studied the sting apparatus and found it was clearly related to that of *Vollenhovia* Mayr. Both genera are now included in the tribe Metaponini (Bolton, 1994, 1995).

This peculiar myrmicine ant genus has blind workers with smooth, thick and yellow integument. The legs and antennae are short, and the insect has an elongate, yet robust appearance. The worker caste has the following combination of characters: mandibles short and 4-toothed; bicarinate clypeus; eyes absent; scapus short and somewhat club shaped (similar to that of *Vollenhovia*); promesonotum flat in profile and without dorsal suture; propodeal spiracle large; propodeum unarmed; bulla of the metapleural gland long and digitiform; petiole and postpetiole massive, the former with a well developed subpetiolar lobe.

Liomyrmex has been collected at several distant Asian localities, and many authors in the past described each new series as a new taxon. Bolton (1995) listed seven species and a single subspecies belonging to *Liomyrmex*.

The absence of really diagnostic characters useful to separate the supposedly different species in the original descriptions prompted us to reexamine type specimens of known taxa, as well as further material stored in some important ant collections. We were not really surprised to discover that the genus is apparently monotypic: besides trivial variations in size and indices, we could not find any consistent difference among the various series of specimens we examined.

MEASUREMENTS AND INDICES

To those defined in Bolton (1987) we added the following:
PeW (Petiolar Width): the maximum width of the petiolar node seen from above
PeI (Petiolar Index): PeW x100/HW
ScW (Scutum Width): in the queen, the maximum width of the mesonotal scutum in dorsal view

Measurements are in millimeters and were taken by means of a Wild M8 stereomicroscope with an ocular micrometer.

DEPOSITORIES

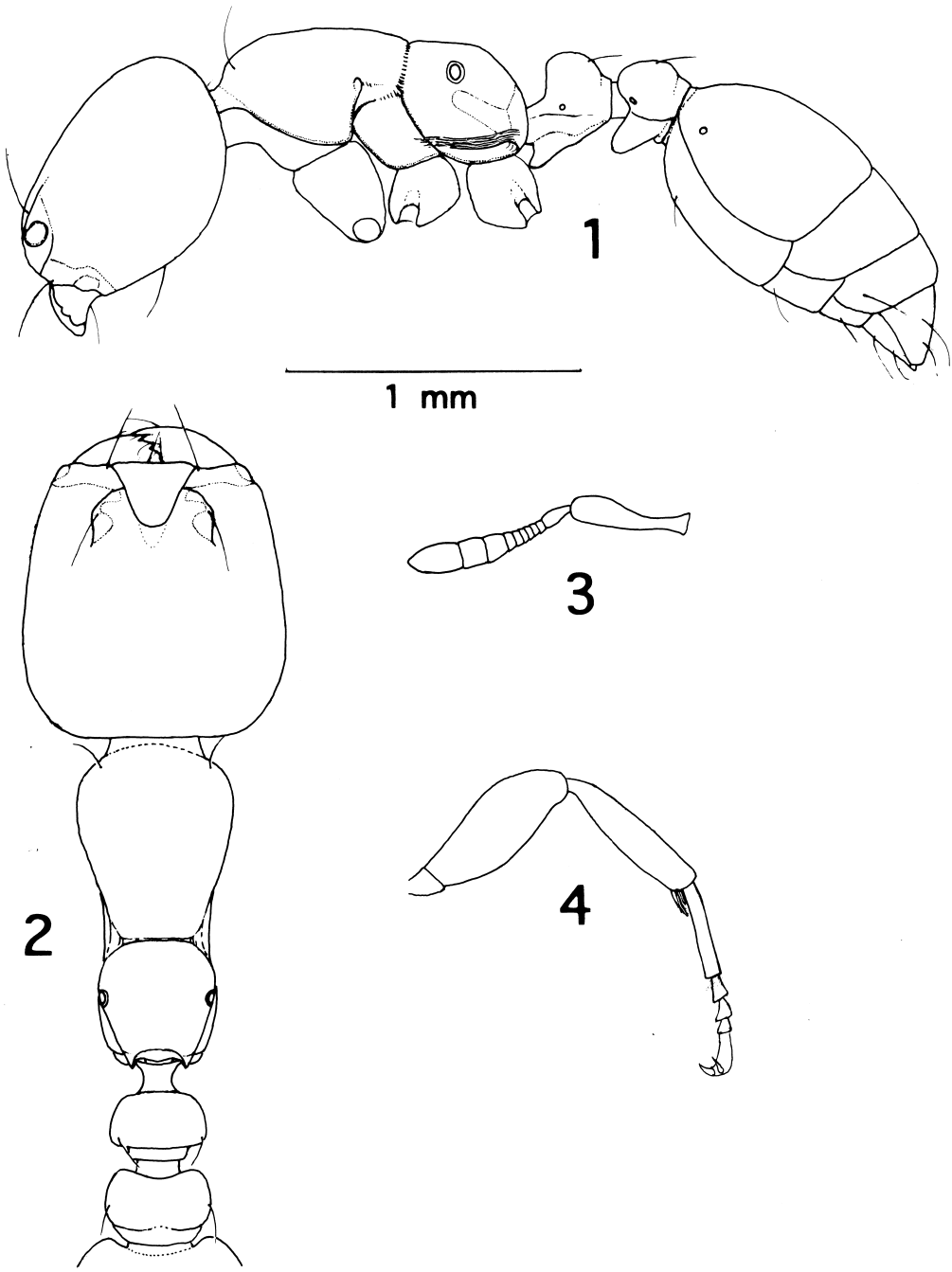
BMNH: The Natural History Museum, London, United Kingdon
CAS: California Academy of Sciences, San Francisco, USA
MCSN: Museo Civico di Storia Naturale "Giacomo Doria", Genoa, Italy
MCZ: Museum of Comparative Zoology, Cambridge, Massachusetts, USA
MHN: Muséum d'Histoire Naturelle, Geneva, Switzerland
MNHU: Museum für Naturkunde an der Humboldt-Universität zu Berlin, Germany

