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Prenolepis fisheri, an Intriguing New Ant Species, with a Re-description of *Prenolepis naoroji* (Hymenoptera: Formicidae) from India

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ABSTRACT

The taxonomy of Indian *Prenolepis* is discussed here for the first time in detail. *Prenolepis fisheri* sp. n., an intriguing species described as new, is the second species of the genus known from India, with only *Prenolepis naoroji* Forel, 1902 reported earlier. *P. fisheri* sp. n. resembles the Antillean *Prenolepis albimaculata* Santschi, 1930; *Prenolepis gibberosa* Roger, 1863 and *Prenolepis karstica* Fontenla, 2000, sharing with them the presence of ocelli in the worker caste. All castes of *Prenolepis naoroji* are addressed and a key is provided to separate the Indian species.

Key words: taxonomy, new species, ants, Formicinae, key, *Prenolepis fisheri* sp. n., Shivalik.

INTRODUCTION

Prenolepis Mayr is a small genus with 20 described species and six subspecies distributed widely all over the globe, but the genus reaches its highest species diversity levels in southeastern Asia and southern China (Bolton, 2011). *Prenolepis* awaits a global taxonomic revision, however, important taxonomic contributions in terms of species/subspecies additions to this genus include: Say (1836), Mayr (1853), Roger (1863), Emery (1893; 1900), Forel (1894; 1902; 1911; 1916), Santschi (1920; 1930), Crawley (1923), Wheeler (1930), Xu (1995), Zhou and Zheng (1998), Fontenla (2000), Zhou (2001) and Wang and Wu (2007). More recently, LaPolla *et al.* (2010) carried out a significant work on phylogeny and taxonomy of the *Prenolepis* genus group.

In India, *P. naoroji* Forel is the only species known to date, the worker of which is re-described with illustrations and morphometrics. The queen and male caste of *P. naoroji* are also described here for the very first time. *P. fisheri* sp. n., a species potentially interesting from the phylogeographic and phylogenetic point of view, sharing a morphological feature with Antillean species (see below), marks the second addition to Indian *Prenolepis.* Below we describe it as new from Uttarakhand, northern India, based on worker and queen castes.

MATERIAL AND METHODS

The specimens were collected through Winkler extractor, pitfall, honey bait, beating vegetation, soil core and hand picking methods in foothills of Indian Himalaya. The taxonomic analysis was conducted on Nikon SMZ 1500 stereomicroscope. For digital images, MP evolution digital camera was used on the same microscope with Auto-Montage (Syncroscopy, Division of Synoptics, Ltd.) software. Later, images were cleaned with Adobe Photoshop CS5. Morphological terminology for measurements (given in millimeters) and indices include:

HL Maximum length of head in dorsal view, measured in straight line from the anterior most point of the median clypeal margin to the midpoint of the occipital margin.

HW Maximum width of head in dorsal view (excluding the portion of eyes that extends past the lateral margins of the head).

SL Maximum length of the scape excluding the basal neck and condyle.

WL Weber's length measured from the anterior surface of the pronotum proper (excluding the collar) to the posteriormost point of the propodeal lobes.

CI Cephalic index: HW/HL x 100.

SI Scape index: SL/HW x 100.

RESULTS

Prenolepis Mayr, 1861

***Prenolepis* Mayr, 1861: 52.**

Type-species: *Tapinoma nitens*, by subsequent designation of Bingham, 1903: 325 (see Bolton *et al.,* 2007 for complete taxonomic history).

Distribution. Neotropical, Holarctic, Oriental, Indo-Australian and Afrotropical.

Diagnosis. Mandible with 5 to 7 teeth (in *Prenolepis kohli* up to 8 teeth observed in some specimens); maxillary palps 6-segmented; labial palps 4-segmented; erect setae on dorsum of head randomly placed; with erect setae on scapes, legs and dorsum of mesosoma, including propodeum. Eyes well developed, often strongly convex, and placed posteriorly on the head. Mesothorax constricted immediately behind pronotum; propodeum with a high-domed dorsal face, with entire propodeum often distinctly rounded in overall shape; overall mesosoma shape long and slender (LaPolla *et al.,* 2010).

