



A new species of parasitic wasp *Neastymachus* Girault (Hymenoptera: Chalcidoidea: Encyrtidae) collected by fogging *Vateria indica* L. (Dipterocarpaceae) canopy in the Western Ghats of India

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Abstract: A new species of the encyrtid genus *Neastymachus* (*N. punctatiscutellum* Singh, sp. nov.) is described from a female specimen collected from the Western Ghats of India. It was collected by fogging the canopy of *Vateria indica* L. (Dipterocarpaceae). A key to the females of the Afrotropical, Australian and Oriental species is also given.

Keywords: Canopy fogging, Discodini, Encyrtidae, Hymenoptera, new species.

Rainforest canopies are a treasure trove of biodiversity, adaptations and complex interactions (Mitchell 1986). Forest arthropods contribute majority of this species diversity which in turn is due to large number of insects in the canopy (Erwin 1982, 1983). Tropical rainforest insects are more abundant in the

canopy than near the forest floor (Erwin 1982; Smythe 1982; Erwin 1983; Sutton et al. 1983; Stork 1991). A number of insect diversity works have been done in the rainforests of South America and elsewhere in the world, but in India studies on canopy biodiversity are negligible. Srinivasa et al. (2004) has done some work on insect diversity in the canopies of two rainforest species *Vateria indica* L. and *Dipterocarpus indicus* Bedd. (Dipterocarpaceae) from linear tree increment plot that lay undisturbed since the 1920s. From this collection chalcids were also recovered, some of which were found new to science. Singh, in Singh & Srinivasa (2010) has already described a new species of *Eutrichosomella* Girault (Hymenoptera: Aphelinidae) collected during this study. In the present work a new species of the genus *Neastymachus* Girault (1915) (Hymenoptera: Chalcidoidea: Encyrtidae) is described. A key to some species of this genus is also given.

Date of publication (online): 26 August 2012
Date of publication (print): 26 August 2012
ISSN 0974-7907 (online) | 0974-7893 (print)

Editor: Md. Hayat

Manuscript details:

Ms # o2960
Received 30 September 2011
Final received 13 June 2012
Finally accepted 18 July 2012

Citation: Sudhir Singh & Y.B. Srinivasa (2012). A new species of parasitic wasp *Neastymachus* Girault (Hymenoptera: Chalcidoidea: Encyrtidae) collected by fogging *Vateria indica* L. (Dipterocarpaceae) canopy in the Western Ghats of India. *Journal of Threatened Taxa* 4(9): 2883–2888.

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Acknowledgements: The first author is thankful to Dr. S.S. Negi, the Director, Forest Research Institute, and Dr. Mohd. Yousuf, the Head, Forest Entomology Division for providing the necessary laboratory facilities. We are also thankful to Indian Council of Forestry Research and Education for funding the research work. First author is thankful to Dr. Mohd. Hayat, Department of Zoology, AMU, Aligarh for his comments and verifying the material during his visit to FRI, Dehradun. Thanks are also due to the two unknown reviewers for their valuable comments and suggestions for improving the quality of the paper.

Material and Methods

This species was collected from canopies of *Vateria indica* L. trees located at an altitude of 128m, which had a moderately dense canopy and about 40m tall with the lower most branch at about 22m from the ground. At the time of sampling, *V. indica* was fruiting. Samples were obtained using an insecticide fog (Kingfog® @ of 0.34% a.i.) generated from a thermal fogger (Vanfog®) (Srinivasa et al. 2004).

Body length is given in millimeters. All other measurements are in µm. The holotype of the new species is deposited in the National Forest Insect Collection, Entomology Division of the Forest Research Institute, Dehradun, India (NFIC-FRI).

Abbreviations and measurements used in the text are according to Noyes & Hayat (1984) and Singh & Agarwal (1993).

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Genus *Neastymachus* Girault

Neastymachus Girault, 1915:86. Type species *Neastymachus auraticorpus* Girault, by monotypy.

Nikolskiella Trjapitzin and *Pseudmicroterys* Shafee, Alam & Agarwal are synonyms of the genus (Noyes & Hayat 1984).