Liomyrmex Mayr

Liomyrmex Mayr, 1865: 23. Type-species: *Myrmica caeca* F. Smith, 1860: 108, by monotypy. [Junior primary homonym of *Myrmica caeca* Jerdon, 1851: 116; first available replacement name: *gestroi* Emery, 1887: 461 (synonymy by Bolton, 1995: 248).]
Laparomyrmex Emery, 1887: 461. Type-species: *Laparomyrmex gestroi* Emery, 1887: 461, by monotypy. [Synonymy by Dalla Torre, 1893: 63.]
Promyrma Forel, 1912: 764. Type-species: *Promyrma butteli* Forel, 1912: 764, by monotypy. [Synonymy by Forel, 1913: 26.]

DIAGNOSIS

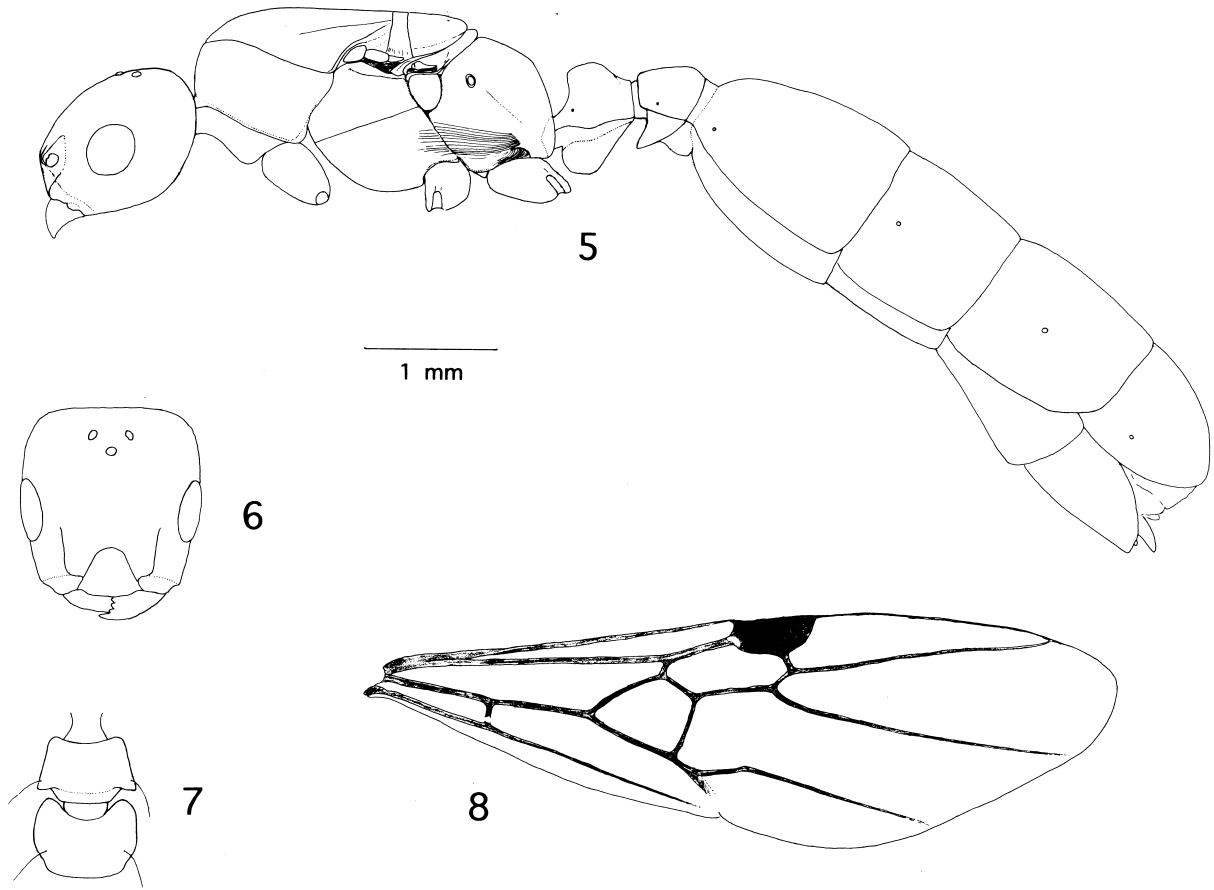
WORKER (figs 1-4). Monomorphic but size-variable, subterranean, maybe termitophilous (see below), myrmicine ant, with the following combination of characters:
1) Palp formula 2,2.
2) Mandibles with a short, 4-toothed, masticatory margin; the teeth increasing in size from the basalmost to the apical.
3) Clypeus with a distinct, raised median portion, margined at each side by a well defined carina. Clypeus longitudinally arched and widely inserted between the frontal lobes. Anterior clypeal margin straight in the middle. Two short, straight, anteriorly directed and slightly converging setae are present, one on each side of the mid point of the anterior margin.



Figs 1-4. *Liomyrmex gestroi*, worker: 1 - body profile; 2 - dorsal view; 3 - antenna; 4 - hind leg (pubescence and weak sculpture omitted).

