

# ***Megascolex* Templeton, 1844 (Clitellata, Megascolecidae): description of a new species from the northern Eastern Ghats, India with taxonomic key to the Indian species**

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**Abstract.** The earthworm fauna of the Eastern Ghats Hills in Peninsular India is still under explored. Here a new species, namely, *Megascolex jamiesoni* Narayanan & Paliwal, sp. nov. is described based on the specimens collected from the Eastern Ghats hills of Koraput district of Odisha state, India. It belongs to the *ratus*-species group. Members of this group are characterized by the following features: spermathecal pores in intersegmental furrows 7/8/9, penial setae absent, holandric, calciferous glands absent, and seminal vesicles in segments 9 and 12. Present work provides a detailed description of the new species along with the illustrations of the key characters. Apart from this, a key for the Indian *Megascolex* species is provided. With the new findings, the range of *Megascolex* genus has been extended to further north in the Eastern Ghats Hills. With the discovery of the new taxa, the total number of species in the *Megascolex* genus has increased to 71, of these, 35 are found in India.

**Key words.** Annelida, earthworm, endemic, Odisha, Oligochaeta, taxonomy.

## INTRODUCTION

India is one of the world's most diverse regions in terms of geography, climate, and habitats and furthermore it is one of the countries with the greatest earthworm diversity (Narayanan *et al.* 2023a). Over the past ten years, several new species of earthworms have been described from India (Narayanan *et al.* 2017, 2021a, 2022; Lone *et al.* 2020, 2022; Tiwari *et al.* 2021; Ahmed *et al.* 2022, 2023a, b; Naik *et al.* 2024). Majority of these new species are from the Western Ghats mountain ranges and Northeastern Indian hills. At

this juncture, it is also important to note that the earthworm fauna of the Eastern Ghats Hills, especially the remnant forests of these isolated hill ranges are highly unexplored and insufficiently documented, and only three species are recently described from this region (Ahmed *et al.* 2023a; Naik *et al.* 2024). Unlike the Western Ghats, the Eastern Ghats form a discontinuous range of hills along the eastern coast of Peninsular India. It begins in the north from Mahanadi Basin in Odisha, traverses southwards through Andhra Pradesh to Central Tamil Nadu, where the Eastern Ghats turn southwest to meet the Western Ghats

in the Nilgiri Hills, with an average elevation of 600 m and the highest peak in Biligirirangan Hills up to 1816 m (Srinivasan & Prashanth 2006; Kehimkar 2008; Nayaka *et al.* 2013). Much of the Eastern Ghats region has dry deciduous forest, but still it supports pockets of various tropical forests such as moist deciduous, evergreen and semi-evergreen forests (Kehimkar 2008; Nayaka *et al.* 2013).

The earthworms of the genus *Megascolex* Templeton, 1844 belonging to the family Megascolecidae Rosa, 1891 have a multifarious taxonomic history. The first species of an earthworm scientifically described from the Indian subcontinent was *Megascolex caeruleus* by Templeton (1844) from Ceylon (= Sri Lanka) (Narayanan *et al.* 2021b). The genus *Megascolex* is an ancient lineage with their origins in the ancient super continent Gondwanaland (Lone *et al.* 2022) but it is one among the advanced megascolecid genera (Blakemore 2012). The genus is restricted to Peninsular India and Sri Lanka (Stephenson 1923; Narayanan *et al.* 2020, 2021b, 2023a). There are 70 valid taxa in this genus (Narayanan *et al.* 2020, 2021b, 2023a; Lone *et al.* 2022; Naik *et al.* 2024) but *M. insignis* Michaelsen, 1910 is the only species found in both countries, whereas, 33 and 36 taxa are endemic to Peninsular India and Sri Lanka respectively (Michaelsen 1910; Stephenson 1923; Narayanan *et al.* 2020, 2021b, 2023a; Naik *et al.* 2024). Several *Megascolex* species described from the Indian subcontinent are known only from their respective type localities (Narayanan *et al.* 2021b, 2023a). However, in the recent past, many of these species have been collected from additional localities (Narayanan *et al.* 2014, 2023b, c; Sathrumithra *et al.* 2018; Anuja *et al.* 2023). *Megascolex* species are showing discontinuous distribution in Peninsular India (Stephenson 1924, 1925; Naik *et al.* 2024), with a stronghold in the southern portions of Western Ghats mountain range and west coast (Narayanan *et al.* 2020). Formerly, only two species of *Megascolex* were described from outside the Western Ghats Hills (Stephenson 1924, 1925). But recently Naik *et al.* (2024) has added two more species from the Eastern Ghats Hills in the Ko-

