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Description of a new species of *Polynema* (Hymenoptera: Mymaridae) from Ladakh, India

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Abstract
A new species of *Polynema* Haliday (1833) (Hymenoptera: Mymaridae), *Polynema* (*Doriclytus) tyakshiensis* sp. nov., is described from the Trans-Himalayan region Ladakh, India. Illustrations of the holotype are given. The holotype has been preserved in the Zoology Department, Aligarh Muslim University (ZDAMU), India.

Keywords: Fairifly, *Doriclytus*, trans-himalaya, Ladakh

Introduction
Genus *Polynema* Haliday (Hymenoptera: Mymaridae), a cosmopolitan genus of fairyflies has been studied in India in the past hundred years. The first species of *Polynema* from India was reported by Girault, (1913), In their research of the Indian species of this genus, Hayat & Anis (1999) offered taxonomic remarks on the reported species, mostly based on analysis of the holotypes. In (2001), Hayat & Singh described one species from India. Later Rehmat & Anis (2014) reviewed genus *Polynema* and added four new species.
This paper describes a new species of the genus Polynema from the trans-Himalayan region, Ladakh; India. With the addition of this new species, the total number of Polynema species in India now stands at Fifteen.

Material and Method
Sampling area
The data used in this study is based on the sample collected by M. Irfan in the month of June 2022 from the Indian village of Tyakshi in the Ladakh region (34.8783°N 76.8159°E). Ladakh region is located at an elevation of 11,400 feet, placed between the Karakoram Mountain range to the north and the Himalayas to the south.

Collection Method and Preservation
The insect samples were collected by using a Sweep net. The specimens that were gathered were first kept in ethanol (80%) and later card mounted on rectangular shaped cards (14x5mm), and permanent slides were also prepared based on the method adopted by Noyes (1982).

Identification
The collected specimens were identified through relevant literature (Rehmat & Anis, (2015); Hayat, M. & Anis, S.B. (1999); Hayat, M. & Singh, S. (2001); Mani & Saraswat, (1973); Huber, J. T., Read, J. D., & Triapitsyn, S. V., (2020) [9, 3, 4, 7, 5].

Technical support
Body colour and length of specimens on card mount were noted using a Stereo-zoom microscope (Olympus SZX16). Only The length of the body is measured in mm, other measurements were taken using the divisions of a linear scale of a micrometre placed in the eyepiece of a compound microscope (Nikon Eclipse, E200). A map of the sampling location was prepared using *ArcGIS* Software.

Photography
Photography of the card-mounted specimen was done with a DSLR camera "EOS *M50 Mark II"* attached to a stereo Zoom Binocular microscope (Olympus SZX7).
Photographs of slide mounts were captured with a digital camera "DIGI1000 Dewinter" connected to a compound microscope (Olympus CX41). The photograph plate was prepared using (Adobe Photoshop® 7).

Line Drawings
Line drawings of some body parts from slide-mounted were drawn with the help of a drawing tube fixed to the compound microscope (Olympus CX41) at 400× magnification.

Result
Genus *Polynema* Haliday, 1833
Polynema Haliday, 1833: 269, 374. Type species *Polynema flavipes* Walker, by subsequent designation of Huber & Bouček, 2001: 280–281.
Doriclytus Foerster, 1847: 226–227. Type species *Doryclytus vitripennis* Foerster, by monotypy. Synonymy by Schauff, 1984: 52. As subgenus of *Polynema* by Triapitsyn & Fidalgo, 2006: 57.

Diagnosis
*Female***.** Face with or without pit beside each torulus. Mandible 3 dentate. Antennal scape with cross ridges or smooth on inner surface; funicle 6-segnented, all segments more or less cylindrical, longitudinal sensilla mostly absent or present only on F6; clava entire, usually with 7−9 longitudinal sensillae. Pronotum either an undivided plate or divided mid-longitudinally; pronotum, mesoscutum and scutellum sometimes with inconspicuous, mostly cellulate sculpture; mesoscutum with distinct notauli; axillar seta of different lengths, sometimes blunt; scutellar sensillae usually closer to anterior margin of scutellum; frenal foveae on scutellum present or absent; propodeum with complete to partial to incomplete median carina. Fore wing disc usually broader, often narrow just beyond apex of venation; marginal vein punctiform, mostly with one or two (distal)

dorsal macrochaetae and one short ventral seta at apex. Hind wing narrow. Tarsi 4-segmented. Metasoma with petiole considerably longer than broad, cylindrical, attached posteriorly to gastral tergum; ovipositor length variable, from slightly exserted to considerably much exserted.

Colour
General body colour varies, from yellow to black, commonly light brown to dark brown. Antennal segment from light brown to dark brown. Legs mostly somewhat lighter than body.

