

Amyntas aspergillum (Perrier, 1872) (Clitellata, Megascolecidae): A new addition to the South Asian earthworm fauna

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Abstract. The presence of the exotic and potentially invasive pheretimoid earthworm *Amyntas aspergillum* (Perrier, 1872) of the family Megascolecidae is reported for the first time from South Asia. Specimens were collected from Dehradun of the Uttarakhand state in the Western Himalayan biodiversity hotspot of India. This work provides the detailed description of the specimens collected along with figures. Besides, certain biological aspects are also discussed.

Keywords. Annelida, India, Oligochaeta, peregrine, Uttarakhand, Western Himalaya.

INTRODUCTION

The family Megascolecidae is the most speciose among the earthworms of the world with over 2,335 species/subspecies (Mısırlıoğlu *et al.* 2023). Among the megascolecid earthworms, the “pheretimoids” are considered to be one of the most evolved group of earthworms (Blakemore 2012). They are recognizable from other members of the family by the existence of an oesophageal gizzard in segment 8 and often also in segments 9 and 10 (Easton 1982). Pheretimoid species are alien to the Indian mainland, but a few species are endemic to the Andaman and Nicobar Island groups of India (Narayanan *et al.* 2023), which biologically share close affinities with Southeast Asia, the pheretimoid stronghold. Currently, 36 pheretimoid species, belonging to 5 genera are recorded from India, viz., *Amyntas* Kinberg, 1867; *Metaphire* Sims & Easton, 1972; *Pheretima* Kinberg, 1867; *Pithemera* Sims & Easton, 1972 and *Polypheretima* Michaelsen, 1934 (Narayanan *et al.* 2023). About a quarter of these species were

reported during the last fifteen years (Siddaraju *et al.* 2010, Ahmed & Julka 2017, Vishwakarma & Yadav 2017, Kharkongor 2018, Narayanan *et al.* 2019, Lone *et al.* 2021, Vabeiryureilai *et al.* 2020, Tiwari *et al.* 2022). Nevertheless, a number of these entries are without any detailed taxonomic information, hence requiring further validation (Narayanan *et al.* 2023). The genus *Amyntas* is the most speciose with 713 nominal species/subspecies in the Megascolecidae family (Mısırlıoğlu *et al.* 2023) and widespread among the pheretimoid earthworm genera (Blakemore 2012). However, Blakemore (2012) stated that possibly more than half of the named *Amyntas* species are synonyms. They are widely distributed in the East and Southeast Asia, Australasia and Oceania regions, with unusually large number of peregrine species (Sims & Easton 1972, Blakemore 2012, Nguyen *et al.* 2016).

Until now, 20 *Amyntas* species were reported from India, including 4 species which are indigenous to the Andaman and Nicobar Islands

(Narayanan *et al.* 2023). Recently, a couple of unusually large earthworms were collected from the urban Dehradun, the capital of the Indian state of Uttarakhand in the Western Himalayan biodiversity hot spot. Later, they were identified as the exotic pheretimoid earthworm *Amyntas aspergillum* (Perrier, 1872) by one of the authors (SPN). Through literature review, we affirmed that this species has never been recorded from South Asia prior to this study (Stephenson 1923, Gates 1972, Blakemore 2007a, Narayanan *et al.* 2021, 2023). In this paper, we report the details of the *A. aspergillum* specimens collected in India.

MATERIALS AND METHODS

Earthworms were collected in Dehradun, Dehradun District, Uttarakhand State in 2023, while they were found slowly moving over the land in the night time. Collected specimens were preserved in 5% formalin. All relevant morphological and anatomical characterisation of the earthworms were carried out under Nikon stereomicroscope (Model: SMZ800N). Colour images were taken by a camera attached directly to the microscope. Raw images were improved using Adobe Photoshop. Specimens were identified following Chang *et al.* (2009) and Blakemore (2012). Collected specimens are housed in the earthworm museum of the Advanced Centre of Environmental Studies and Sustainable Development (ACESSD), Mahatma Gandhi University, Kottayam, Kerala, India.