raput district of Odisha state, India. This discovery has extended its known range to further north in the Eastern Ghats Hills. From the same collection, the presence of another new species of *Megascolex* was also revealed, which is described and illustrated herein this work.

## MATERIALS AND METHODS

Earthworms were collected from Jeypore Ghati in Koraput district of Odisha state by digging soil with a spade, hand-sorting the soil for earthworms and also searching for organic microhabitats such as fallen tree trunks and leaf litter. Collected specimens were preserved in 10% formalin and later transferred to 95% ethanol. All relevant morphological and anatomical (through dorsal dissection) characterization of the earthworms was carried out under a Magnus MSZ series stereomicroscope. Illustrations were made with the help of a camera lucida attached to the microscope. Colour images were taken using a Nikon stereomicroscope (Model: SMZ800N). Raw images and line drawings were improved using Adobe Photoshop. The types of the new species are deposited in the 'National Zoological Collection' of the Zoological Survey of India, Western Ghat Regional Centre, Kozhikode (ZSIK), Kerala State, India, which is a 'Designated National Repository' for fauna.

## TAXONOMY

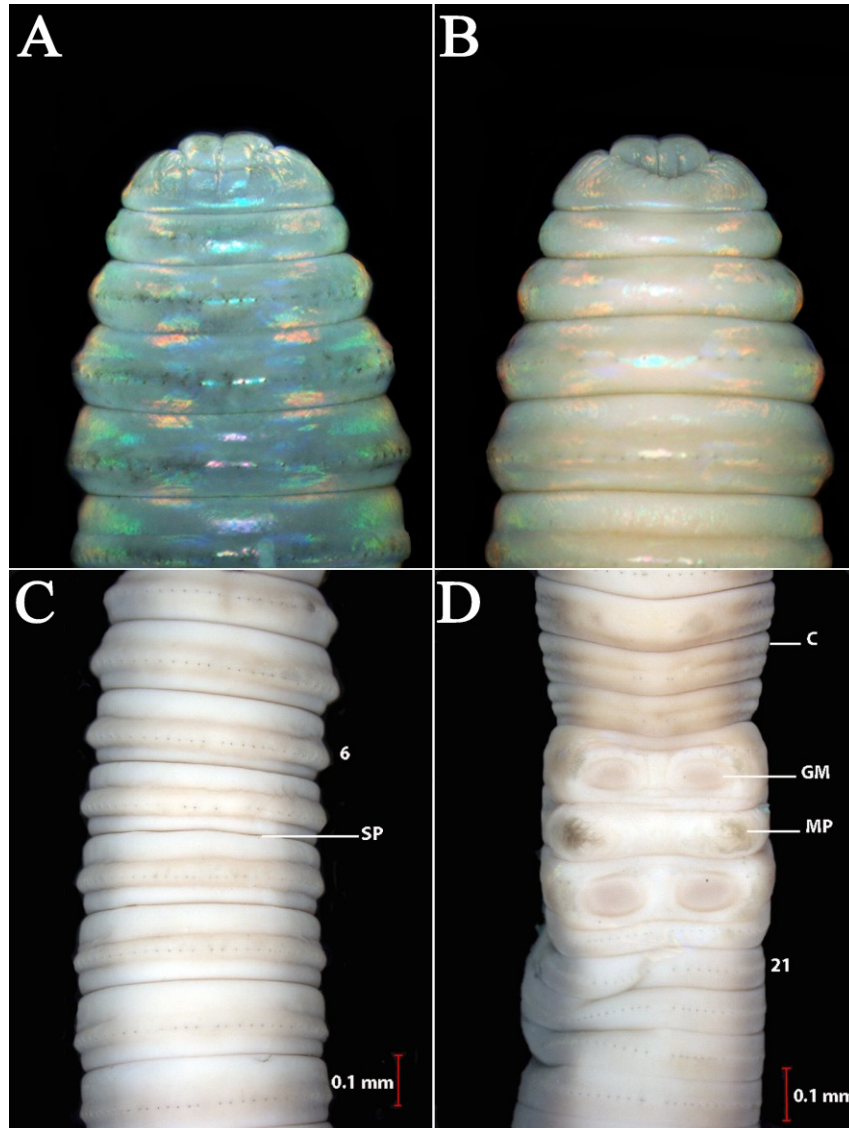
### Family Megascolecidae Rosa, 1891

### Genus *Megascolex* Templeton, 1844

### *Megascolex jamiesoni* Narayanan & Paliwal, sp. nov.

(Figures 1A–D, 2A–D)