Subgenus *Doriclytus* Foerster
Diagnosis
Female. Head with one pit beside each torulus. Antenna with scape usually smooth, sometimes with striations on inner surface; all funicle segments (F1−F6) usually longer than wide; clave entire having 7, sometimes 8, longitudinal sensillae. Pronotum entire or divided longitudinally; propleura abutting anteriorly, thus prosternum closed anteriorly; mesosoma usually smooth, occasionally with reticulate sculpture on mesoscutum, axilla, scutellum, and metanotum.; scutellar sensillae apart from each other and usually in middle of the scutellum, frenal lines usually with a row of foveae; propodeum mostly smooth, very rarely with transverse wrinkles, and either with a midlongitudinal carina of various lengths, from complete to very short carina posteriorly or carina entirely absent. Fore wing with two dorsal macrochaeta on marginal vein; Forewing somewhat uniformly setose beyond venation, disc hyaline or variably infimate. Petiole longer than broad, usually somewhat cylindrical but sometimes dilated anteriorly, rarely dilated along entire length and also flattened; ovipositor of various lengths, from very short to very long.

Description
Female: Holotype. Body length, 0.984 mm. Head with toruli above mid-level of eyes. vertex smooth, face with a pit beside each torulus (fig.2). 09 setae on each side of the head below torulus. Antenna with a radicle and scape approximately 1.76 times as long as the pedicel. Scape without cross ridges (fig.4); single longitudinal sensilla present on F6 (fig.3); F2 longest; F1 and F6 equal in length; F3 is about 0.75× F2; clava is about 3.75 as long as wide, subequal to three preceding funicle segments combined and with 6 longitudinal sensillae (Fig.3); Pronotum about 0.2× mesoscutum length, with at least 3 setae on each side along the anterior margin, Mesoscutum equal to scutellum in length with complete notauli (Fig.8). Scutellum with one row of frenal foveae (fig.8); mesophragma does not reach the posterior edge of the propodeum. Propodium shorter than the scutellum with one pair of setae on the posterior margin. Fore wing 3.1× as long as wide. marginal vein dark brown with one macrochaetae (fig.5), hypochaeta not reaching to posterior margin of wing base (Fig.6). longest marginal seta about 0.59× wing width; disc evenly setose, setae distributed above marginal vein (Fig.5); Hind wing hyaline with 2 rows of setae in the middle of disc (Fig.7), hind wing 23.25× as long as broad; longest marginal fringe about 4× as long as wing width. Metasoma, Gaster about 1.24× mesosoma. Petiole slightly longer than hind coxa; ovipositor subequal to gaster in length, exserted at apex (fig.8).

Colour
Head and body metallic black (Fig.1). Antenna with scape and pedicel brown. Legs dark brown tarsal segments lighter. Gaster brown petiole light brown; ovipositor sheaths light brown.

Relative measurements (slide)
Head length, 85; minimum width of frontovertex, 95; distance between toruli, 37; eye height,44; length of scape, 31; length of pedicel, 22; length of clava, 60; width of clava, 16; F1–F6, length (width) 24(6); 32(6); 23(6); 18 (8); 18(8); 24(10), length of mesosoma, 148; pronotum length, 11; pronotum width,; mesoscutum length, 55; mesoscutum width, 80; scutellum length, 55; scutellum width, 52; length of propodeum, 35; fore wing length, 460; fore wing width, 148; fore wing marginal fringe length, 88; hind wing length, 372; hind wing width, 14; hind wing marginal fringe length, 64; fore femur length, 96; fore tibia length, 75; fore tarsus length, 105; fore pretarsus length, 11; mid tibia length, 105; mid tarsus length, 75; mid pretarsus length, 12; hind coxa length, 37; hind femur length, 95; hind tibia length, 140; hind tarsus length, 120; hind pretarsus length, 11; petiole length, 40; gaster length, 184; ovipositor length, 192; exserted ovipositor length, 28.

Male: Unknown.
Host: Unknown.

Material Examined: Holotype♀ (on slide) (ZDAMU): Ladakh; Tyakshi (34.8783°N 76.8159°E), 15.v.2022, coll. M. Irfan.

Distribution: Ladakh (UT)

Comments
Polynema (Doriclytus) tyakshiensis is similar to *Polynema (Doriclytus) bicolorigaster* in having antennal scape without cross ridges, petiole Subequal to hind coxae, and presence of sensilla on F6. It can be distinguished from *Polynema (Doriclytus) bicolorigaster* by the characteristics listed below.

Characters	*Polynema (Doriclytus) bicolorigaster*	*Polynema* (*Doriclytus) Tyakshiensis* **sp.nov.**
Funicle, f1&f5	Sub equal	f1 is 1.3× f5
Number of Sensilla on clava	8	6
Microchaetae	2	1
Marginal setae length	0.30× Fore wing width	0.60× Fore wing width
Hind Wing	37.5× as long as wide	26.5× as long as wide
Clava	3.3× as long as wide	3.75× as long as wide
Oviposiiter to Hind tibia ratio	0.7:1	0.9:1
Ovipositor	Shorter than gaster	Slightly longer than the gaster

Etymology
The species name *tyakshiensis* is based on village Tyakshi in Ladakh from where the specimen was collected.

