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Taxonomic Studies on the Genus *Myrmoteras* Forel (Hymenoptera:Formicidae), with Description of Two New Species from India

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ABSTRACT

The Indian species of the genus *Myrmoteras* Forel are studied taxonomically. A total of 5 species are recognized from India, including 2 species described as new. These are: *M. agostii* sp. n.*, M. brachygnathum* Moffett, 1985, *M. indicum* Moffett, 1985, *M. moffetti* sp.n. and *M. scabrum* Moffett, 1985. Male of *M. brachygnathum* is here described for the very first time. A revised key to the Indian species is also provided.

Key words: Ants, new species, Formicidae, *Myrmoteras,* key, taxonomy, male, Kerala, India.

INTRODUCTION

Myrmoteras Forel, 1893 is among the most distinctive of the tropical Asian ant genera, and represents perhaps the most aberrant genus in the subfamily Formicinae worldwide (Moffett, 1986). The genus is currently represented by 39 species (Bolton, 2014) and is distributed in Oriental region and the Austro-Malayan subregion of the Australian region (Bui *et al.* 2013). Most of the species are reported from Indonesia followed by Malaysia, Thailand, Philippines, India, Vietnam, Myanmar, Sri Lanka and China.

Pioneer contributions to the genus were made by Bingham (1903), Wheeler (1919), Creighton (1930) and Gregg (1954). Moffett (1985) carried revision of the genus in full and divided it into two subgenera (*Myrmoteras* s.str. and *Myagroteras*). He added 10 new species and redescribed 8 previously known species. Agosti (1992) revised the genus from Malay Archipelago and, described 13 new species. Zettel and Sorger (2011) described 2 new species of the genus from Philippines. Recently Bui *et al.* (2013) revised the Indo-Chinese species of the genus and described 5 new species. Herein, two new species of the genus *Myrmoteras* are described and male of *Myrmoteras brachygnathum* is also described for the first time.

MATERIALS AND METHODS

The specimens were collected from Periyar Tiger Reserve Forest and Salim Ali Bird Sanctuary, Kerala mainly by hand picking and Winkler methods. Taxonomic analysis

was conducted by using Nikon SMZ 1500 stereo zoom microscope. Photographs were taken with digital camera attached to the microscope with Auto-Montage (Syncroscopy, Division of Synoptics, Ltd.) software. The description pattern, terminology and measurement of various sclerites followed are after Moffett (1985). The following abbreviations are used: HW=Head width (maximum width of head, in full-face view behind eyes (excluding eyes)); HL=Head length (maximum length of head, in full-face view excluding mandibles, measured at full-face view along midline, from anterior clypeal margin to posterior margin of occipital lobe); SL=Scape length (measured in straight line, excluding basal condyle); EL=Eye length (maximum diameter of eye); ML=Mandibular length (length of closed mandible measured in straight line from apex of mandible to lateral clypeus tooth on the same side); PTL=Petiole length (maximum length of the petiole in profile view); PW=Pronotal width (maximum width of pronotum in dorsal view); HFL=Hind femur length (maximum length of the hind femur); WL= Weber length (diagonal length of mesosoma in lateral view, from frontal-most point of declivitous area of pronotum to posterior-most point of apex of metapleural lobe); GL=Gaster length (length of the gaster in lateral view from the anterior most point of first gastral segment to the posterior most point); TL=Total length (ML+HL+WL+PTL+GL); CI= Cephalic index (HW/HL); MI=Mandibular index (ML/HL×100); EI=Eye index (EL/HW×100); SI=Scape index (SL/HW×100); TWI=Tibial width index (Maximum width of the middle tibia in lateral view divided by its maximum length).

The following acronyms are used for depositories:

BMNH= The Natural History Museum, London, England.

PUAC= Ant Collection, Department of Zoology and Environmental Sciences, Punjabi University Patiala, India.

RESULTS

***Myrmoteras agostii* sp.n. (Figs. 1-3)**

Type material. Holotype and paratype (worker). INDIA: KERALA: Periyar tiger reserve, Manalar, 9°35`N, 77°18`E, 1630m a.m.s.l., 24.x.2011, hand picking, Coll. Shahid A. Akbar. Holotype and paratype deposited in PUAC.

Measurements (holotype in brackets): TL 4.52-4.62(4.62), HW 1.03-1.05(1.05), HL 0.88-0.90(0.90), CI 116-117(116), ML 1.19-1.20(1.20), MI 133-135(133), SL 1.09-1.12(1.12), SI 105-106(106), EL 0.24-0.27(0.27), HFL 1.25-1.27(1.27), PTL 0.21-0.22(0.22), TWI 14-15(15), WL 1.24-1.27(1.27), EI 23-25(25), GL 1.00-1.01(1.01), PW 0.58-0.60 (0.60) (n=2).

