



First record of *Chaetonotus (Primochaetus) heideri* (Gastrotricha, Chaetonotida) from India

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Abstract

This study briefly reports a newly recorded gastrotrich species, *Chaetonotus (Primochaetus) heideri* Brehm, 1917, which was isolated from the water sample collected from the Ramsar site Khajjiar Lake, Himachal Pradesh, India. A brief description of the Indian population, based on photomicrographs taken from live specimens, is presented here. The species is reported to be common in freshwater habitats in many areas of the world and is also known to exhibit variable morphology.

Keywords: Gastrotrich, Khajjiar Lake, Live Observation, Ramsar Site

Introduction

The small acoelomate gastrotrichs are found in freshwater, marine, and brackish environments, and rarely in terrestrial soils. Currently, the number of gastrotrich species distributed globally is about 890 (Saponi & Todaro, 2024), with Chaetonotidae being the most speciose family. The group is widespread, with a density in freshwater that may reach 100,000 individuals/m² (Balsamo & Todaro, 2002), and serves as a vital connection between the microbial loop and larger predators in the meiofauna community (Todaro & Hummon, 2008; Todaro & Luporini, 2022). Despite the early diversity of Indian freshwater gastrotrich species being as low as 25 only (Naidu & Rao, 2006), there have been few reports published throughout the decades (Annandale, 1907; Naidu, 1962; Visvesvara, 1963; Dhanapathi, 1976; Rao & Chandramohan, 1977; Sharma, 1980; Sharma, 1987; Naidu & Rao, 2004; Harkal & Mokashe, 2013). According to Bharti and Kumar (2019), the insufficient account of the biodiversity of Indian Gastrotricha is attributed, in part, to the lack of taxonomists with deep expertise on these micro metazoans. Therefore, conducting additional sampling across India and employing advanced microscopic techniques, such as DIC optics and molecular sequencing, will unveil additional species and

enhance the precision of redescriptions (Chatterjee *et al.*, 2019; Chatterjee & Todaro, 2021).

Material and Methods

A water sample (about 150 ml) was collected from the Ramsar site Khajjiar Lake, Himachal Pradesh, India (32°32'46"N 76°03'29"E) during a survey in October 2021. The water sample was promptly examined for the presence of gastrotrichs and ciliates immediately upon arrival at the laboratory. The raw culture was maintained at room temperature (20°C) by adding a few sterile rice kernels to promote bacterial growth (Bharti & Kumar, 2019). Specimens were isolated from the water sample for observation and live photomicrography using stereo zoom (SZ2-ILST, Olympus, Japan) and bright-field (CX 43, Olympus, Japan) microscopes. In vivo measurements were conducted at magnifications ranging from 40x to 1000x. The identification was made following standard literature (Todaro *et al.*, 2019; Balsamo *et al.*, 2019).

Results

One species of gastrotricha, identified as *Chaetonotus (Primochaetus) heideri* Brehm, 1917, was found in freshwater samples collected from Khajjiar Lake,

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Himachal Pradesh. A brief description of the species is presented below.

Taxonomic Account

Phylum GASTROTRICHA Metschnikoff, 1865

Order CHAETONOTIDA Remane, 1925

Family CHAETONOTIDAE Gosse, 1864

Genus *Chaetonotus* Ehrenberg, 1838

Subgenus *Primochaetus* Kisielewski, 1997

Chaetonotus (Primochaetus) heideri Brehm, 1917
(Figure 1A-F, 2A-G, 3A-B)

