First record of the exotic earthworm *Metaphire bahli* (Gates, 1945) (Oligochaeta: Megascolecidae) from India

S.P. Narayanan1*, S. Sathrumithra1, R. Anuja2, G. Christopher1, A.P. Thomas1 & J.M. Julka3

1Sasankan Prasanth Narayanan, Somanadhan Sathrumithra, Guna Christopher & Ambatu Paili Thomas, Advanced Centre of Environmental Studies and Sustainable Development, Mahatma Gandhi University, Priyadarshini Hills, Kottayam – 686560, Kerala, India. Email: narayanankc@gmail.com *Corresponding author
2Rajagopal Anuja, School of Environmental Sciences, Mahatma Gandhi University, Priyadarshini Hills, Kottayam – 686560, Kerala, India.
3Jatinder Mohan Julka, School of Biological and Environmental Sciences, Faculty of Basic Sciences, Shoolini University, Solan – 173 212, Himachal Pradesh, India.

Abstract. The occurrence of the exotic earthworm species *Metaphire bahli* (Gates, 1945) of the family Megascolecidae is recorded for the first time from India. Specimens were collected from the Alappuzha District of Kerala State. Its detailed description along with geographical distribution is provided.

Keywords. Annelida, Peregrine, Kerala, New record, Western Ghats.

INTRODUCTION

India is one of the mega earthworm biodiversity countries, about 71% of genera and 89% of earthworm species are endemic here (Julka & Paliwal 2005). Currently 425 earthworm species and subspecies belonging to 10 families and 67 genera are recorded from India (Julka 2014, Ahmed & Julka 2017, Mandal et al. 2017, Narayanan et al. 2016, Kharkongor 2018). Within the country, the Western Ghats biodiversity hotspot along with the western coastal plains stand out as the regions with the highest level of earthworm species richness, consisting of ca. 53% of the country’s earthworm diversity (Julka & Paliwal 2005). Kerala State is a narrow strip of land spreading over an area of 38,863 km² along the southwest corner of the Indian subcontinent (between 8°17’–12°47’N and 74°52’–77°24’E). It is an important biodiversity region as 48% of its area belongs to the Western Ghats. Various workers have contributed to the taxonomical studies of the earthworm fauna of the state but most of the earthworm species of Kerala were recorded more than 80–90 years ago and many are known only from the original description (Narayanan et al. 2016a). At present 98 species/subspecies belonging to 27 genera and 9 families are reported from the state, of which 17 are exotic (Narayanan et al. 2016a, b, c, 2017). However, the diversity and distribution pattern of alien earthworm species of Kerala State are still not fully understood (Narayanan et al. 2016d). As part of our study to assess the earthworm diversity of Kerala State, we have sampled various regions of the Alappuzha District, which revealed the presence of the exotic *Metaphire bahli* (Gates, 1945). Survey of relevant literature affirmed that this species has not been previously reported from India (Stephenson 1923, Gates 1972, Blakemore 2012).

MATERIALS AND METHODS

Earthworms were collected by digging and hand sorting method as proposed by Julka (1990). Collected specimens were preserved in 5% formaldehyde solution.
malin. All anatomical observations were made by dorsal dissection under a binocular stereomicroscope (Nikon SMZ800N). Specimens were identified following Gates (1945), Blakemore (2012, 2016) and Nguyen et al. (2017). Collected specimens were deposited in the earthworm laboratory of the Advanced Centre of Environmental Studies and Sustainable Development, Mahatma Gandhi University, Kerala, India.

RESULTS

Family Megascolecidae Rosa, 1891
Metahire bahli (Gates, 1945)
(Figures 1A–D, 2)


Type locality. Colombo in Sri Lanka (Gates 1945).
Type material. Unknown (Nguyen et al. 2016).

Material examined. 12 clitellate and 3 a clitellate specimens, Reg. No. ACESSD/EW/880, Chennithala, 9.273746°N, 76.529845°E), Alappuzha District, Kerala State, India, 27 August 2018, leg. S.P. Narayanan (Fig. 2).


Ingesta. Mainly sand and major portion of it is tiny quartz, also a few pieces of rootlets, bark and colloids.

Remarks. At the collection site this species coexisted with a number of native (Megascolex konkanensis konkanensis Fedarb, 1898 and Megascolex sp.) and exotic species (Pontoscolex corethrurus (Mueller, 1857) and Metaphire houleti (Perrier, 1872)). Once collected out from the soil, it remained motionless for a bit of time. When disturbed, it moved away with serpentine motion with great agility through sand and even through grasses.