***Prenolepis fisheri* sp. n.** (Figs. 1-6)

Type Material. Holotype ☿**,** India: Uttarakhand, Forest Research Institute, 30.3476°N 77.9965°E, 640m, 11.v.2009, hand collecting, coll. Aijaz A. Wachkoo. *Paratypes.* 7☿, and 1♀, same data as holotype.

Type depository. PUPAC, Punjabi University Patiala Ant Collection, Patiala, India. Two paratypes will be deposited in BMNH, Natural History Museum, London, U.K.

Figs. 1-3. *Prenolepis fisheri* sp. n., worker; 1) head, dorsal view, 2) body, dorsal view, 3) body, lateral view.

Figs. 4-6. *Prenolepis fisheri* sp. n., queen; 4) head, dorsal view, 5) body, dorsal view, 6) body, lateral view.

Worker. Measurements: HL 0.63-0.65; HW 0.62-0.66; WL 0.75-0.8; SL 0.67-0.69. Indices: CI 95.39-104.76; SI 101.51-109.68 (*n* = 8).

Head. Head subtriangular, as broad as long, much broader posteriorly than in front, occipital margin straight with rounded corners, sides convex. Anterior margin of clypeus broad, entire, convex, strongly carinate in the middle. Mandibles armed with 5-6 teeth on the masticatory margin, counting from apex 3rd and 5th teeth in 6-teeth condition and only 3rd in 5-teeth condition are reduced. Eyes oval, convex, moderately large; 3 small ocelli present. Antennae long, scapes extending about 1/3rd of their length beyond occipital margin of head, flagellum incrassate towards apex. Frontal carina feeble, short and diverging.

Mesosoma. Mesosoma stout, strongly constricted in the middle; metanotal groove conspicuous; in side view pronotum and mesonotum together form a high dome, propodeum low, broadly rounded with declivous face obliquely truncate.

Petiole. Petiole low and transverse, subtriangular in profile, inclined forward, with posterior face longer than anterior face.

Gaster. Gaster short and gibbous.

Sculpture and pilosity. Cuticular surface smooth and shining, pubescence absent; mandibles weakly striate, frontal area with feeble reticulations and mesopleura with transverse rugae. Setae weak, short and more uniform than in *P. naoroji*. Clypeal setae longest, reaching up to 0.17 mm.

Color. Castaneous, gaster blackish.

Queen. Measurements: HL 0.89; HW 0.98; WL 1.57; SL 0.84. Indices: CI 110.11; SI 85.71 (*n* = 1).

As in worker, with modifications expected for the caste and the following differences: overall color darker than in workers, with thorax and gaster brown. Entire body finely punctate; covered in a dense layer of pubescence and setae of varying lengths. Antennae filiform; mandibles 6 toothed. Mesosoma massive, flat above, without any constriction. Petiole broad, strongly compressed anteroposteriorly and lower than in workers, with dorsal margin deeply emarginated. Gaster exceptionally long.

Male. Unknown.

Remarks. This is an intriguing species, as it possesses ocelli, a character shared only by three other species of *Prenolepis* known from the Antilles. However, it can be easily separated from them by shorter scapes (SL 0.67-0.69 & SI 101.51-109.68). All the Antillean species possess much longer scapes with SL 1.75-2.10 and SI 155.0-181.8.

Distribution and habitat. This species is rare in Shivalik range of North-West Himalaya and was found only in a single locality of Uttarakhand during the intensive surveys. This species was found under a small stone, along edge of a primary, subtropical, semi-evergreen forest with relatively high annual precipitation.

Etymology. The species is named in the honour of Brian Fisher.

***Prenolepis naoroji* Forel, 1902** (Figs. 7-16)

Prenolepis naoroji Forel, 1902: 290 (☿)

Worker. Measurements: HL 0.58-0.78; HW 0.49-0.66; WL 0.76-1.08; SL 0.87-1.1. Indices: CI 78.67-89.23; SI 153.85-182.35 (*n* = 20).

Head. Head broadly oval, longer than broad, broader posteriorly than in front, occipital margin straight with rounded corners, sides convex. Anterior margin of clypeus broad, with a slight medial emargination; longitudinally carinate in the middle. Mandibles with 6 teeth on the masticatory margin, counting from apex 3rd and 5th teeth are reduced. Eyes round, large and bulging; ocelli absent. Antennae remarkably long, scapes extending about 1/2 of their length beyond occipital margin of head, flagellum filiform. Frontal carina feeble, short and diverging.