*Material examined. Holotype.* Clitellate (ZSIK Reg. No. ZSI/WGRC/I.R.INV.26204), Jeypore Ghati (18.83929°N, 82.61730°E), around 10 km away from Jeypore town, Koraput District, Odisha State, India, 862 m a.s.l., moist deciduous forest, collected from beneath the leaf litter in a bed of pebbly soil along with roots of Pteri-



**Figure 1.** *Megascolex jamiesoni* sp. nov., external characters: A = Prostomium with canalicula, dorsal view; B = Prostomium with canalicula, ventral view; C = Spermathecal pore region, ventral view; D = Male field showing the male pores and genital markings, ventral view. C – Clitellum, GM – Genital marking, MP – Male pore, SP – Spermathecal pore.

dophyte (*Athyrium* sp.), around 10 m away from a non-perennial stream, 5 June 2022, leg. Ayusmita Naik. *Paratype*: 1 clitellate (ZSIK Reg. No. ZSI/WGRC/I.R.INV.26786), same collection data as for holotype.

**Diagnosis.** Large sized; length 229–269 mm, width 7.5–9 mm at segment 10, 162–167 segments. Prostomium proepilobic, with conspicuous canalicula. Clitellum on segments  $\frac{3}{4}13$ , 13–19 (=  $6\frac{3}{4}$ –7), 13–16 annular, 17–19 saddle shaped, dor-

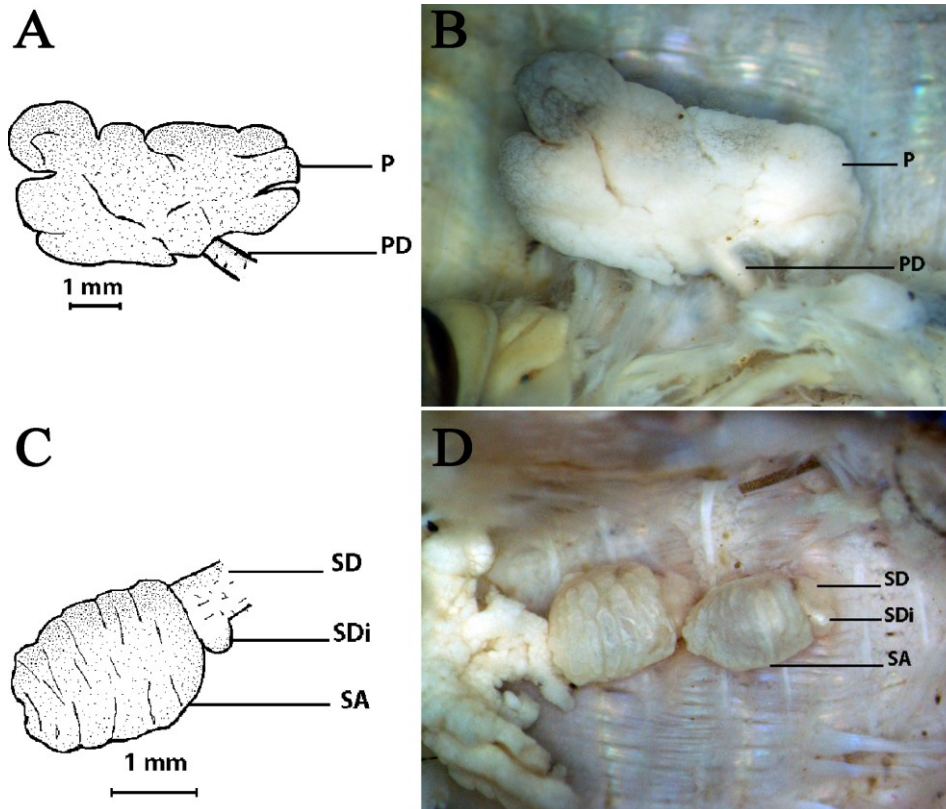
sal pores absent, indication present, setal arc indication present at dorsum, visible on ventrum segment 13. Quadrithecal, spermathecal pores inconspicuous, concealed in intersegmental furrows 7/8/9. Male field light coloured, occupying the whole segment 18, male porophore minute, at the centre of an equatorial swollen papilla, setae absent between male pores. Genital markings two pairs, whitish, transversely elliptical depression, with finite elevated edge, confined to segments 17 and 19. Penial setae absent. Gizzard large, mus-