TAXONOMY

Family Megascolecidae Rosa, 1891

Genus *Amyntas* Kinberg, 1867

Type species. *Amyntas aeruginosus* Kinberg, 1867, by monotypy (Sims & Easton 1972).

Amyntas aspergillum (Perrier, 1872)

(Figures 1A–D, 2A–D)

Perichaeta aspergillum Perrier, 1872: 118.
Perichaeta takatorii Goto & Hatai, 1898: 76.

Pheretima aspergillum: Michaelsen 1900: 253

Amyntas aspergillum: Blakemore 2007b: 9.

For further synonyms see Chang *et al.* (2009), Blakemore (2012) and Nguyen *et al.* (2016).

Type locality. Amoy and Kowloon, China (Blakemore 2012).

Type material. At Muséum national d'Histoire naturelle, Paris, France - MNHN 575 (Reynolds & Wetzel 2024).

Material examined. 2 clitellates (one specimen missing most of the posterior region), Reg. No. ACESSD/EW/1697, Forest Department Colony in Dehradun (30.3373403°N, 78.0559959°E), Uttarakhand State, Dehradun District, India, 640 m a.s.l., urban home garden, 14 August 2023, leg. Harshita Verma and Akash Kumar Verma.

Description of the present specimens. External: Large size, body cylindrical, colour brownish red on dorsum and pale brown on ventrum in life. Length 224 mm, diameter 9–11 mm (mid clitellum), segments 138. Setae perichaetine, on raised rings, 61–69 in segment 8 ($n = 2$), 73 in segment 20 ($n = 1$), 14 between male pores ($n = 1$). Prostomium open epilobic, with a visible central groove (Fig. 1A). First dorsal pore on intersegmental furrow 11/12. Spermathecal pores two pairs, widely separated in intersegmental furrows 7/8/9 (Fig. 1B), 0.36 body circumference ventrally apart ($n = 1$). Clitellum annular, in segments 14–16, coffee brown colour (in preserved specimens), furrows obliterated, seta absent, arc not prominent (Fig. 1C), dorsal pores absent. Female pore single, ventro-median, in a lightly depressed area, on segment 14 (Fig. 1C). Male pores paired, widely separated on segment 18, porophore on the top of a slightly raised equatorial round papilla (Fig. 1C), surrounded by several circular folds (Fig. 1D), 0.26 body circumference apart ($n = 1$), setae visible between male pores. Genital papillae present, single, lateral to spermathecal pores (Fig. 1B), multiple papillae in 2–3 transverse rows medial to male pores, number 1–4 in each row, number higher in the rows closer to setal arc (Fig. 1D). Nephridiopores not recognisable.