Diagnosis: Head in frontal view wider than high; antennal scrobes shallow or moderately impressed with lateral margins rounded, not longer than half the distance between a torulus and median ocellus. Funicle 6-segmented; club 3-segmented, apex rounded. Mandibles tridentate or with two sharp teeth and a truncation. Wing hyaline, marginal vein at least two times as long as wide. Hypopygium not extending more than two-thirds length along gaster; ovipositor either not exerted or only slightly exerted. Body generally yellow, orange or brownish-yellow to dark brown; gaster darker than rest of the body. Antenna yellowish, with scape and club may be brown. Legs completely pale yellow.

Comments: The type species of *Neastymachus* and the Palaearctic and Costa Rican species have short notaular lines (=parapsidal furrows) on the mesoscutum (Dahms & Gordh 1997; Noyes 2010). The Indian species lack notaular lines on the mesoscutum. But a short curved darker line is present on either side of mesoscutum just behind the pronotum which is a narrow gap in the underlying muscles visible through translucent mesoscutum. However, reflections from sculptural patterns from this area show no sign of any groove or ridge. Similar pattern was also seen in the holotypes of *N. axillaris* and *N. latiscapus*. On the basis of setation on base of the fore wing, shape of gaster and location of the cercal plates and colour pattern of the pronotum, Hayat (1999) divided Indian species into two groups: the *cerococci* group with four species (*angustifrons*, *burksi*, *cerococci* and *latiscapus*) and the *delhiensis* group with two species (*axillaris* and *delhiensis*). Hayat did not elaborate on the colour of pronotum. It has been observed that all the species from India and Australia have a black spot or band on anterior face of pronotum and a corresponding dark band or spots on the occiput (same may be present on the African species but due to its darker colour these characters may not be distinguishable. All the species in *cerococci* group usually have a dark brown spot on the pronotum, whereas *delhiensis* group has a narrow dark brown band on the pronotum and also brown

spots or band on the occiput of head behind eyes.

The genus belongs to tribe Discodini (Hayat 2006; Noyes 2010). They are parasitoids of families Acleridae and Asterolecaniidae of Hemiptera (Noyes & Hayat 1984).

Species and distribution

Neastymachus is an old world genus with 14 described species (including the new one). The genus is represented by two undescribed species in the Nearctic region (Noyes et al. 1997). The region wise distribution of species is as follows:

Afrotropical (1): *Neastymachus dispar* Prinsloo, 1996.

Australian (1): *Neastymachus auraticorpus* Girault, 1915.

Oriental (7, all from India): *Neastymachus angustifrons* (Shafee, Alam & Agarwal, 1975); *N. axillaris* Singh, Agarwal & Basha, 1991; *N. burksi* (Shafee, Alam & Agarwal, 1975); *N. cerococci* (Shafee, Alam & Agarwal, 1975); *N. delhiensis* (Subba Rao, 1957); *N. latiscapus* Singh, Agarwal & Basha, 1991 and *N. punctatiscutellum* Singh, sp. nov.

Palaearctic (3): *N. luteus* (Nikol'skaya, 1952), *N. secundus* (Trjapitzin, 1962) and *N. japonicus* (Tachikawa, 1970).

Neotropical (2, from Costa Rica): *N. orthanes* Noyes, 2010; *N. peyries* Noyes, 2010.

Neastymachus punctatiscutellum Singh, sp. nov.