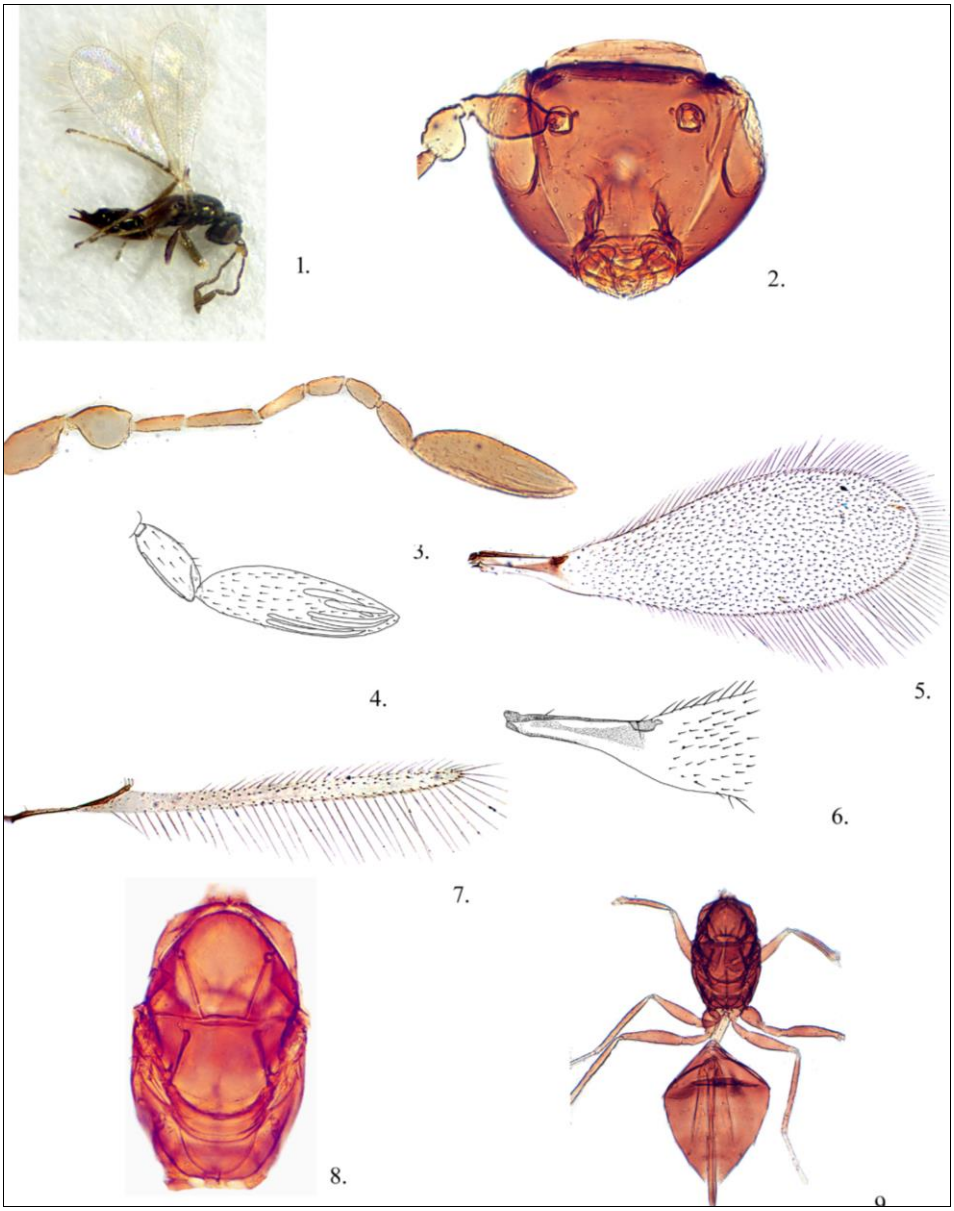

Fig 1−9: *Polynema (Doriclytus) Tyakshiensis* Irfan & Anis, sp. nov., female: 1) habitus (On card), 2) Head frontal view, 3) antenna, 4) clava, 5) fore wing, 6) fore wing basal part 7) hind wing 8) Mesosoma 9) body with ovipositor.

Conclusion

This is the first record of any Mymarid species from this high-altitude ecosystem. However, other chalcid wasp-like Trichogrammatids were found and published recently by Khan *et al*. 2023. Ladakh has different biogeographic conditions than the rest of India and is also unexplored taxonomically. This study not only adds to the entomological taxonomy of Ladakh, but it also serves as a valuable reference point for a broader understanding of Mymarids and other chalcid wasps in the region and the need for additional research to investigate the intricate relationship between Chalcid parasitoid wasp taxa and their host insects.

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