Description. Head 0.15 × as broad as long; blunt ridge on temple separates flat anterior from slightly convex posterior face; medial frontal sulcus deeply impressed posteriorly reaching anterior ocellus and anteriorly up to margin of frons; clypeus with anterior margin concave and posteriomedially prominently elevated; mandibles long with 14 teeth consisting of 4 large and 10 small teeth (mandibular teeth count include the preapical and apical denticles); maxillary palp 5- and labial with 3-segmented.

Antennal scrobes indistinct; antennae with slender funiculus, each segment about 2x as long as broad.

Mesosoma. Pronotum with high convex summit, higher than mesonotum; metanotum groove conspicuously impressed; propodeum highly convex. Legs with middle and hind tibiae slender.

Metasoma. Petiole node moderately thick with steep anterior and posterior faces; ventral outline of petiole beneath the node convex. Gaster small and rounded.

Sculpture. Head and occiput mostly smooth and shiny; three to four rugae originating posterio-medially of torulus; frons, temples and vertex smooth and shiny; mandibles smooth. Mesonotum dorsally with longitudinal rugae; propodeum with transverse striations. Gaster smooth and shiny.

Vestiture. Body pilosity prominent, erect hairs (ca. 0.15mm) distributed evenly throughout its surface; body surface also with short suberect hairs. Apical funicular segments, mandibles and legs with small standing hairs.

Colour. Body largely light brown. Legs, antennae, palpi and mandibles yellow; gaster pale yellow.

Etymology. The species is named in honor of Donat Agosti for his contributions to the genus *Myrmoteras* Forel.

Differential diagnosis. The new species shares most affinities with *M. tonboli* Agosti, 1992. The two species can be easily separated from each other by combination of following characters: In *M. agostii* sp.n., body is light brown coloured, mesonotum without any transverse rugae; propodeum and metanotum dorsally with transverse striations; pilosity prominent throughout the body, and mandibles relatively shorter (ML 1.20, MI 135) whilst *M. tonboli*, the body dark brown coloured; mesonotum dorsally with transverse rugae; propodeum dorsally smooth and shiny; pilosity reduced, and mandibles relatively longer (ML 1.64, MI 164). The new species is also somewhat close to *M. cuneonodum* Xu, 1998. The two species can be easily separated from each other by combination of following characters. In *M. cuneonodum*, head dorsum medially finely rugose, gena with short oblique rugae and petiolar node in lateral view with vertical anterior face and steep posterior slope; ventral outline of petiole beneath the node concave whilst *M. agostii* sp.n., head dorsum medially smooth, gena smooth and petiole node thick with steep anterior and posterior faces; ventral outline of petiole beneath the node convex.

***Myrmoteras brachygnathum* Moffett, 1985 (Figs. 4-12)**

Diagnosis. M. brachygnathum belongs to subgenus *Myrmoteras* s.str. The subgenus is characterized by the labrum having pointed anterior margin with long trigger hairs, relatively shorter mandibles and weakly developed frontal sulcus. *M. brachygnathum* is easily separated from closely related *M. ceylonicum* Gregg, 1957 and *M. scabrum* Moffett, 1985 by the lack of sculpture on the head and pronotum. Male of *M. brachygnathum* is here described for the first time. For description and comparative account see (Moffett, 1985; Pages. 26-27, Figs. 19, 22, Map 1).

Male description: Measurements. TL 3.45-3.53, HW 0.66-0.69, HL 0.71-0.73, CI 92-94, SL 1.04-1.05, ML 0.28-0.29, MI 39-40, SI 152-157, PTL 0.33-0.35, EL 0.33-0.34, HFL 0.99-0.10, TWI 11-12, WL 1.05-1.07, EI 49-50, GL 1.08-1.09, PW 0.60-0.63 (n=2).

Material examined: 2 ♂♂: INDIA: KERALA: Salim Ali Bird Sanctuary, 10°45`N, 76°44`E, 118m a.m.s.l., 10.x.2011, Winkler method, Coll. Shahid A. Akbar. Deposited in PUAC.