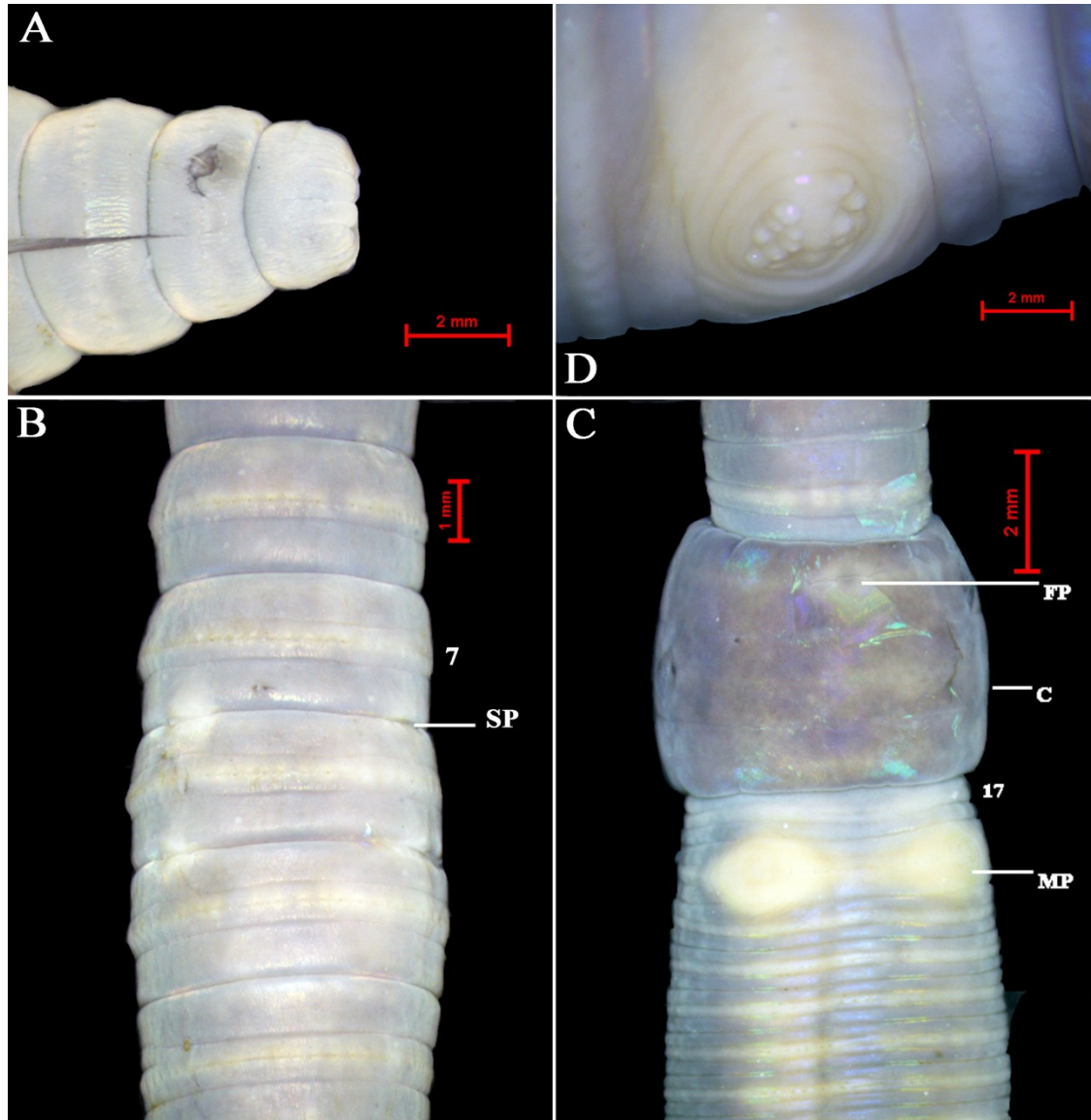


Figure 1. *Amyntas aspergillum* (Perrier, 1872) external features, A = Prostomium, dorsal view, B = Spermathecal pore region, ventral view, C = Clitellum and male field, ventral view, D = Genital papillae at male pore region, ventral view, rhs. *Abbreviations.* C – Clitellum; FP – Female pore; MP – Male pore; rhs – right hand side; SP – Spermathecal pore.

Internal: Septa 5/6/7/8 thickly muscular, 8/9/10 absent and 10/11/12/13 strongly muscular. Gizzard large, globular, in segments 8–9, oesophagus and gizzard attached to the parietes via several longitudinal muscular fibre strands piercing through the septa; intestine origin in segment 15; intestinal caeca paired, simple, in segments 27–24, bent upwards, projected back into segment 25, margins indented or lobate (Fig. 2B);

typhlosole present, simple. Last pair of hearts in segment 13. Holandric; seminal vesicles two pairs (Fig. 2A), in segments 11 and 12, racemose, compact, dorsally lobulated. Spermathecae two pairs, in segments 7 and 8, ampulla peach-shaped or elongated, duct stout, shorter than ampulla; unidiverticulate, ectal diverticulum, diverticulum stalk long, slender, sinuous, coiled, seminal chamber oval or elongated, diverticulum longer