4) Frontal lobes widely separated, convergent anteriorly and parallel posteriorly. Frontal carinae and scrobes absent.
5) Frontal triangle very faintly impressed; hardly visible.
6) Antenna 11-segmented and short, with a well defined 3-merous club. Scape club-shaped in dorsal view; in frontal view it appears somewhat flattened at the apex.
7) Eyes absent.
8) Promesonotum flat and without any trace of suture in dorsal view.
9) Metanotal groove impressed.
10) Propodeum unarmed; broadly arched between the flat dorsum and the moderately convex declivity.
11) Propodeal spiracle large.
12) Propodeal lobes well developed, not protruding posteriorly and continuing the curvature of the propodeal declivity.
13) Metapleural gland present, with a large, elongate, digitiform bulla directed upward and forward.
14) Petiole massive with a short peduncle and a distinct node. The latter is transverse in dorsal view and thick and squarish in profile. A large, flat subpetiolar process is also present.
15) Postpetiole massive, slightly wider than the petiole and with an anteroventrally projecting, but not compressed, sternite.
16) Sting well developed and long.
17) Mid and hind tibia with two small apical spurs. The anterior one (with the leg positioned perpendicularly to the body axis) shorter, smooth and straight; the posterior longer, slightly curved and weakly pectinate.
18) Integument thick and pale, mostly testaceous.
19) Body smooth with very sparse and tiny piligerous (bearing pubescence) pits. Some weak sculpture is present only on the frontal lobes (weak rugulae), peduncle and sternite of the petiole (reticulate), and especially around the metapleural gland (longitudinal fine rugulae).
20) Pubescence very sparse, short and appressed on the body; moderately abundant, long and decumbent on the appendages.
21) Hairs very sparse on the body. Usually there is a single pair of strong, long, tapered and slightly curved macrochetae in the following positions: a) on the clypeus, just outside of the carinae; b) close to the rim of the frontal lobes; c) on the ventral side of the head, quite close to the hypostomal bridge; d) on the pronotum, in front of the humeri; e) close to the posterior corners of the petiolar and postpetiolar nodes. Hairs are also present on the gaster: a pair on the sternites I, II and III; two laterally on the tergite III; the sternite and tergite IV have more than a single pair of hairs.

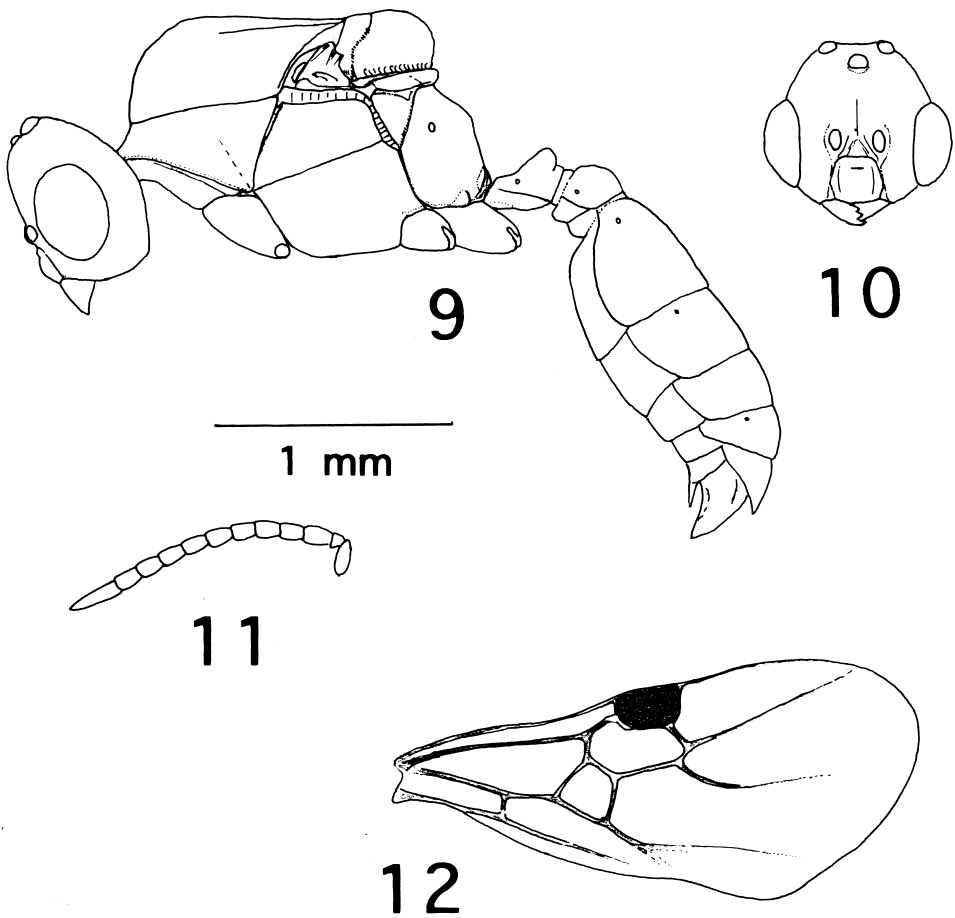
QUEEN (figs 5-8). Black, much larger than the worker. Mandibles, antennae, legs, pubescence and pilosity about as in the worker. The rest as follows:
1) Clypeus with a median, bicarinate portion which is flat and gradually slopes towards the mandibles.
2) Eyes well developed, close to the middle of the sides of the head.