Description. Head 0.04 × as long as broad, excluding the large convex compound eyes. The mandible reduced to a triangular peg like structure with apex simple and acute. Frontal sulcus feebly impressed at medial line. Palpi segmentation 3, 2. Antennae slender, 13-segmented; antennal scrobes absent. Mesonotum with reduced notauli; scutellum disc shaped and raised. Legs with claws simple. Gaster elongated; terminalia retracted; pygidium broadly rounded. Petiole node more slender than that of worker. Genitalia with parameres exerted out and prominent.

Sculpture. Head smooth and shiny with reduced frontal sulcus. Pronotum dorsum smooth but, lateral side's rugulose; mesonotum and metanotum with similar sculpture. Metasoma smooth and shiny.

Vestiture. Head mostly devoid of any erect pilosity, some erect hairs ca 0.14mm along posterior margins of head; hairs on mesosoma similar to that of head; gaster with number of erect hairs.

Colour. Body uniformly dark brown with appendages brown.

***Myrmoteras indicum* Moffett, 1985 (Figs. 13-21)**

Diagnosis: *M. indicum* belongs to subgenus *Myagroteras* and is characterized by the labrum having rounded anterior margin with pair of short conspicuous hairs instead of long trigger hairs (characteristic of subgenus *Myrmoteras*), strongly developed frontal sulcus and relatively longer mandibles (ML 1.20). *M. indicum* shares most affinities with *M. bakeri* Wheeler, 1919 and *M. diastematum* Moffett, 1985. *M. indicum* can be distinguished from *M. bakeri* by having a single apical denticles and relatively slender tibiae (TWI < 21) and from *M. diastematum* by the lack of wide sulcus between the clypeus and head capsule; and from both species by the reduced palpal segmentation. See Moffett (1985; Pages. 37-39, Figs. 4, 7-10, 27, 30, Map 2).

***Myrmoteras moffetti* sp. n. (Figs. 22-24)**

Type material. Holotype and 2 paratypes (worker): INDIA: KERALA: Periyar tiger reserve, Thanikkudy, 9°.30`N, 77°.16`E, 1003m a.m.s.l., 15.x.2011, hand picking method, Coll. Shahid A. Akbar. Holotype and paratype in PUAC, one paratype will be deposited in BMNH.

Measurements (Holotype in brackets). TL 4.90-5,03(5.03), HW 1.01-1.04(1.03), HL 0.92-0.94(0.94), CI 109-110(109), ML 1.50-1.52(1.52), MI 161-163(161), SL 1.03-1.05(1.04), SI 100-101(100), PTL 0.16-0.18(0.18), EL 0.27-0.29(0.29), HFL 1.10-1.13(1.13), TWI 18-19(19), WL 1.32-1.35 (1.35), EI 26-28(28), GL 1.00-1.04(1.04), PW 0.65-0.67(0.68) (n=3).

Description. Head 0.09× as broad as long; blunt ridge on temple separates flat anterior from slightly convex posterior face; medial frontal sulcus deeply impressed posteriorly reaching anterior ocellus and anteriorly up to margin of frons; clypeus with anterior margin concave and posteriomedially prominently elevated; mandibles long with 14 teeth consisting of 5 large and 9 small teeth (mandibular teeth count include the preapical and apical denticles); maxillary palp with 5- and labial palp 3-segmented. Antennal scrobes indistinct; antennae with slender funiculus, each segment about 2× as long as broad.

Mesosoma. Pronotum with summit gently convex, slightly higher than mesonotum; metanotum groove conspicuously impressed; propodeum feebly convex and with summit virtually level with mesothorax. Legs with middle and hind tibiae slender.

Metasoma. Petiole node moderately thick with anterior face straight and posterior face less steep and curving gently into summit; summit rounded and moderately wide. Gaster small and rounded.

Sculpture. Mandibles smooth. Head and occiput smooth and shiny, with the exception of three to four rugae originating posteriomedially of torulus. Frons, temples and vertex smooth and shiny. Pronotum smooth and shiny; mesonotum, metanotum and propodeum strongly granulo-rugose; gaster smooth and shiny.

Vestiture. Body pilosity reduced; moderate, short suberect hairs distributed evenly throughout the body. Head with the longest hair, ca. 0.15mm. Apical funicular segments, mandibles and legs with small standing hairs.

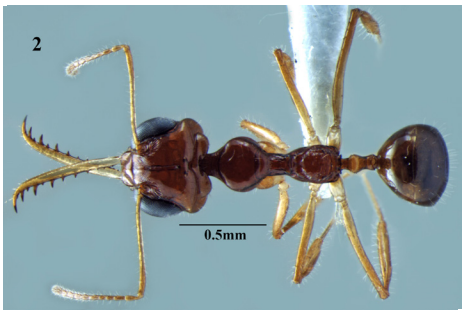
Colour. Body uniformly dark brown. Mandibles and antennae yellow with tint of brown; palpi yellow. Legs largely yellow with trochanter brown.