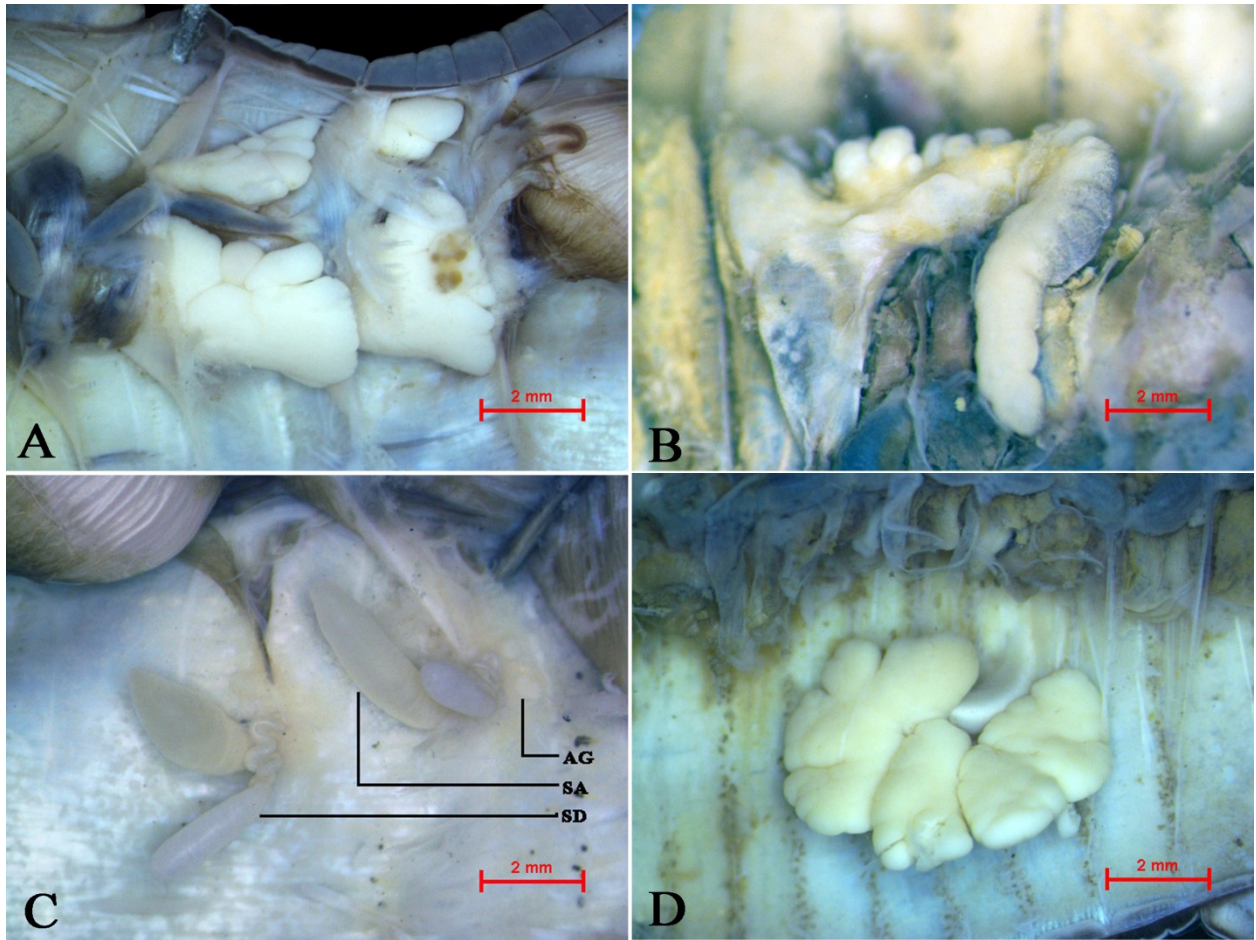


Figure 2. *Amyntas aspergillum* (Perrier, 1872) internal features, A = Seminal vesicles, dorsal view, B = Caecum, lhs, dorsal view, C = Spermathecae and accessory glands, rhs, dorsal view, D = Prostate, rhs, dorsal view. *Abbreviations.* AG – Accessory glands; lhs – left hand side; rhs – right hand side; SA – Spermathecal ampulla; SD – Spermathecal diverticulum.