Mesosoma. Mesosoma rather long, strongly constricted in the middle; in side view convexity formed by pronotum and mesonotum together, is sub equal to propodeal convexity; declivous face obliquely truncate.

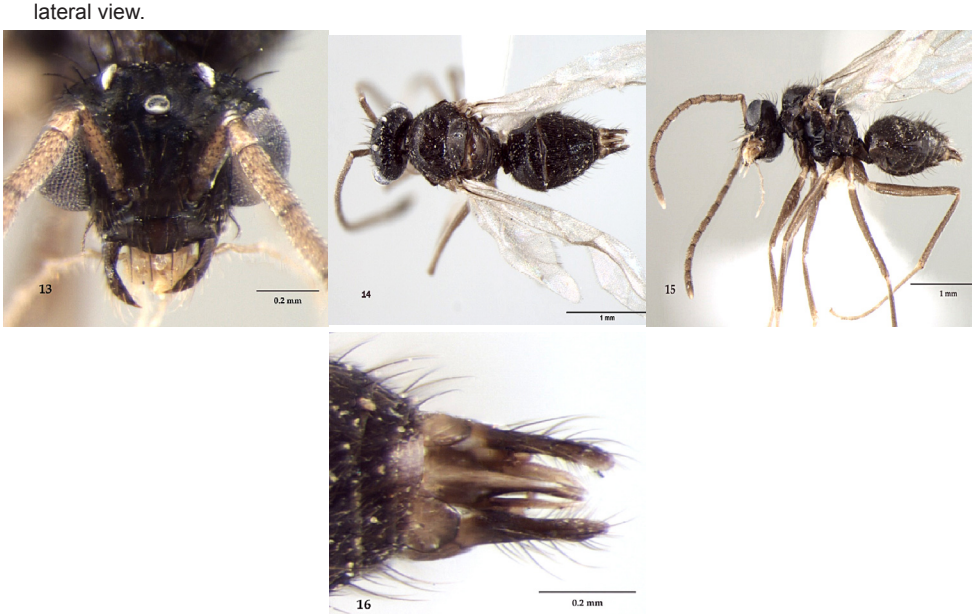
Petiole. Petiole low with shallow emargination, less compressed anteroposteriorly than in *P. fisheri* sp. n., triangular in profile, inclined forward, with posterior face longer than anterior face.

Gaster. Gaster elongate and gibbous.

Sculpture and pilosity. Cuticular surface smooth and shining; devoid of pubescence. Remarkably long setae of varying lengths cover the whole insect, denser on gaster and longest on head, reaching up to 0.41 mm.

Figs. 7-9. *Prenolepis naoroji* Forel, worker; 7) head, dorsal view, 8) body, dorsal view, 9) body, lateral view.

Figs. 10-12. *Prenolepis naoroji* Forel, queen; 10) head, dorsal view, 11) Body, dorsal view, 12) body, lateral view.



Figs. 13-16. *Prenolepis naoroji* Forel, male; 13) head, dorsal view, 14) body, dorsal view, 15) body, lateral view,16) male genitalia in dorsal view.

Color. Castaneous to dark piceous brown; mesosoma, mandibles, antennae and legs lighter.

Queen. Measurements: HL 0.97; HW 1.08; WL 1.8; SL 1.21. Indices: CI 111.34; SI 112.08 (*n* = 1).

As in worker, with modifications expected for caste and the following differences: overall color darker than in workers, with head and gastral dorsum brown; mesosoma with lighter reddish brown patches especially on scutum and propodeal declivity. Entire body punctured, but more pronounced on head followed by mesosoma; setae of varying lengths cover entire body but longer ones restricted to head and shorter, denser ones on gaster, with only a few on mesosoma; pubescence most abundant on gaster. Mandibles 6-toothed. Mesosoma without any constriction, very robust, with raised scutellum interrupting the regular convexity above, propodeal declivity very steep. Petiole broad, strongly compressed anteroposteriorly and lower than in workers, its dorsal border deeply emarginated. Gaster short and gibbous.

Male. Measurements: HL 0.63-0.65; HW 0.67-0.71; WL 1.2-1.24; SL 0.35-0.38. Indices: CI 104.69-109.52; SI 52.24-55.07 (*n* = 3).