Figs 5-8. *Liomyrmex gestroi*, queen: 5 - body profile; 6 - head, dorsal view; 7 - petiole and postpetiole, dorsal view; 8 - fore wing (pilosity and weak sculpture omitted; in 7 setae are shown).

3) Ocelli small, their distance from one another greater than their maximum diameter.
4) Alitrunk distinctly elongate, a little narrower than the head. Parapsidal furrows weak. Axillae well separated, linked by a narrow strip; but the suture between axillae and scutellum is obliterated in the middle. Propodeum unarmed.
5) Propodeal spiracle of ordinary size: proportionally much smaller than in the worker.
6) Petiole with a very large ventral lobe and a transverse, dorsally flattened node. In dorsal view the latter has posteriorly divergent sides and prominent angles.
7) Postpetiole massive, wider than long; its node is deeply concave anteriorly.
8) Gaster elongate.
9) Integument not so smooth as in the worker. Piligerous pits are a little less sparse and more developed. Such pits are very evident on the katepisternum and on the propodeum. A series of thin rugulae run from the metapleural gland orifice to the posterior portion of the katepisternum.
10) Colour piceous black; mandibles, antennae, anterior margin of the head, and legs from the coxo-trochanteral articulation, ferrugineous.
11) Pubescence as in the worker; but quite abundant on the propodeum.
12) Pilosity sparse as in the worker. A pair of macrochetae occur on the scutellum.
13) Fore wing with closed radial and cubital cells; discoidal cell present and large. cu-a vein interrupted by the vannal fold. Wings appearing somewhat slightly infuscated.

MALE (figs 9-12). Black, winged and of the size of a large worker.
1) Mandibles short, overlapping and with three well developed teeth at the apical margin.
2) Clypeus with two lateral carinae, which are not so developed as in the female castes. A short transverse sulcus is present posteriorly.
3) Frontal lobes absent, toruli exposed.
4) Frontal triangle recognisable but with confused margins because of the small rugae present in that area.
5) Antenna with 12 segments. Scape short, as long as the second funicular segment. All of the funicular segments, excluding the pedicel, are longer than wide.
6) Eyes large, closer to the mandibles than to the vertex.
7) Ocelli quite large, distance from one another about equal to their maximum diameter.
8) Alitrunk narrow, yet not so elongate as in the queen. Notauli absent, parapsidal furrows present. Axillae separated in dorsal view, although closely approaching in the middle. Scutellum a little bulging in profile.
9) Propodeum obtusely tubercled at both sides between the dorsum and the declivity.
10) Propodeal spiracle relatively small.
11) Legs long and slender.
12) Petiole in profile with a rounded, triangular node.
13) Postpetiole distinctly wider than the petiole.
14) Gaster relatively small.
15) Fore wing with the same venation as in the queen; yet it is relatively distinctly shorter and wider and the radial cell appears open. Wings hyaline.
16) Pilosity (but see below) and pubescence sparse as in the females.
17) Sculpture more developed than in females. The head is mostly longitudinally rugulo-



