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## A NEW SPECIES OF *PROBOLOMYRMEX* FROM MADAGASCAR

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### ABSTRACT

The worker and queen of *Probolomyrmex tani* (sp. nov.) from Madagascar are described. This is the first record of the genus from the Malagasy region. *P. tani* is widespread throughout western Madagascar but rare in collections. Collection data indicate that this species nests and forages in soil or litter in a range of habitats from montane forest to dry spiny bush. *P. tani* is most similar in size and general shape to *P. guineensis* found in western and central Africa.

**Key words:** Hymenoptera, Formicidae, *Probolomyrmex tani*, Madagascar, taxonomy, new species, littoral forest.

## INTRODUCTION

*Probolomyrmex* was revised globally by Taylor (1965). Additional species were subsequently described from the Neotropics (Agosti, 1994; O'Keefe & Agosti, 1997) and the Oriental region (Tanaka, 1974; Brown, 1975; Terayama & Ogata, 1988). This paper describes a new species and the first record of the genus from the island of Madagascar. The genus *Probolomyrmex* was placed in the subfamily Proceratiinae by Bolton (2003). This placement has been confirmed by molecular work (Ouellette *et al.*, 2006). As in other regions, *Probolomyrmex* in Madagascar is cryptic and rarely collected using the traditional arsenal of ant collecting methods (sifted litter, hand collecting, pitfall, Malaise, light trap, and beating low vegetation). Over 6,000 leaf litter samples, 4,000 pitfalls and 8,000 additional hand collecting events throughout Madagascar from 1992-2004 turned up only 25 specimens from nine localities.

## MATERIAL AND METHODS

The following species of *Probolomyrmex* were examined from Africa and Asia for comparison with specimens from Madagascar: *bidens* (specimens from India), *filiformis* (specimen from South Africa), *guineensis* (specimens from Guinea, Ivory Coast, Cameroon, Gabon, Central African Republic, Democratic Republic of Congo), and *ponce* (specimens from India). All species and type material examined in this study have been imaged and are available on AntWeb ([www.antweb.org](http://www.antweb.org)). Material was deposited at California Academy of Sciences, San Francisco (CASC) and Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts (MCZC).

Digital images (Fig. 1-6) were created using a JVC KY-F75 digital camera and Syncrosopy Auto-Montage (v 5.0) software. All metric measurements were taken at 80× power with a Leica MZ APO microscope using an orthogonal pair of micrometers and recorded to the nearest 0.001 mm and rounded to two decimal places for presentation. Measurement indices and their abbreviations used in the paper are based on those used by Taylor (1965). Size and the shape of the petiolar node are the most important characters for the identification and delimitation of *Probolomyrmex* species. Both Brown (1975) and Agosti (1994) found the node measurements petiolar height (PH) and petiolar length (PNL), as defined by Taylor, somewhat ambiguous (see definitions below). I include these measurements used by Taylor for comparison with species in other studies, but I also provided additional measurements (PNH and DPNL, see below). PNH does not include the subpetiolar process which is variable in species with a thin projecting cuticular tooth or lamella. DPNL measures the length of the petiolar node in dorsal view and includes only the posterior margin of the node and not the posteriormost extension of the petiolar tergum where it surrounds the gastric articulation.

|     |                                                                                                                                                                                 |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| HL  | Head length: maximum longitudinal length from the anteriormost portion of the projecting clypeus to the midpoint of a line across the back of the head.                         |
| HW  | Head width: maximum width of head, including the eyes in queens.                                                                                                                |
| LHT | Length of the hind tibia, measured in dorsolateral view, from the articulation with the femur, excluding the proximomedial condyle, to the distal extremity of the tibia.       |
| CI  | Cephalic index: $HW/HL \times 100$ .                                                                                                                                            |
| SL  | Scape length: maximum chord length excluding basal condyle and neck.                                                                                                            |
| SI  | Scape index: $SL/HW \times 100$ .                                                                                                                                               |
| WL  | Weber's length: in lateral view of the mesosoma, diagonal length from posteroventral corner of mesosoma to the farthest point on anterior face of pronotum, excluding the neck. |
| PW  | Pronotum width (workers only): maximum width of pronotum in dorsal view.                                                                                                        |
| MW  | Mesonotal width (queen only): maximum width of mesoscutum in dorsal view.                                                                                                       |
| DPW | Dorsal petiolar width: maximum width of the petiole in dorsal view.                                                                                                             |
| PNI | Petiolar node index (workers only): $DPW/PW \times 100$ .                                                                                                                       |