DISCUSSION

Metaphire bahli morphologically belongs to the peguana species group consisting of M. peguana peguana (Rosa, 1890), M. peguana laisonensis Nguyen & Nguyen, 2017 and M. doipha laisongo Bantaowong & Panha, 2016. Members of this group have similar number and position of spermathecal pores, genital markings and morphology of male region (Bantaowong et al. 2016, Blakemore 2016, Nguyen et al. 2017). However, they are distinguished from each other by size, shape of genital markings in male region, origin of spermathecal diverticula and shape of the prostate (Bantaowong et al. 2016, Nguyen et al. 2017). M. bahli was described from Sri Lanka (Gates 1945), but the original home is supposed to be the region of Thailand/Laos (Blakemore 2012). Present record from Chennithala, Kerala State represents the first record of this species from India. So far, this species is known mainly from Asia (Cambodia, Laos, Myanmar, Philippines, Sri Lanka, Thailand and Vietnam) and Australia (Gates 1945, 1972, Blakemore 2012, Nguyen et al. 2016, 2017). Apart from M. bahli, two other species of Metaphire are known from Kerala State; they are
First record of the exotic earthworm *Metaphire bahli* from India

**Figure 1.** *Metaphire bahli* (Gates, 1945), A = Clitellum, female pore, male field and genital markings, B = Spermathecae, C = Prostate, D = Caeca.

**Table 1.** Character comparison among the *Metaphire* species found in Kerala State, India

<table>
<thead>
<tr>
<th>Character</th>
<th><em>M. houlleti</em> §</th>
<th><em>M. penguana</em> §</th>
<th><em>M. bahli</em> #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (mm)</td>
<td>40–240</td>
<td>115–240</td>
<td>76–121</td>
</tr>
<tr>
<td>Diameter (mm)</td>
<td>2.6–7</td>
<td>4.2–8</td>
<td>4–5</td>
</tr>
<tr>
<td>Segments</td>
<td>73–200</td>
<td>97–125</td>
<td>79–119</td>
</tr>
<tr>
<td>Prostomium</td>
<td>Epilobous open</td>
<td>Epilobous open</td>
<td>Epilobous open</td>
</tr>
<tr>
<td>First dorsal pore</td>
<td>Often in 9/10 or 11/12, sometimes in 7/8–12/13</td>
<td>12/13</td>
<td>12/13</td>
</tr>
<tr>
<td>Spermathecal pore</td>
<td>6/7/8/9</td>
<td>6/7/8/9</td>
<td>6/7/8/9</td>
</tr>
<tr>
<td>Genital markings</td>
<td>Usually absent, when present near spermathecal pores</td>
<td>17/18 and 18/19, nearly elliptical pads with slit-like central apertures</td>
<td>17/18 and 18/19, invaginate</td>
</tr>
<tr>
<td>Morphology of male region</td>
<td>Not concave</td>
<td>Not concave</td>
<td>Strongly concave</td>
</tr>
<tr>
<td>Spermathecal diverticula origin</td>
<td>Entally</td>
<td>Ectally</td>
<td>Ectally</td>
</tr>
<tr>
<td>Intestinal caeca</td>
<td>27–22</td>
<td>27–22</td>
<td>27–24</td>
</tr>
<tr>
<td>Prostate</td>
<td>Racemose in 16, 17–20, 21,</td>
<td>Racemose in 16–21</td>
<td>Racemose in 17–20</td>
</tr>
</tbody>
</table>
M. houlleti (Perrier, 1872) and M. peguana (Rosa, 1890). Key characters to distinguish these species are provided in table 1. The former is now widely distributed in the state (Narayanan et al. 2015) and the latter is known only from a single location (Narayanan et al. 2016b).

Occurrence of the exotic invasive species such as Pontoscolex corethrurus (Müller, 1857) and M. houlleti in Kerala State was reported around a century back (Fedarb 1898, Michaelsen 1910, Stephenson 1916), and now they are found widely colonized here (Narayanan et al. 2015, 2016d). Being a cosmopolitan invasive species M. bahli could establish itself in different regions of the country with time. Further collections in the surrounding areas should be carried out to determine whether this species has been colonized in other similar areas of the region. Hitherto, existence of 51 exotic earthworm species has been documented from India (Julka 2014, Ahmed & Julka 2017). With the addition of M. bahli, the number rose to 52 species. Many regions of India remain unexplored regarding the earthworm fauna and the country has been a trade center since millennia. Hence, further intensive surveys may unearth the presence of many new exotic species from the country.

Acknowledgements – We would like to extend our sincere gratitude to Mr. Karunakaran Akhildev for preparing the distribution map.

REFERENCES


STEPHENSON, J. (1923): The fauna of British India, including Ceylon and Burma – Oligochaeta. Published by Taylor and Francis, London, pp 518.

103