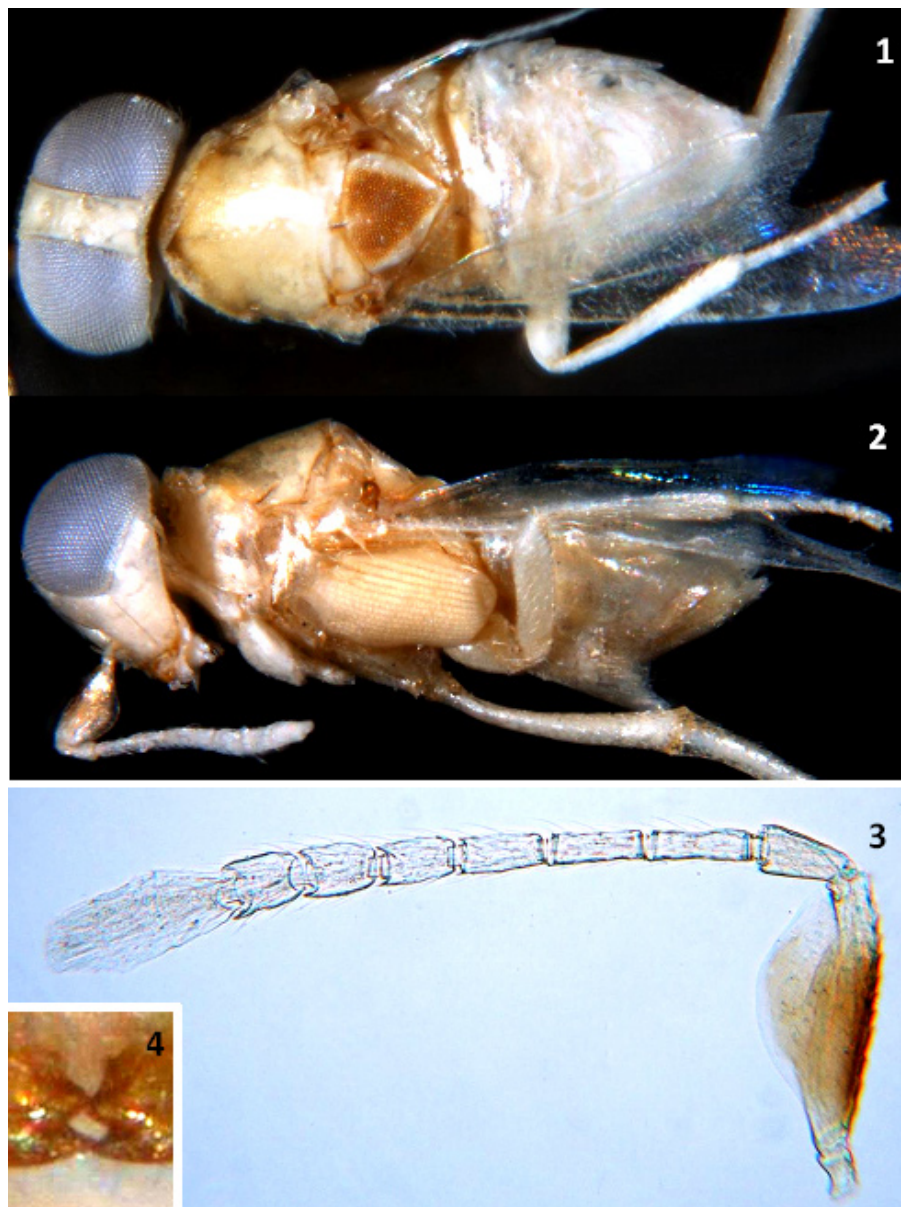
(Images 1–10)

Material examined: Holotype: 26.vi.2003, female (on card, with both antennae, wings, fore and middle legs and left hind leg mounted on a slide under five cover slips), (12°04'39.2"N & 75°43'33.6"E) in the Western Ghats; ex. canopies of *Vateria indica*, located at an altitude of 128m; collected by canopy fogging, Makuta near Virajpet, Bannadapaare, Karnataka, India, coll. Y.B. Srinivasa. (NFIC-FRI, Dehradun. Accession No. 21906).

Diagnosis: Female: Body pale yellow except scutellum and middle portion of scape brownish. Scutellum asetose, with distinct punctate reticulate sculpture and with conical distal margin, basal portion of fore wing naked.

Description: Female, length 1.65 mm (holotype).