Figs 9-12. *Liomyrmex gestroi*, male: 9 - body profile; 10 - head, dorsal view; 11 - antenna; 12 - fore wing (pilosity and sculpture omitted).

se and sublucid. The upper frons and vertex are finely reticulate punctate and nearly matt. Rest of the body smooth with a feebly developed reticulated sculpture. Side of the alitrunk with a stronger reticulum. Axillae and scutellum strongly, somewhat longitudinally, reticulate and subopaque; also, the scutellum has some distinct, although not deep, punctures. 18) Colour black. Mandibles and appendages brown.

N.B. the single male available is a syntype of *Liomyrmex froggatti* Donisthorpe. Although the specimens is quite well preserved, some features appear somewhat difficult to recognize. Hairs are absent (abraded?) from most of the body, even where females have them. Also, terminalia could not be dissected.

Liomyrmex gestroi (Emery)

Myrmica caeca F. Smith, 1860: 108 [junior primary homonym of *Myrmica caeca* Jerdon, 1851: 116]. Syntype workers, NEW GUINEA, Dory (BMNH) [examined]. [Synonymy with *gestroi* by Bolton, 1995: 248].
Liomyrmex caecus (F. Smith) Mayr, 1865: 23 [first combination in *Liomyrmex* of *Myrmica caeca* F. Smith].
Laparomyrmex gestroi Emery, 1887: 461, pl. 2, fig. 16. Holotype queen, NEW GUINEA: Fly River, 1876-77 (*L.M. D'Albertis*) (MCSN) [examined]. [First available replacement name].
Liomyrmex aurianus Emery, 1889: 504. Syntype workers: MYANMAR (=BURMA), Tenasserim, Meetan, iv.1887 (*L. Fea*) (MCSN, MHN) [examined]. **n. syn.**
Liomyrmex gestroi (Emery) Dalla Torre, 1893: 63 [combination in *Liomyrmex* of *Laparomyrmex gestroi* Emery].
Liomyrmex carinata Stitz, 1911: 366, figs 13, 14. Holotype queen, NEW GUINEA: Pauwi, 2-11.vi.10 (*S.G. Moszkowski*) (MNHU) [examined]. **n. syn.**
Promyrma butteli Forel, 1912: 764. Syntype queens: MALAYSIA, Selangor, Malacca, 823 m (*von Buttel*) (MHN) [examined]. [Synonymy with *aurianus* by Forel, 1913: 26]. **n. syn.**
Liomyrmex tagalanus Menozzi, 1925: 445, pl. 1, fig. 5. Holotype queen, PHILIPPINES: Mindanao, Kolambugan (*C.F. Baker*) (MCZ) [examined]. **n. syn.**
Liomyrmex froggatti Donisthorpe, 1940: 40, figs 1-3. Syntype queen and male, NEW GUINEA: (no locality) Hy 408 (*J.L. Froggatt*) (BMNH) [examined]. **n. syn.**
Liomyrmex froggatti ssp. *major* Donisthorpe, 1941: 204. Holotype queen, PHILIPPINES: (no locality) no. 47.22 (*Stephenson*) (BMNH) [examined]. **n. syn.**
Liomyrmex reneae Donisthorpe, 1948: 293, fig. 1. Syntype workers, NEW GUINEA: Maffin Bay, 10.vi.1944 and 20.vi.1944 (*E.S. Ross*) (BMNH; CAS) [examined]. **n. syn.**
Liomyrmex taylori Tiwari & Jonathan, 1986: 88, fig. 1. Holotype and paratype workers, INDIA: South Andaman Is., Port Blair, South Point, 17.xii.1975 (*P.K. Maity* and *Party*) (Zoological Survey of India) [not seen]. **n. syn.**