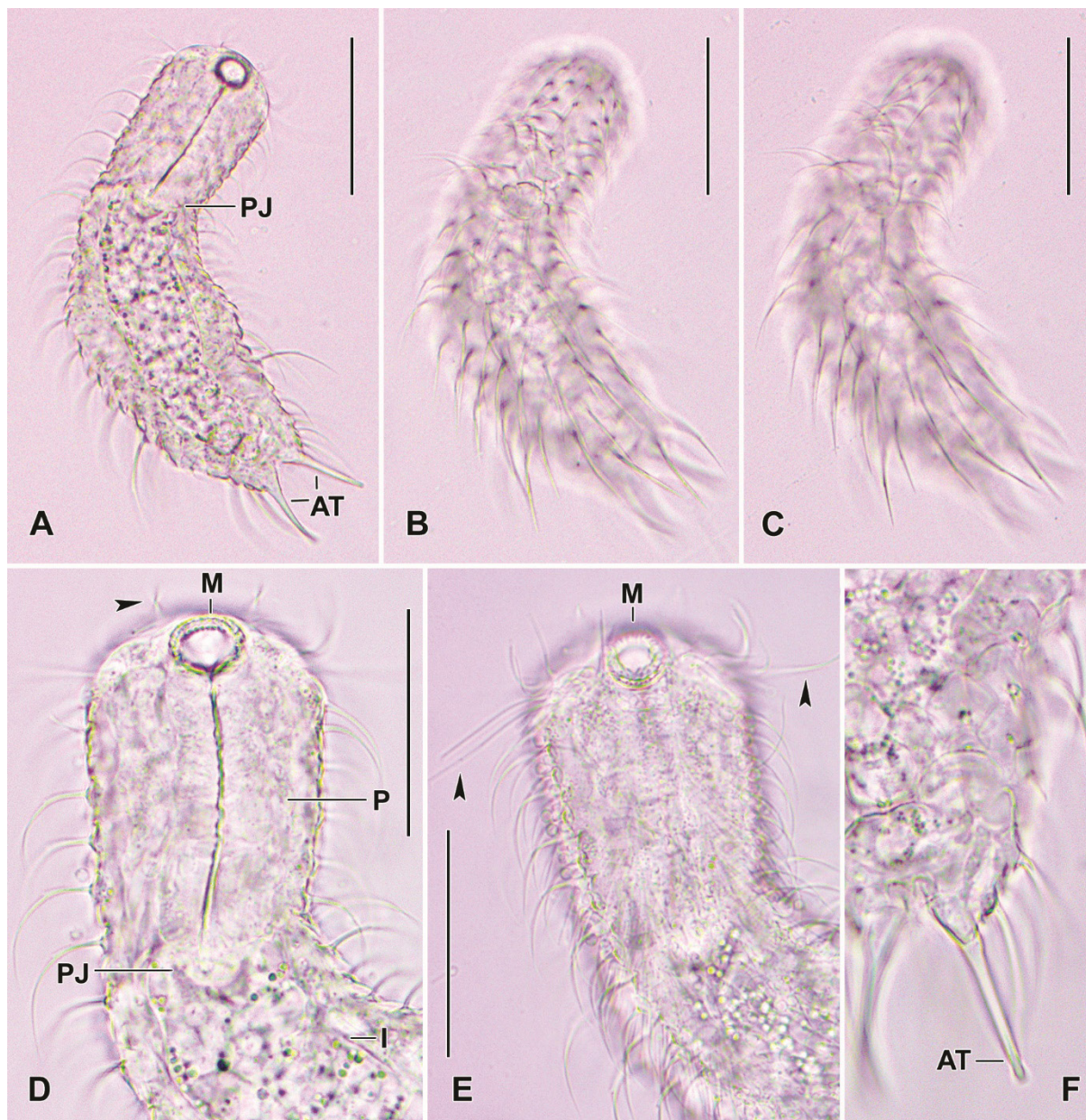


Figure 1. Photomicrographs of *Chaetonotus (Primochaetus) heideri* from live specimens. A-C. Specimens show the body shape and body flexibility. D. Enlarged view of the pharynx, arrowhead indicates a sensory ciliary tuft. E. Detailed view of the oral opening and sensory ciliary tufts (arrowheads). F. Posterior portion of a specimen with a thin adhesive tube. AT, adhesive tube; I, intestine; M, mouth; P, pharynx; PJ, pharyngeal junction. Scale bars: 40 µm (D, E) and 50 µm (A-C).