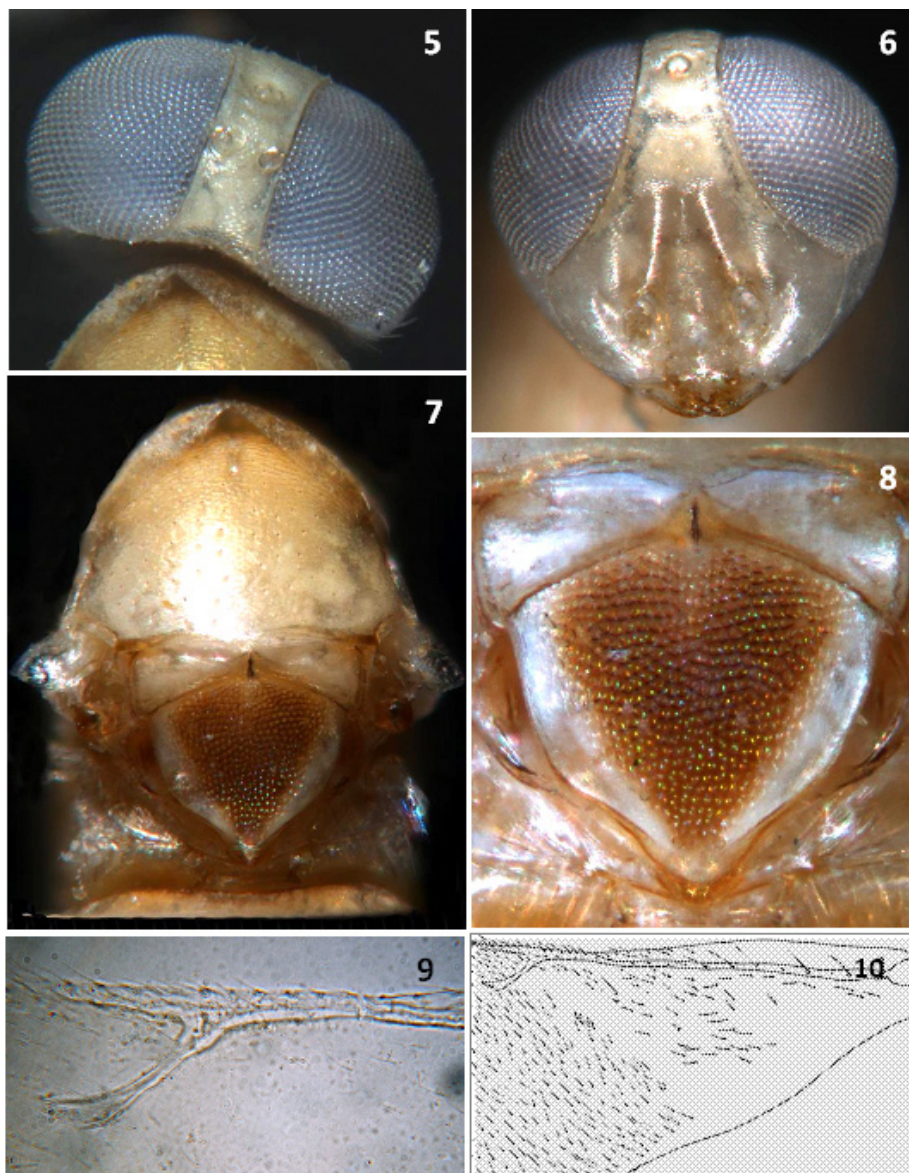
Colour, setation and sculpture: Body completely



Images 1–4. *Neastymachus punctatiscutellum* Singh, sp. nov., female (holotype)
 1 - body in dorsal view; 2 - body in lateral view; 3 - antenna;
 4 - dentitions of mandibles.
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pale yellow except central part of scutellum and middle portion of scape brownish. Head completely pale yellow with very faint and shallow reticulate sculpture, sculpture much distinct at ocellar region than around scrobes; setae translucent and very inconspicuous, along the inner margins of eye setae longer; eyes naked, light grey in colour, ocelli colourless; mandible with teeth reddish-brown; maxillary and labial palpi pale yellow. Antenna white, except scape with basal two-thirds of brown, ventral margin and apical third white; pedicel slightly pale yellow; funicle segments with translucent, fine and long setae. Mesosoma pale yellow except central area of scutellum brownish; collar of pronotum with about 20 moderately strong

setae; mesoscutum pale yellow with faint and very shallow reticulate sculpture which is larger than that on head, with about 100 pale, inconspicuous and scattered setae; axillae pale yellow and smooth, with one or two setae; scutellum brown, except narrow pale yellow stripes on sides; brown area of scutellum with prominent punctate reticulate sculpture (Image 8), setae absent; lateral pale stripes of scutellum smooth. Wings hyaline, venation almost translucent; setae transparent and hardly visible even under higher magnification of compound microscope; basal portion of fore wing naked. All legs pale yellow, lighter than mesosoma. Metasoma pale yellow, lighter than mesosoma, with inconspicuous setae.