WORKER: TL 2.8-3.9, HL 0.71-0.90, HW 0.65-0.85, CI 87-98, SL 0.32-0.41, SI 46-52, AL 0.81-1.08, PW 0.41-0.54, PeW 0.25-0.32, PeI 36-41 (59 measured).
QUEEN: TL 9-11 ca. (some specimens with an extended gaster), HL 1.35-1.50, HW 1.25-1.36, CI 89-94, SL 0.60-0.63, SI 46-48, AL 2.60-2.84, ScW 1.16-1.20, PeW 0.70-0.80, PeI 54-60 (5 measured).

This ant is remarkably uniform all over its range. The size varies considerably in single series and large workers tend to have a high CI and a more trapezoidal head, distinctly wider behind than in front.

Slight variation occurs in the pilosity. Rarely a true humeral seta may occur in addition to the usual prehumeral one; the pair of long clypeal hairs is sometimes directed upward rather than forward. Some workers have two pairs of setae on postpetiole instead of the usual one pair. Also, some hairs may be easily lost (by abrasion?).

The subpetiolar process shows slight variation in shape and size: appearing more keel-like in some, more digitiform in others; but there is no zoogeographical separation of the extremes. Also, in several nest series some variation in shape and size is plainly visible.

Body colour varies from light yellowish-brown to mid-brown.

Unfortunately we could not see type-material of *Liomyrmex taylori* Tiwari & Jonathan. The original description reports a comparison with *L. reneae* Donisthorpe, yet the diffe-

rences cited seem quite weak. Moreover, the worker figured by the authors is very similar to most specimens examined by us. As *Liomyrmex* is very widespread in the Oriental and Indo-Australian regions, we are quite confident that *L. taylori* is another straightforward synonym of *L. gestroi.*

BIOLOGY. A species of forest leaf-litter and topsoil, but few reports are available. Wheeler (1914) cited a letter of C.F. Baker from Philippines saying that *Liomyrmex* was: "abundant with termites - living in the same chambers with these in entire amity"; in the MCZ collection there are two specimens of Baker's series with a termite mounted on the same pin. Later, Wilson (1953) briefly defined *Liomyrmex* as "thief-ants".

One of us (B.B.) found this species in W Malaysia under a log and sharing a gallery with termites.

Lastly, B.B. Lowery (unpublished) found the species in a rotten log, not mentioning the presence of any termite.

Unfortunately the relationship of *Liomyrmex* to termites remains uninvestigated: *Liomyrmex* may be a specialised predator of isopterans; yet Wheeler (l.c.), based on Baker's comments, suggested that the association might be more intimate than a merely termite-ant predator one.

MATERIAL EXAMINED (other than type specimens). MYANMAR: Tenasserim, Meetan (*Fea*). VIETNAM: Muong Moun (*R.E. Wheeler*). THAILAND: Khao Yai Nat. Park (*I. Löbl & D. Burckhardt*); Chanthaburi Prov., Khao Soi Dao (*Sk. Yamane*). W. MALAYSIA: Cameron Highlands (*B. Bolton*); Malacca. SINGAPORE (*Sk. Yamane*). BRUNEI: Tasek Merimbum (*K. Eguchi*). INDONESIA: W Java, Ujung Kulon N. P., Cibom (*F. Ito*); W Bali, Jelati Mendaya, Dusun PK (*K. Eguchi*); Sulawesi, Utara, Dumoga-Bone Nat. Park (*P. Hammond*); Flores I., Nangagete (*W.L. Brown*). PHILIPPINES: Dumaguete (*J.W. Chapman*); Dumaguete (*D. Empeso*); Luzon, Mt. Makiling (*S.M. Cedena*); Mt. Makiling (*Baker*). PAPUA NEW GUINEA: Maffin Bay (*E.S. Ross*); Bulolo (*R.W. Taylor*); Bulolo (*B.B. Lowery*).

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