Head. Head about as broad as long; eyes large and bulging beyond head outline in full-frontal view; three prominent ocelli present. Antennae 13 segmented, filiform, scapes short, failing to reach the posterior margin of head. Clypeus carinate in middle, roughly rectangular with entire anterior margin. Mandibles slender, curved strap like, the apex simple and acute without any teeth or denticles.

Mesosoma. Mesosoma enlarged to accommodate flight muscles, not constricted; pronotum small; scutum punctate, scutellum raised; declivity steep.

Petiole. Petiole broad, very low, with apex slightly emarginated.

Gaster. Gaster elongated.

Genitalia. Parameres elongated, roughly triangular, slightly bent inward at apices, covered with long setae; cuspi with short peg-like teeth and bent toward digiti; digiti straight and long, about 3 times as long as cuspi with round dorsum, covered by short peg-like teeth and bent towards each other apically; penis valve projecting.

Vestiture. Setae of varying lengths cover entire body; pubescence most abundant on gaster with terminalia especially setose.

Color. Blackish, darker than corresponding workers and queens.

Material examined: Himachal Pradesh: Andretta, 940m, 6☿, 11.vi.2010, 12☿, 15.vi.2010, 14☿, 3♂♂, 19.vi.2010, 12☿, 20.vi.2010, 4☿, 21.vi.2010; Dakpathar, 750m, 4☿, 20.viii.2009; Dattal, 940m, 5☿, 16.vi.2010; Dharampur, 450m, 2☿, 14.x.2008; Ghatti, 425m, 5☿, 28.ix.2009; Guga, 600m, 4☿, 6.x.2008; Guradhar, 660m, 1☿, 4.x.2009; Kotla, 500m, 13☿, 30.v.2009, 33☿, 13.x.2008, 4☿, 29.ix.2009; Lwasa, 1200m, 12☿, 1♀, 27.viii.2009; Nahan, 760m, 6☿, 13.viii.2009. Jammu & Kashmir: Manda, 500m, 17☿, 4.viii.2010; Mansar, 690m, 3☿, 3.viii.2010; Samba, 360m, 2☿, 11.vii.2009; Surinsar, 700m, 11☿, 14.vii.2009. Uttarakhand: FRI, 640m, 1☿, 30.ix.2008, 20☿, 1.x.2008, 23☿, 30.vii.2009, 1☿, 12.v.2009, 3☿ ,17.viii.2009, 21☿, 2.ix.2009, 2☿, 4.ix.2010; Rajaji Forest Area, 660m, 15☿, 5.viii.2009, 1☿, 6.viii.2009, 2☿, 10.viii.2009, 2☿, 11.viii.2009, 15☿, 25.v.2010; Selaqui, 670m, 1☿, 2.x.2008, 13☿, 3.x.2008, 7☿, 7.viii.2009 (coll. Aijaz A. Wachkoo).

Remarks. The workers of this species are identified easily by the long scapes and setae, and bulging eyes. However, there is a considerable variation in size and color patterns.

Distribution and habitat. This species is relatively common in the northern India and can be found on trees, fallen trunks, and occasionally on ground. *P. naroji,* was mostly collected by beating on vegetation, indicating that it is an arboreal forager.

Key to species of *Prenolepis* of India based on worker caste

Scapes short, surpassing posterior margin of head by less than half their length (SI: 101.51-109.68), ocelli present……..…….….. *P. fisheri* sp. n.

Scapes very long, surpassing posterior margin of head by about half their length (SI: 153.85-182.35), ocelli absent……...……. *P. naoroji* Forel

DISCUSSION

Although the type material could not be studied, the original description of Forel (1902) and follow up descriptions by Bingham (1903) and Zhou (2001) does not mention presence of any ocelli in *P. naoroji*. Moreover, more than 250 specimens were observed for ocelli under different lights, but no ocelli could be traced. Mention of ocelli in *P. naroji* by LaPolla *et al.* (2010) remains uncertain. The presence of ocelli in *P. fisheri* may be of significant phylogeographic and phylogenetic importance and possibly will play a pivotal role in taxonomic decision regarding the question of separate generic status of Antillean species. However, it can be easily argued that ocelli have evolved independently and would require species from both groups to be included in a comprehensive molecular phylogeny to make more substantiated statements about their relationships.

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