Images 5–10. *Neastymachus punctatiscutellum* Singh, sp. nov., female (holotype)
 5 - head in dorsal view; 6 - head in frontal view; 7 - mesosoma; 8 - part of mesosoma showing sculpture on the scutellum; 9 - part of the fore wing showing venation and 10 - basal part of the fore wing showing venation and setal pattern.
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Structure: Head in dorsal view (Image 5) semicircular, anterior margin rounded, posterior margin concave; 1.8x as wide as long (587:317), 4.8x as wide as frontovertex width at level of median ocellus (587:120); ocelli in acute angle triangle; POL as long as, OCL 3.15x and OOL about 0.2x the diameter of middle ocellus (38:120:9:38); eye about 1.4x as long as wide (321:230). Head in frontal view (Image 6) rounded, slightly wider at eye and tapering towards genal area; 1.16 x as wide as long (586:504); inner eye margins smoothly curved and diverging anteriorly from level of median ocellus; eye 1.7x as long as wide (370:216); toruli 1.6x as long as wide (78:48), half their length below the line joining lower ends of eyes; distance between toruli 1.34x, distance

between torulus and eye margin 1.53x, torulo-mouth margin distance slightly shorter than torular length (105:120:72:78); scrobes narrow, moderately deep, not meeting dorsally, reaching halfway between torulus and median ocellus (168:340). Head in profile (Image 2) triangular, anterior margin smoothly curved, 2.5x as high as malar space length (504:201); eye 1.12x as long as wide (360:321). Antenna (Image 3) with scape flattened and expanded beneath, 2.3x as long as wide (264:114); pedicel long conical, 1.87x as long as wide (91:48); all funicle segments longer than wide; F1 slightly longer than pedicel, 2.96x as long as wide (95:32); F2 as long and as wide as F1, F3 2.27x (82:36), F4 1.65x (68:41), F5 1.36x (68:50), F6 1.23x (68:55); club 2.36x as long as wide (182:77).

Mesosoma (Image 7): 0.9x head width (528:585); pronotum, visible part, narrow, about 9x as wide as long (432:48); mesoscutum convex from side to side, posterior margin at the middle curved and produced over the axillae separating them, 1.57x as wide as long (528:336); axillae rounded on sides, width of axillae 0.67x the thorax width (355:528); scutellum flat, conical apically, as long as wide (288); propodeum 11.2x as wide as long (538:48). Fore wing 2.5x as long as wide (1445:578); marginal vein (104) longer than postmarginal (68) as well as stigmal vein (91). Middle tibial spur slightly longer than basitarsus (211:192).

Metasoma (Image 1): Longer than mesosoma, 1.16x as long as wide (696:600), cercal plates situated slightly before middle of metasoma; hypopygium extending to two-thirds length along gaster; ovipositor length 0.73x the mid tibia length (456:624), ovipositor sheath length 0.17x the ovipositor length (77:456).

Male: Unknown.

Etymology

Named after the distinct punctate reticulate sculpture of the scutellum.

Distribution

India: Western Ghats (Karnataka).

Comments

This is a distinct species and can be separated from other known species by shape (flat and apically v-shaped), colour (dark brown with lateral narrow white stripes) and sculpture (prominently deep punctuate reticulate) of the scutellum; flattened scape and the asetose scutellum. (See key to species.)