cular, in segment 7, septa 7/8/9 pushed posteriorly in funnel-like manner, thus take the spaces of segments 8–9. Oesophagus and gizzard are attached to parietes with several crisscrossed muscular fibres; intestine origin in segment 20. Last pair of hearts in segment 13. Holandric. Prostates large, racemose, irregularly oblong, longitudinally placed, incised, lobed at margins, extends in segments 18–19, 20, duct obliquely placed, muscular, moderately stout, fairly equal width throughout, duct shorter than the length of prostate. Spermathecae unidiverticulate, close to anterior margins in segments 8 and 9, ampulla, large, ovoid sac-like, somewhat dorsoventrally flattened, posteriorly directed, ampulla and duct well marked off, duct thick, muscular, *c.* 1/3rd of the width of ampulla, *c.* 1/4th length of duct plus ampulla; ental spermathecal diverticulum, enclosed in duct-wall, projected on lateral face of the duct. Genital markings glands absent.

*Description. External.* Brownish, dark (in life), restricted to dorsum, pale at ventrum; body circular. Dimensions: Holotype – 229 mm, width 7.5 mm at segment 10, 162 segments; paratype – 269 mm, width 9 mm at segment 10, 167 segments. Prostomium proepilobic, with canalicula (Fig. 1A), cleft visible in ventrum (Fig. 1B). Segments 4–12 biannulate, setae at the centre of elevated ridge. First dorsal pore concealed in intersegmental furrow 5/6. Clitellum dark coffee brown colour in life, light brown in preservation, on segments 3/4, 13–19 (= 6<sup>3/4</sup>–7), 13–16 annular, 17–19 saddle shaped, dorsal pores absent, indication present, intersegmental furrows distinct, seta visible at segment 13, a few visible in segments 15–17 at ventrum, but indication present at dorsum, pale whitish at male field and genital markings. Setae perichaetine throughout, fairly large; setal formula  $aa = 1.81$   $ab = 1.53$   $bc = 1.67$   $yz = 1.33$   $zz$  on segment 12,  $aa = 2.58$   $ab = 2.58$   $bc = 3.8$   $yz = 2.58$   $zz$  on segment 24 ( $n = 1$ ); 54–60 on segment 5, 58–64 on segment 9, 56–58 on segment 12, 58–60 on segment 20, 64–76 on segment 25 ( $n = 2$ ); 14–16 between spermathecal pores lines on segment 8, setae absent between male pores. Male field pale coloured, male pores paired widely on segment 18, porophore minute,

on the top of a swollen equatorial papilla, which is surrounded with 3–5 circular folds, porophore in line with *gh* or *hi* setal lines, 0.17–0.19 body circumference apart. Female pores minute, paired, pre-setal, ventro-median, in transverse depression, at *ab* setal lines, on segment 14. Spermathecal pores paired, inconspicuous, transversely placed, concealed in intersegmental furrows 7/8/9, in line with *fg* or *g* setal lines (Fig. 1C), 0.25–0.29 body circumference apart. Nehridiopores not recognizable. Genital markings present, two pairs, pale whitish, transversely elliptical depression, with finite elevated edge, confined to segment 17 and 19, rather postsetal, anterior end start from the setal arc (Fig. 1D). Penial setae absent.