|      |                                                                                                                                                                                                                                                                                                                            |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PH   | Petiole height: maximum height of petiolar segments in side view, measured vertically from the posteroventral corner of the subpetiolar process to the level of the petiolar apex.                                                                                                                                         |
| PNH  | Petiole node height: maximum height of petiolar node in side view, measured vertically from a line tangent to the posterior and anteriormost points of the tergosternal suture to the level of the highest point on the node.                                                                                              |
| PNL  | Petiole node length: maximum length of the node, measured longitudinally from the level of the spiracular process to that of the posteriormost extension of the petiolar tergum, where it surrounds the gastric articulation.                                                                                              |
| DPNL | Petiole node length: in dorsal view, maximum length of the node, measured from the anterior margin of the node (excluding articulation with propodeum) to the posteriormost dorsal margin of node. If anterior or posterior margin is concave, the length is measured from the midpoint of a line drawn across the margin. |
| LPI  | Lateral petiolar index: $PNL/PH \times 100$ .                                                                                                                                                                                                                                                                              |
| LPNI | Lateral petiolar node index: $DPNL/PNH \times 100$ .                                                                                                                                                                                                                                                                       |
| TL   | Total length: sum of HL + WL + PNL + length of gaster in lateral view (abdominal segment III to the apex of last visible abdominal segment, usually pygidium)                                                                                                                                                              |

*Probolomyrmex tani*, new species

Figures 1-7

**TYPE MATERIAL**

**Holotype** worker, Madagascar: Prov. Antsiranana, Forêt d'Analabe, 30.0 km 72° ENE Daraina, 13°05'00"S, 049°54'30"E, 30m, 27 Nov 2003, littoral rainforest, (coll. B.L. Fisher et al.) Collection code: BLF9426, specimen code: CASENT0041505, (CASC) **Paratypes:** 1 worker and 1 dealate queen with same data as holotype but with specimen codes CASENT0041506 (1dQ) (CASC) and CASENT0041507 (1w) (MCZC).

**ETYMOLOGY**

The specific name is an arbitrary combination, to be treated as a noun in apposition.

**DESCRIPTION**

**Worker** Measurements (mm): maximum and minimum based on all specimens,  $n = 22$ , (holotype), [paratype].

TL 2.3-2.76 (2.5) [2.5], HL 0.55-0.64 (0.60) [0.59], HW 0.37-0.43 (0.40) [0.40], LHT 0.34-0.46 (0.39) [0.39], CI 65-75 (67) [67], SL 0.36-0.44 (0.37) [0.37], SI 85-104 (91) [94], WL 0.69-0.87 (0.77) [0.75], PW (w) 0.28-0.36 (0.31) [0.31], DPW 0.17-0.22 (0.19) [0.19], PNI (w) 56-69 (62) [61], PH 0.25-0.32 (0.28) [0.27], PNL 0.24-0.32 (0.27) [0.28], LPI 86-104 (96) [104], PNH 0.20-0.23 [0.22], DPNL 0.20-0.25 [0.25], LPNI 96-117 [117].

Characters of *Probolomyrmex* worker as described by Brown (1975: 7). In full face view, posterior margin of head straight, lateral margins convex, posterolateral corners rounded. Mandible with apical tooth followed by a series of 6 small denticles. Palp formula 4,2. Eyes absent. Antennae 12 segmented.

General form of mesosoma and petiole as in figure 5. Dorsal outline of mesosoma in profile more or less straight, posterolateral corners of propodeum with blunt angles; posterior declivity of propodeum weakly concave in dorsal view. Dorsal sutures of mesosoma absent. Posterior face of petiolar node in lateral view more or less straight, with only a slight concave impression and enclosed laterally and dorsally by a low carina. Subpetiolar process developed as in figure 2; posteroventral portion projected into an acute angle (shape of posteroventral lamella variable in shape in specimens examined), without an acute tooth.