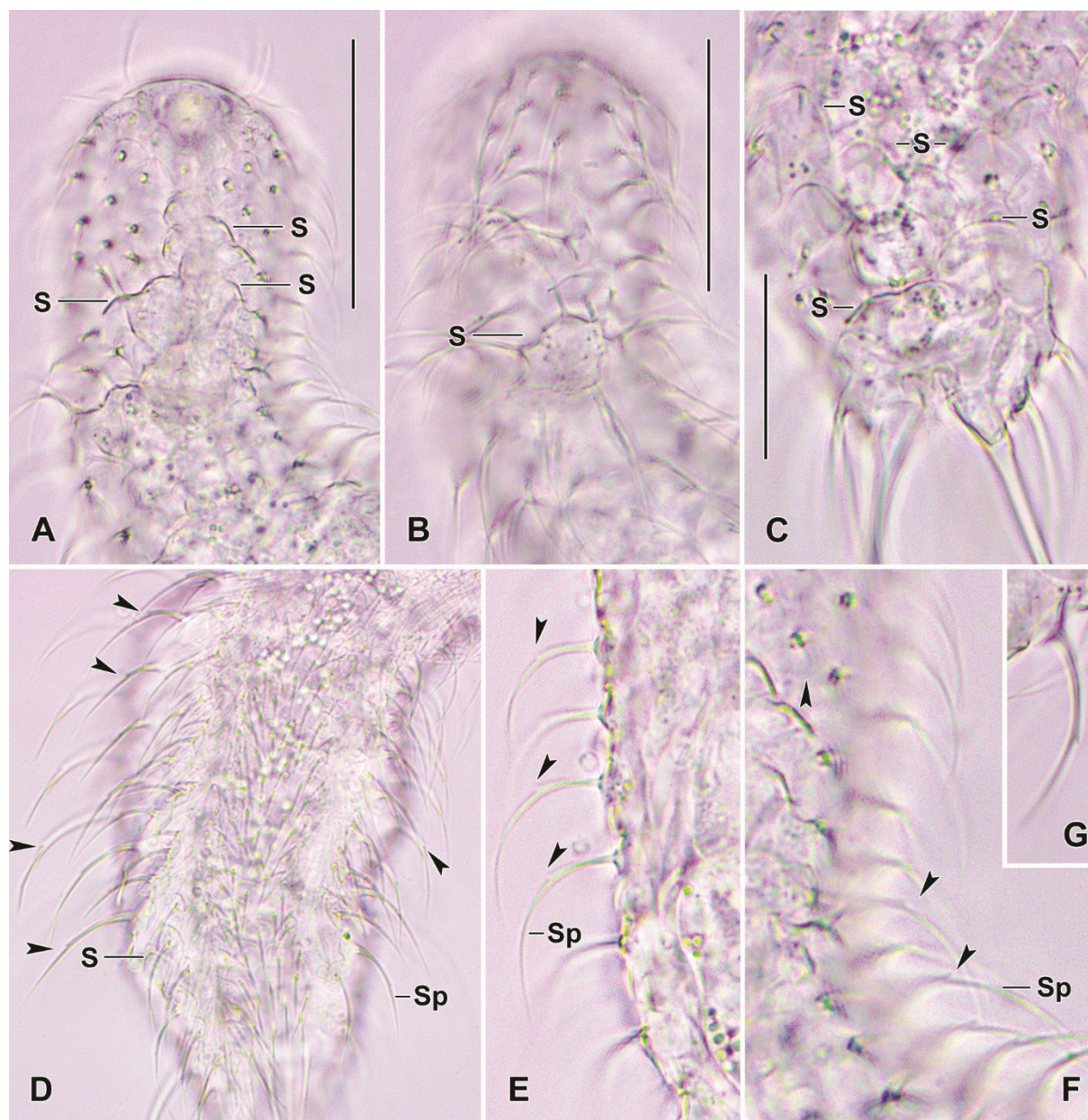


Figure 2. Photomicrographs of the surface scales and spines in *Chaetonotus (Primochaetus) heideri* from live specimens. A-C. Specimens showing the anterior (A, B) and posterior (C) scales, bearing a double anterior edge. D. Middle portion of a specimen showing ventral spines and the spined scales in the interciliary field. E-G. Enlarged views showing barbed spines. Note the barbed structure present in the middle of the spines (arrowheads in D-F). S, scales; SP, spines. Scale bars: 20 μm (C) and 40 μm (A, B).

Diagnosis of the Indian population of Chaetonotus (Primochaetus) heideri Brehm, 1917: The individuals from India exhibit a bottle-to-ten-pin shape with a three-lobed head. On average, the dimensions of the Indian specimens are as follows: body length = 170 μm , body maximum width = 50 μm , head width = 40 μm , mouth diameter = 10 μm , pharynx length = 45 μm , pharynx width = 15

μm , adhesive tube length = 20 μm , posterior-dorsal scale length = 11 μm , egg length = 28 μm , Egg width = 11 μm . The body is flexible, and the cuticle is covered in scales and spines, which extend over the entire animal. The scales exhibit an anterior double edge, characteristic of the taxon, with dorsal spines increasing in length from