*Internal.* Brownish pigmentation in circular muscle layer. Septum 5/6 muscular, septa 6/7/8/9 membraneous or thin, 9/10/11/12/13 thickly muscular. Oesophagus with large, muscular, barrel-shaped gizzard, in segment 7, septa 7/8/9 pushed posteriorly in funnel-like manner, thus take the space of segments 8, 9; oesophagus and gizzard are attached to the parietes with several crisscrossed muscular fibers, calciferous gland like swelling present in oesophagus at segments 16 and 17; intestine origin in segment 20; intestinal caeca absent, typhlosole, simple, low ridge-like, lamelliform. Dorsal blood vessel, single and complete; supra esophageal vessel single. Last pair of hearts in segment 13. Holandric; testis and funnels, paired, free, in segments 10 and 11; seminal vesicles two pairs, racemose, in segments 9 and 12, anterior pair bushy or elongated branched, attached to posterior face of septum 9/10. Prostates paired in segment 18, fairly large, longitudinally placed, irregularly oblong, thickly racemose, lightly incised, lobed at margins, extending into segments segment 18–19, 20, penetrating through the septa 18/19/20; prostatic duct, obliquely placed, muscular, moderately stout, fairly equal width throughout, duct shorter than the length of prostate (Fig. 2A, B). Spermathecae two pairs, close to anterior margins in segments 8 and 9, posteriorly directed, anterior pair smaller, ampulla large, more or less ovoid, sac-like, wider at ectal end, somewhat dorsoventrally flattened, transversely striped; ampulla and duct well marked off, duct thick muscular, *c.* 1/3rd of the



**Figure 2.** *Megascolex jamiesoni* sp. nov., prostate and spermatheca: A, B = Prostate, left side, dorsal view; C, D = Spermatheca, right side, dorsal view. P – Prostate, PD – Prostatic duct, SA – Spermathecal ampulla, SD – Spermathecal duct, SDi – Spermathecal diverticulum.

width of ampulla, *c.* 1/4th length of duct plus ampulla (Fig. 2C, D); seminal chamber-like ental spermathecal diverticulum, enclosed in duct-wall, projected on lateral surface. Nephridia exonephric, astomate micromeronephridia scattered in parietes. Genital marking glands absent.

**Variation.** In holotype prostates extend in segments 18–19, but bulging into segment 20 through septum 19/20, whereas in the paratype, it extends in segments 18–20. Second specimen also has a pair of pseudovesicles present in segment 13.

**Etymology.** The specific epithet ‘*jamiesoni*’ is an eponym, named in honor of Prof. B.G.M. Jamieson, renowned Australian biologist and academician, for his tremendous contributions to the taxonomy and systematics of the earthworms of the world.

**Ingesta.** Significant proportion of coarse soil, pebbles, good quantity of barks and hard woody plant materials.

**Habitat.** Moist deciduous forest with large rocks, boulders and soil with fine-loamy texture, in the Eastern Ghats Hills, with altitudinal ranges from 600–900 m m.s.l. The collection site has a non-perennial stream and worms were extracted from beneath the leaf litter in a bed of pebbly soil along with roots of Pteridophyte (*Athyrium* sp.). Almost 90% of the vegetation of this area is dominated by *Shorea robusta* trees. Apart from this *Terminalia tomentosa*, *Xylia xylocarpa*, *Pterocarpus marsupium*, *Anogeissus latifolia*, *Butea monosperma*, *Careya arborea*, *Casaeria tomentosa*, *Lannea coromandelica*, *Helicteres isora*, *Holarrhena pubescens*, *Curcuma aromatica*, *Clerodendron infortunatum*, *Thysanolaena maxima*, *Cyonodon dactylon*, *Imperata arundina-*

*cea*, *Arundinella setosa*, *Oxytenanthera monostigma* etc. were found in the site.

*Ecology.* Seems to be an anecic species, as indicated by large quantity of plant materials and gravely soil in the intestine.

*Distribution.* Appears endemic to Jeypore Ghati of the Eastern Ghats Hills, Koraput District, Odisha State, India (Fig. 3). It may be found in the nearby hilly regions of the Eastern Ghats.