than the duct plus ampulla (Fig. 2C). Prostates paired, large, thickly racemose, multi-partite, in segments 16–20, prostatic duct, muscular, stout, bent, thick at ectal end (Fig. 2D). Meronephric. Accessory glands present, small spheroidal mass, attached to parietes near spermathecae and prostates.

Habitat. Home garden in an urban area.

Natural history. The earthworms were found moving over the land surface during night, possibly actively migrating to nearby area.

Distribution. Forest Department Colony in Dehradun, Uttarakhand State, India: (present re-

cord) (Fig. 3); *Elsewhere.* Asia: China, Taiwan and Vietnam (Chang *et al.* 2009, Blakemore 2012, Nguyen *et al.* 2016).

Remarks. According to Chang *et al.* (2009), it is an anecic earthworm. Its anatomical peculiarity, the presence of several strong longitudinal muscular fibre strands that attaches oesophagus and gizzard to the parietes agrees with Chang *et al.*'s (2009) ecological observation. Specimens collected from Taiwan have large prostates occupying segments 18–22 or 17–21 and with 8–19 setae between male pores (Tsai 1964, Chang *et al.* 2009, Wang & Shih 2010), whereas those from western Himalaya have prostates in segments 16–20 and 14 setae between male pores. According to

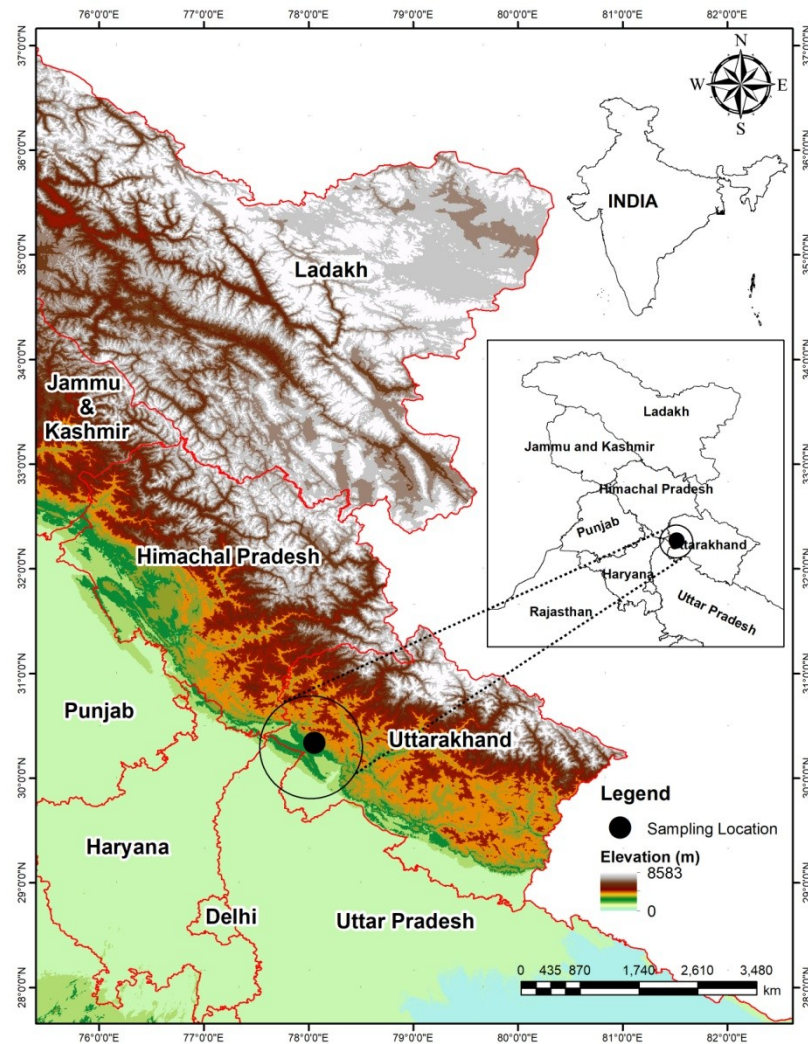


Figure 3. Collection locality of *Amyntas aspergillum* (Perrier, 1872) in India.

Chang *et al.* (2009), spermathecal ampulla of the specimens from Taiwan is peach-shaped, whereas in the Indian specimens, it is peach-shaped or elongated. Differences in external and internal features are definitely intraspecific variations.

DISCUSSION

Apart from the present record from India, *A. aspergillum* is known from three Asian countries viz., China, Taiwan and Vietnam. The species was described based on the specimens from China (Perrier 1872), and in China it is known from Amoy, Fuchow, Kowloon and Hainan Island

(Blakemore 2012). In Taiwan, it is widely distributed in low elevation regions and also in the Lanyu and Kinmen Islands (Chang *et al.* 2009). It is commonly found in the northern and central regions of Vietnam (Nguyen *et al.* 2016). According to Chang *et al.* (2009), in Taiwan, it is frequently found on lawns of schools and parks even in big cities. Present record of the species from India is also from an urban garden; this indicates its wide adaptability to the urban conditions.