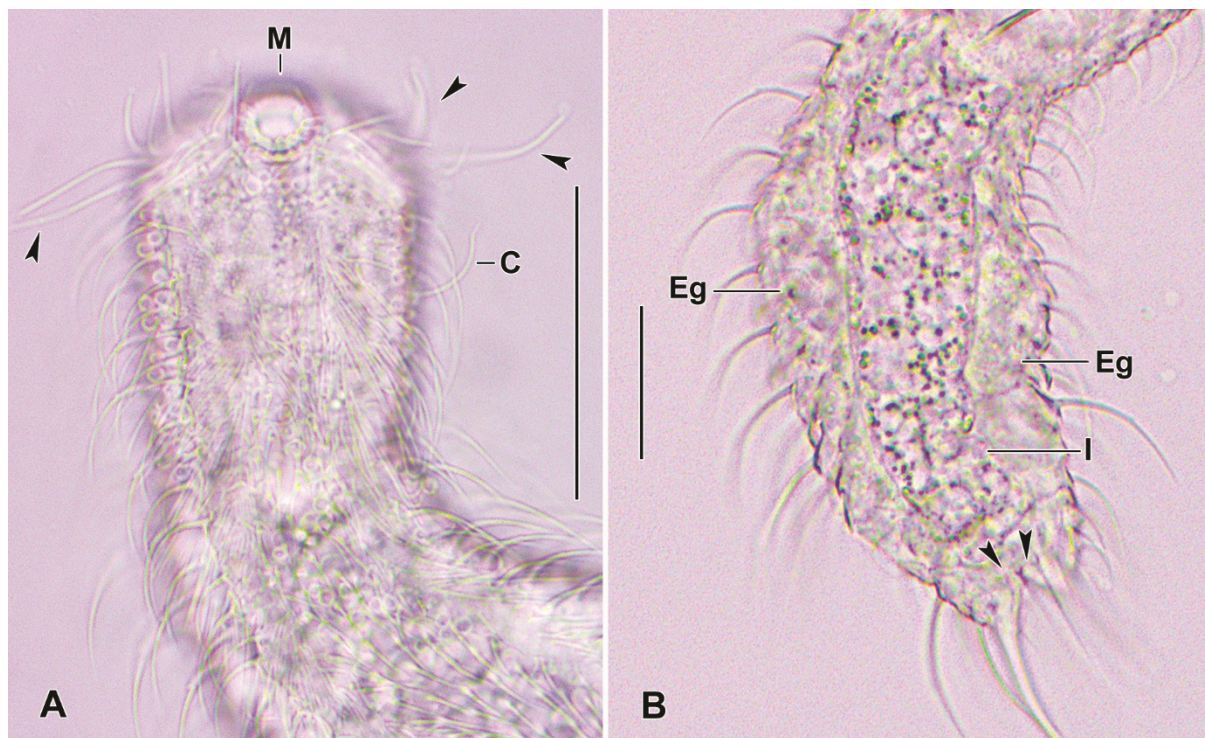


Figure 3. Photomicrographs of *Chaetonotus (Primochaetus) heideri* from live specimens. **A, B.** Detailed view of the anterior **A.** Spine alignment on the ventral surface, cephalic sensory ciliary tufts (arrowheads in **A**) and spined scales in the interciliary field. **B.** Specimen showing caudal spines (arrowheads in **B**) and eggs. **C,** locomotor cilium; **Eg,** egg; **I,** intestine; **M,** mouth. Scale bars: 20 μm (**B**) and 40 μm (**A**).

the anterior to the posterior end. The spines become barbed approximately at the near-middle portion of each spine. The posterior end is furcated, and each furcal branch terminates with a thin adhesive tube. Posterior-most spines are parallel to the adhesive tubes and do not exceed the length of the tubes.

Occurrence: India- (present study); Elsewhere: The species is thus far reported from U.S.A. (Emberton, 1980), Italy (Balsamo & Fregni, 1995), Sweden (Kånneby *et al.*, 2009, 2013), Brazil (Garraffoni *et al.*, 2010; Kånneby *et al.*, 2013), Canada, France, Germany, Great Britain, Romania, Russia (Schwank, 1990; Kånneby, 2013), Poland (Koliczka *et al.*, 2013, 2020), Ukraine (Trokhymchuk, 2020).

Remarks: New record to Indian waters.

Discussion

Earlier records of this species indicated significant morphological variability among disjunct populations (e.g., Balsamo & Fregni, 1995). In summary, the Indian

population shows less morphological similarity in terms of spine structure compared to the reported morphological forms by Balsamo (1980). Since only a few specimens could be isolated from the raw culture for morphological analysis, the identification of the Indian population of *Chaetonotus (Primochaetus) heideri* Brehm, 1917 in the present study may be considered provisional. Therefore, a more detailed study based on morphology, especially Differential Interference Contrast (DIC) microscopy, and molecular sequence analyses could clarify the classification of the Indian population.

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