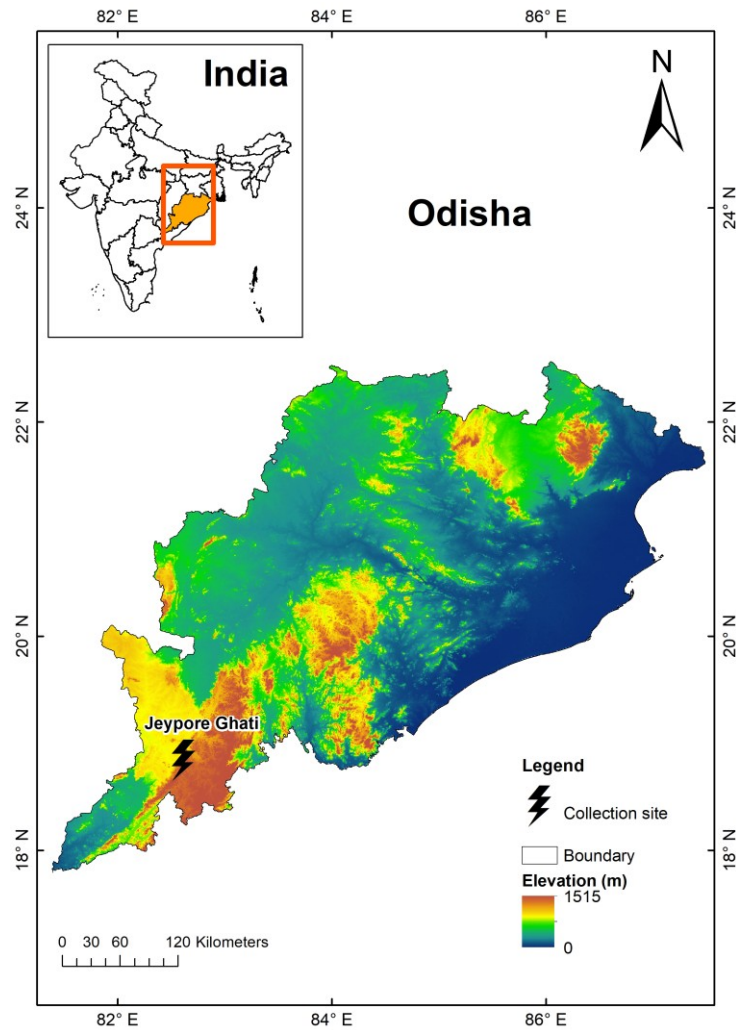
*Remarks.* *Megascolex jamiesoni* sp. nov., belongs to the *ratus* species group, with two pairs of spermathecal pores in intersegmental furrows 7/8/9, penial setae absent, holandric, calciferous glands absent and seminal vesicles in segments 9 and 12. Apart from the new species described in this communication, the group consists of four species, namely, *M. ratus* Cognetti, 1911, *M. pumilio* Stephenson, 1916, *M. quadripapillatus* Narayanan & Paliwal, 2024 and *M. jeyporeghatiensis* Narayanan & Paliwal, 2024. Among the group, the new species shows close similarity with *M. ratus*, *M. quadripapillatus* and *M. jeyporeghatiensis*, in body dimensions, presence of genital markings, etc. Of these *M. ratus* is endemic to the Western Ghats (Narayanan et al. 2016, 2023a), whereas the other two were recently described from the Eastern Ghats of Odisha (Naik et al. 2024). The differences of these species from *M. jamiesoni* sp. nov., are as follows.

*M. jamiesoni* sp. nov. is distinguished from the closely related *M. quadripapillatus* by the type of clitellum and its extent ( $\frac{3}{4}13$ , 13–19 (=  $6\frac{3}{4}$ –7), 13–16 annular, 17–19 saddle shaped vs annular, in segments  $\frac{1}{2}13$ –19 (=  $6\frac{1}{2}$ ), extend of genital markings (confined to segments 17 and 19 vs markings of the 19 extending into segment 20), spermathecae (unidiverticulate vs adiverticulate) and the shape of prostate and its extension (irregularly oblong, extending in segments 18–20 vs erect and confined to segment 18). Characters of the prostate (large irregularly oblong extending in segments 18–20 vs small, fan-like, confined to