Etymology. The species is named in honor of Mark Moffett, for his contributions to the genus *Myrmoteras* Forel.

Differential diagnosis. M. moffetti sp. n. is similar to *M. bakeri* Wheeler, 1919 in most of the characters but, differs from the later species mainly by following characters: body dark brown; mandibles with 14 teeth with two apical denticles, pronotum smooth and shiny without longitudinal rugae, dorsum of mesothorax granulo-rugose and relatively slender tibiae (TWI <21) whilst in *M. bakeri*, body light brown; mandibles with11-12 teeth with two apical denticles, pronotum with longitudinal rugae, dorsum of mesothorax loosely granulated and relatively dilated tibiae (TWI>23). The new species also shares some affinities with another Indian species *M. indicum*. However, the two species are easily separated by combination of characters provided in the key.

***Myrmoteras scabrum* Moffett, 1985 (Figs. 25-27)**

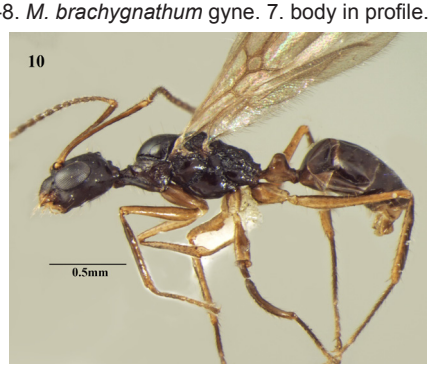
Diagnosis: *M. scabrum* is a very distinct species belonging to subgenus *Myrmoteras* s.str. *M. scabrum* is easily identified with its conspicuously sculptured head and mesosoma. *M scabrum* can be distinguished from closely related *M. ceylonicum* Gregg, 1957 by its larger size; stronger granulo-rugose sculpture; conspicuous mandible bend; convex pronotum; node of petiole wider than tall and much darker colouration. See Moffett (1985; Pages. 30-31, Figs. 21, 24, Map 1).



Figs. 1-2. *M. agostii* sp.n., holotype. 1. body in profile. 2. body in dorsal view.

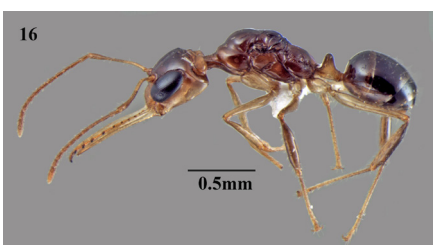
Figs. 4-5. *M. brachygnathum* worker. 4. body in profile. 5. body in dorsal view.

Figs. 7-8. *M. brachygnathum* gyne. 7. body in profile. 8. body in dorsal view.

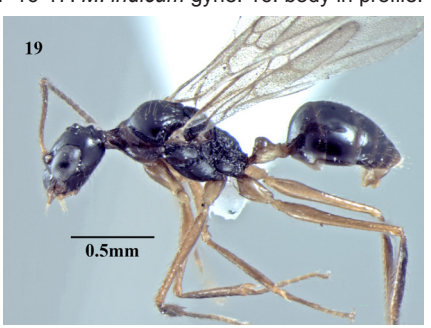


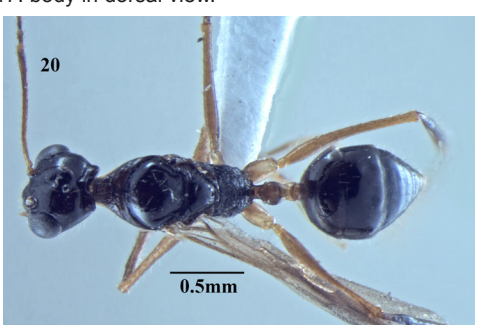
Figs. 10-11. *M. brachygnathum* male. 10. body in profile. 11. body in dorsal view.

Figs. 13-14. *M. indicum* worker. 13. body in profile. 14. body in dorsal view.



Figs. 16-17. *M. indicum* gyne. 16. body in profile. 17. body in dorsal view.