Cephalic dorsum with distinct punctures that overlay a surface of fine superficial punctures; both sizes of punctures separated by distances about equal to their average diameters. Superficial punctures also present on mesosoma and metasoma but less distinct. Mesosomal dorsum overlain with larger punctures similar in size to those on dorsum of head. Sides of mesosoma, petiole, and abdominal segments III and IV with shallow foveolate punctures. Head, mesosoma, metasoma finely shagreened and moderately shining. Pilosity typical for the genus and limited to opening of metapleural gland and mandibles. Pubescence whitish, extremely fine, adpressed and present over entire body, most abundant on abdominal sternites III and IV, and least developed on dorsum of mesosoma and underside of head. Color reddish brown

**Queen** measurements (mm): maximum and minimum based on all specimens,  $n = 3$ , [paratype].

TL 2.4-2.6 [2.6], HL 0.56-0.60 [0.60], HW 0.40-0.47 [0.42], LHT 0.32-0.41 [0.41], CI 67-83 [67], SL 0.33-0.39 [0.39], SI 80-99 [99], WL 0.71-0.80 [0.80], MW 0.32-0.36 [0.34], DPW 0.16-0.23 [0.2], PH 0.27-0.31 [0.28], PNL 0.24-0.29 [0.29], LPI 82-91 [91] PNH 0.19-0.24 (0.20) [0.20], DPNL 0.21-0.29 (0.24) [0.25], LPNI 101-121 (125) [122].

Characters of *Probolomyrmex* queen as described by Brown (1975: 7). General features as in figures 2, 4, and 6. Eyes large (maximum length of compound eye: 0.10-0.12), not convex, situated anterior to the midline of the head. Form of head, mandibles, and petiolar node as in worker. Surface sculpture, pubescence and color developed as in worker. General form of mesosoma as in figure 2. Based on specimen CASENT0102226 from Berenty, wing venation highly reduced, as in previously described species (Taylor 1965).]

## DISTRIBUTION AND BIOLOGY

*P. tani* is infrequently collected but widespread throughout western Madagascar (Fig. 7). This species has been collected most often in lowland (>180 m) xeric habitats (littoral rainforest, tropical dry forest, and spiny bush). There are two examples, however, where the species has been collected in mesic forest: rainforest in Manongarivo (780m) and mountain rainforest in Binara (1100 m). These two localities are nested within the western dry forest ecoregion and are adjacent to dry forest habitats. There are no records of *Probolomyrmex* from the large block of mesic forest in eastern Madagascar.

The type locality is a littoral forest in northeastern Madagascar. This was chosen as the type locality to draw attention to the importance of littoral forest in Madagascar. The remnant patches of littoral forest habitat along the northeastern coast north of Antalaha, such as Analabe and Ambondrobe, are rich in ant species and contain many endemics, but are highly threatened and without protective status. These forest patches do not harbor important vertebrate taxa and thus have not received priority status for conservation in Madagascar. Their rich arthropod fauna, however, should be recognized as an important component of diversity for reserve design (Simons *et al.*, 2004).

The majority of specimens in this study were collected from sifted litter, but one specimen was obtained from under a stone, and one from a pitfall trap. These data suggest that this species nests and forages in soil or litter in a range of habitats from montane forest to dry spiny bush and rarely forages above ground. Unlike the other leaf litter nesting ants such as *Strumigenys* that demonstrate high species turnover across the island (Fisher 1999, 2000), *Probolomyrmex tani* has a wide distribution across many habitats. The subterranean habitat of this species may allow it to survive in a wide range of ecoregions.

## DISCUSSION

Two specimens from the southwest of Madagascar (Tsimanampetsotsa: CASENT0004401 (1w) and Berenty CASENT0102226 (1aQ)) differ from other specimens from the north in lacking distinct shallow punctures on the mesosoma and metasoma. The queen from Berenty is also notably smaller HL 0.56 HW 0.40, LHT 0.32, and SL 0.33. Though the size and sculpture differences are notable, I consider the variation to be intraspecific.