Most of the native Indian earthworms are found in undisturbed natural ecosystems concentrated in the Western Ghats-West Coast Plains

and Eastern Himalaya-Northeast Hills (Narayanan et al. 2020, 2023). Deforestation of the Himalayas as part of the commercial purposes started with the British rule, and after independence exploitation continued as a source of revenue, for agriculture expansion and urbanization (Pandit et al. 2014). In the Western Himalayan region exotic and native peregrine species are the most common ones and native endemic species are confined to the remaining natural ecosystems (Narayanan et al. 2023). A number of studies are available on the earthworm fauna of the Dehradun and Dehradun Valley, which starts from the last quarter of the 19th century to present day (Bourne 1889, Fedarb 1898, Gates 1951, Soota 1966, Soota & Halder 1980, Mandal et al. 2021). Together they have reported the presence of 11 pheretimoid species from the area, which are, *Amyntas alexandri* Beddard, 1901, *A. corticis* (Kinberg, 1867), *A. gracilis* (Kinberg, 1867), *A. morrisi* (Beddard, 1892), *A. pallidus* (Michaelsen, 1892), *A. robustus* (Perrier, 1872), *Metaphire anomala* (Michaelsen, 1907), *M. birmanica* (Rosa, 1888), *M. californica* (Kinberg, 1867), *M. houlleti* (Perrier, 1872), *M. peguana* (Rosa, 1890) and *M. posthuma* (Vaillant, 1868). They might have been introduced into the country, presumably by anthropochorous activities and other agencies (Julka 1988, 2014, Julka & Paliwal 2005). Now, exotic species have successfully established their colonies in disturbed habitats subsequent to deforestation and intensive cultivation, showing their inherent ability to withstand disturbance and interference (Julka & Paliwal 2005c).

None of the above studies reported the occurrence of *A. aspergillum* from the Dehradun areas, hence it can be concluded that this species has been introduced to the region only recently. A total of 57 exotic earthworm species belonging to 8 families have been reported from the country (Narayanan et al. 2023) and with the addition of *A. aspergillum*, the number rose to 58 species. India has been a trade centre for millennia and hence many new exotic species records from the country are likely (Narayanan et al. 2019).

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