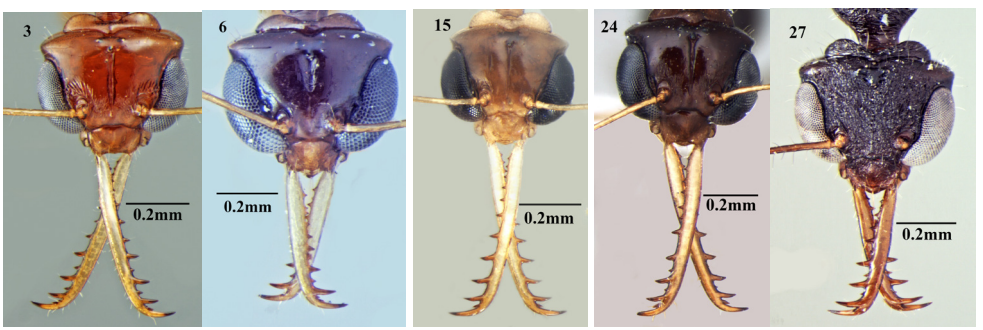




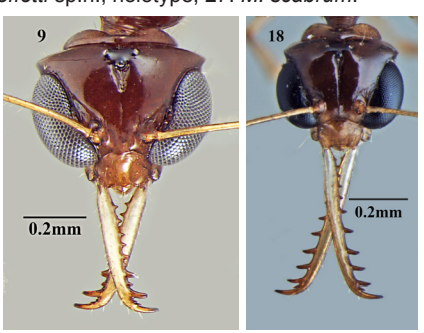
Figs. 19-20. *M. indicum* male. 19. body in profile. 20. body in dorsal view.

Figs. 22-23. *M. moffetti* sp.n., holotype. 22. body in profile. 23. body in dorsal view.

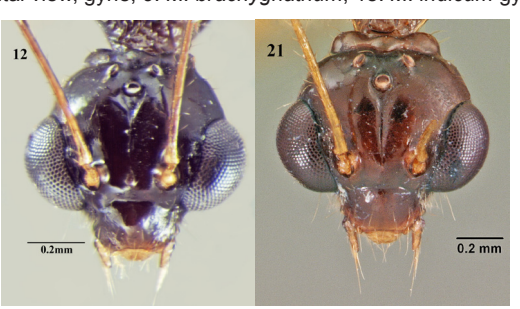
Figs. 25-26. *M. scabrum* worker. 25. body in profile. 26. body in dorsal view.



Figs. 3, 6, 15, 24, 27. Heads in frontal view, workers; 3. *M. agostii* sp.n., holotype; 6. *M. brachygnathum*; 15. *M. indicum*; 24. *M. moffetti* sp.n., holotype; 27. *M. scabrum*.



Figs. 9, 18. Heads in frontal view, gyne; 9. *M. brachygnathum*; 18. *M. indicum* gyne.



Figs. 12, 21. Heads in frontal view, male; 12. *M. brachygnathum*; 21. *M. indicum*.

Key to Indian species of *Myrmoteras* based on worker caste modified after Moffett (1985)

1. Middle of labrum with a pair of long triggered hairs; surface of labrum visible in full face view conspicuously projecting, more or less triangular; frontal sulcus very feeble or absent (Subgenus *Myrmoteras*)……..……..……..…2

- Middle of labrum without triggered hairs; surface of labrum visible in full face view rounded or truncated, not strongly projecting; frontal sulcus on head usually prominent (Subgenus *Myagroteras*)…...……..……..…3

2. Head dorsum smooth……..……..……..*M. brachygnathum* Moffett

- Head dorsum strongly granulo-rugose…….……*M. scabrum* Moffett

3. Mandible with 12 teeth with single apical denticle (mandibular tooth count including the preapical and apical denticles); palpi segmentation (4)3,3; in full frontal view, head and occiput smooth and shiny……*M. indicum* Moffett

- Mandible with 14 teeth with two apical denticles (mandibular tooth count including the preapical and apical denticles); palpi segmentation 5,4; in full frontal view, head with occiput smooth and shiny with the exception of three to four rugae that originate from posterior to middle of the torulus ……..……...……..….4

4. Body uniformly light brown, coxae and femora pale yellow; sculpture on mesosoma not distinct; mesonotum with few longitudinal rugae; propodeum with few transverse striations, highly convex with summit virtually higher than mesothorax; rest of mesosoma smooth and shiny……...…*M. agostii* sp.n.

- Body dark reddish; coxae and femora dark brown; sculpture on mesosoma prominent; pronotum smooth; propodeum feebly convex with summit virtually at the level of mesothorax; rest of mesosoma granulo-rugose……..... *M. moffetti* sp.n.

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