*P. tani* is most similar to *P. guineensis* Taylor from Africa in size, and general shape. Workers of *P. tani* may be easily distinguished from those of *P. guineensis* by the shape of the posterior margin of the petiolar node in lateral view. In *P. tani*, the posterior margin is more or less straight, with only a slight concave impression, while in most other species including, *P. guineensis*, it is distinctly concave. In addition, the lateral and dorsal carina that encloses the posterior face of the petiolar node is more developed in *P. guineensis* than in *P. tani*. *P. tani* is easily distinguished from other ant genera and species in Madagascar by the absence of eyes in worker, and the presence of frontal lobes reduced to a narrow, sharp ridge between antennal sockets with antennal insertions clearly visible when viewed from the front.

## OTHER MATERIAL EXAMINED

MADAGASCAR: Prov. Antsiranana, Forêt d'Anabohazo, 21.6 km 247° WSW Maromandia, 14°18'32"S, 047°54'52"E, 120m, tropical dry forest, 11-16 Mar 2001 (coll. Fisher et al.) - BLF3338: CASENT0458322 (1dQ), CASENT0458323 (1w); Forêt de Binara, 9.4km 235° SW Daraina, 13°15'48"S, 049°36'00"E, 1100m, montane rainforest, 5 Dec 2003 (coll. B.L.Fisher et al.) - BLF98000: CASENT0043467 (1w), CASENT0043468 (1w), CASENT0043471 (1w); Montagne des Français, 7.2 km 142° SE Antsiranana (=Diego Suarez), 12°19'22"S, 049°20'17"E, 180m, tropical dry forest, 22-28 Feb 2001 (coll. Fisher et al.) - BLF3123: CASENT0004400 (1w); R.S. Manongarivo, 12.8 km 228° SW Antanambao, 13°58'36"S, 048°25'24"E, 780m, rainforest, 11 Oct 1998 (coll. B.L.Fisher et al.) - BLF1862(15)-5 (1w); Mahajanga, Parc National d'Ankarafantsika, Ampijoroa Station Forestière, 40 km 306° NW Andranofasika, 16°19'15"S, 046°48'38"E, 130m, tropical dry forest, 26 Mar-1 Apr 2001 (coll. Fisher et al.) - BLF3522: CASENT0465467 (1dQ), CASENT0465863 (1w); Parc National d'Ankarafantsika, Ampijoroa Station Forestière, 5.4 km 331° NW Andranofasika, 16°17'56"S, 046°48'47"E, 70m (coll. Fisher et al.) - BLF3571: CASENT0469570 (1w), CASENT0469571 (1w), CASENT0469572 (1w), CASENT0469573 (1w), CASENT0469574 (1w), CASENT0469575 (1w), CASENT0469576 (1w), CASENT0469577 (1w), CASENT0469578 (1w), CASENT0469579 (1w); Parc National Tsingy de Bemaraha, 3.4 km 93° E Bekopaka, Tombeau Vazimba, 19°08'31"S, 044°49'41"E, 50m, 6-10 Nov 2001 (coll. Fisher et al.) - BLF4232: CASENT0477984 (1w), CASENT0477985 (1w), CASENT0477986 (1w); Toliara, Parc National de Tsimanampetsotsa, Forêt de Bemanateza, 20.7 km 81° E Efoetse, 23.0 km 131° SE Beheloka, 23°59'32"S, 043°52'50"E, 90m, spiny forest/thicket, 22-26 Mar 2002 (coll. Fisher et al.) - BLF6263: CASENT0004401 (1w); Toliara, Berenty 12 km N.W. Amboasary, 5-15.v.1983. (col. J.S.Noyes, M.C.Day) - BM.1983-201: CASENT0102226 (1aQ).