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Key to Afrotropical, Australian and Oriental species of *Neastymachus* (females) (partly based on Singh & Agarwal 1993, and Hayat 2006)

- 1 Fore wing basal triangle with a large bare area; metasoma usually subequal in length to mesosoma, apically rounded, and with cercal plates situated in about middle; occipital margins sharp (except in *angustifrons*); anterior face of pronotum usually with a central dark brown spot 2
- Fore wing basal triangle setose to base, with at most a small bare area; metasoma at least slightly longer than mesosoma, pointed apically, and with cercal plates situated in about basal third; occipital margins narrowly rounded, not sharp; anterior face of pronotum with a broad transverse dark brown stripe 7
- 2 Body strikingly bicolourous; head entirely black, mesosoma and gaster blackish-brown to almost black except distal half of mesoscutum, entire prepectus and scutellum brownish-yellow; antenna sordid white to pale brown with club largely brown. (South Africa; Swaziland) *dispar* Prinsloo
- Body mostly pale yellow to orange, only certain small areas on genal margins, scape, club, postociput, pronotum or scutellum brown 3
- 3 Frontovortex at level of median ocellus about 0.2x of head width; ocellar triangle with apical angle acute; antennal club may or may not be brown 4
- Frontovortex at level of median ocellus broader, at least about 0.33x of head width; ocellar triangle with apical angle not acute; antennal club brown 5
- 4 Scape cylindrical, about 5.0x as long as wide; F1 equal to pedicel in length; antennal club dark brown; body completely yellow, except a brown patch at the centre of anterior face of the pronotum (India); scutellum with black setae *angustifrons* (Shafee, Alam & Agarwal)
- Scape expanded, about 2.3x as long as wide; F1 distinctly longer than pedicel; antennal club white; body completely pale except scutellum brown with lateral narrow white stripes; scutellum without setae (India) *punctatiscutellum* Singh, sp. nov.
- 5 Antennal scape short, and slightly flattened, not more than 3.0x as long as wide; fore wing proximal to linea calva with numerous setae (more than 70); ovipositor sheath not more than one-fifth length of second valvifer; malar area concolourous with face 6
- Antennal scape relatively long, at least 4.0x as long as broad; fore wing proximal to linea calva with fewer setae (less than 40); ovipositor sheath 0.28x the length of second valvifer; lower malar area dark brown (India) *cerococci* (Shafee, Alam & Agarwal)
- 6 Scape yellowish, 3.0x as long as wide; F1 longer than wide, rest of funicle segments, subequal, quadrate to wider than long; ovipositor sheath 1.5x as long as wide and 0.16x second valvifer length; occiput without a brown spot (India) *burksi* (Shafee, Alam & Agarwal)
- Scape dark brown, 2.5x as long as wide; all funicle segments longer than wide; ovipositor sheath about 3x as long as wide and 0.19x second valvifer length; occiput with a brown spot (India) *latiscapus* Singh, Agarwal & Basha
- 7 Funicle with F1 and F2 each at least twice as long as wide, remaining segments shorter but all longer than wide; body yellow to yellowish-brown 8
- All the funicle segments at least about twice as long as wide; body testaceous. (Malar space brownish, frontovortex light brown, occiput with a dark brown spot on the occiput behind the eyes; pronotum with dark brown anterior to collar and a spot on each side; distal two-thirds of scutellum and sides of propodeum light brown, gaster dark brown) (India) *delhiensis* (Subba Rao)
- 8 Frontovortex at level of median ocellus 0.33x head width; F1 slightly longer than pedicel; ovipositor slightly exerted, about one-tenth of gaster length; body with head and mesonotum light brownish-yellow, gaster brown, VII-tergum lighter; two dark brown spots on either side of occiput behind the eyes; pronotum with broad transverse dark brown stripe on the anterior face of pronotum which extends dorsally and appear as spots on collar on either side. (Scutellum distinctly deep reticulate) (India) *axillaris* Singh, Agarwal & Basha
- Frontovortex at level of median ocellus 0.29x of head width; F1 shorter than pedicel; ovipositor exerted by about a-fifth (0.19x) of gaster length; body yellow brown; a narrow black patch transversely across occiput behind eyes which aligns with a broad transverse black stripe on anterior face of pronotum (Australia) *auraticorpus* Girault

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