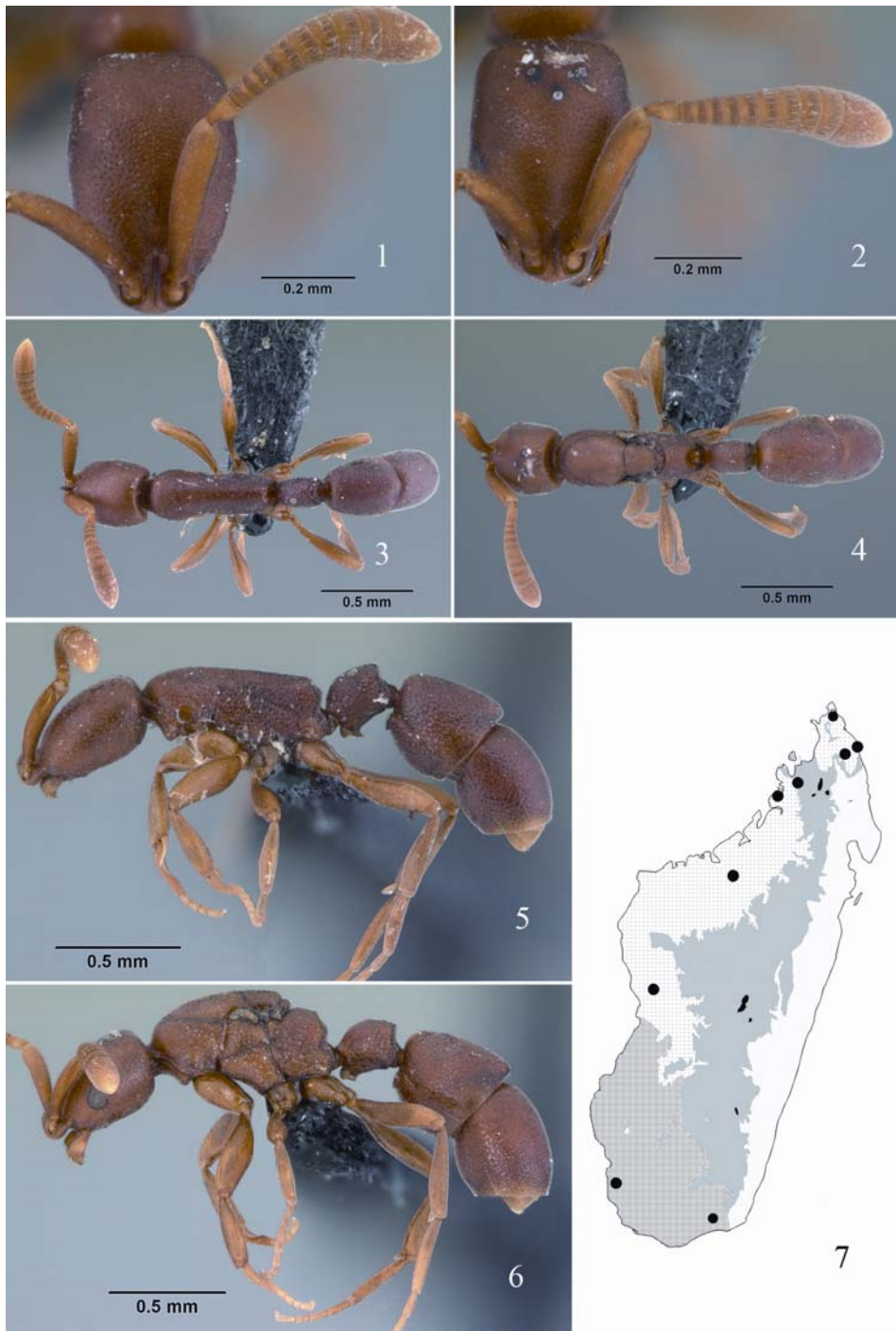
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**Figures 1, 3, 5:** *Probolomyrmex tani* worker: holotype CASENT0041505. **Figures 2, 4, 6:** *Probolomyrmex tani* queen CASENT0041506. **Figure 7:** Collection localities of *Probolomyrmex tani* in Madagascar. Map shows major ecoregions: east (white): rainforest, central (gray): montane forest; central (black): montane shrubland; west (hatch); southwest (gray hatch): desert spiny bush thicket.