segment 18) and type of spermathecae (ental diverticulum vs ectal diverticulum) separate *M. jamiesoni* sp. nov. from the sympatric and closely look alike *M. jeyporeghatiensis*. *M. jamiesoni* sp. nov. is distinguished from *M. ratus* by the type of clitellum and its extent ( $\frac{3}{4}13$ , 13–19 (=  $6\frac{3}{4}$ –7), 13–16 annular, 17–19 saddle shaped vs saddle-shaped in segments 14–18 [= 5]), number of genital markings (2 pairs vs. several), intestinal origin (in segment 20 vs in segment 14), etc. It differs from *M. pumilio* by the presence of genital markings. In addition, it can also be distinguished from *M. pumilio* by the large body size, type of clitellum, segmental origin of intestine and the shape of spermathecae. Detailed comparison of the *M. jamiesoni* sp. nov., with the similar-sized species of the *ratus*-group members are provided in Table 1.

## DISCUSSION

At present a total of 35 *Megascolex* species are known from India, including the new species described in this work. The southern Western Ghats in the southwest region of Peninsular India are home to almost all of India's *Megascolex* species (Narayanan et al. 2020). However, a number of species have been discovered outside of the Western Ghats are either introduced to the area or endemic to their respective type localities (Bourne 1886; Michaelsen 1922; Stephenson 1924, 1925; Narayanan et al. 2019; Kumar et al. 2021; Naik et al. 2024). Karanth (2003), stated that, the current discontinuity of certain species might be representative of a relic of former continuous distribution. In the past *Megascolex* species would have widespread within in the eastern Peninsular India. Hence, the present disjunct distribution of *Megascolex* species in Peninsular India (in the Western Ghats and Eastern Ghats) is of great biogeographical significance (Naik et al. 2024). Approximately 74,000 years ago, the Toba volcano located in northern Sumatra erupted, marking the greatest explosive eruption of the Quaternary Period (Williams et al. 2009; Petraglia et al. 2011). This catastrophic volcanic outburst



**Figure 3.** Location of the type locality Jeypore Ghati of *Megascolex jamiesoni* sp. nov. in the Eastern Ghats of Odisha state, India

steered to prolonged drought and deforestation in India, probably lasted for 1000–2000 years (Williams *et al.* 2009). Also Williams *et al.* (2009) stated that, the carbon isotope evidence from fossil soils found immediately beneath and above the Toba ash in central India demonstrates a major isochronous change in vegetation from forest before the eruption to open woodland or grassland thereafter. According to Lal (2016) this particular catastrophe is the reason for the absence of lush forests in areas like eastern Andhra Pradesh and north-eastern Tamil Nadu, because these regions were most severely impacted by the Toba eruption. The after-effects of the afore-

mentioned Toba eruption, vicariance and other climatic effects would have severely affected or wiped out the *Megascolex* species of the Eastern Ghats and eastern Peninsular India. Even though, the remnant moist forests of the isolated Eastern Ghats hill groups may still have relic population of many undescribed species of *Megascolex*. At present, large scale deforestation, habitat modifications due to urbanization, agriculture expansion, etc. would have further negatively affected the distribution of *Megascolex* range in Peninsular India. As mentioned previously, most of the Eastern Ghats Hills are highly underexplored with reference to earthworm fauna. Therefore, addi-

tional systematic sampling across the varied forest types of Eastern Ghats Hill ranges may uncover more undescribed *Megascolex* species and narrow the gap in the distribution pattern of *Megascolex* within Peninsular India.

### Key to the *Megascolex* species from India

1. Spermathecal pores one pair in intersegmental furrow 8/9 ..... *M. hendersoni* Michaelsen, 1907  
- Spermathecal pores more than one pair.....2
2. Spermathecal pores 2 pairs in intersegmental furrows 7/8/9 .....3  
- Spermathecal pores 3 pairs in intersegmental furrows 6/7/8/9, or numerous in each intersegmental furrows 7/8/9.....30
3. Spermathecal pores, close together, median to *a* setal line or between *aa* setal lines.....4  
- Spermathecal pores otherwise .....8
4. Spermathecal ampulla and diverticulum single.....5  
- Spermathecal ampulla 3 ovoid sacs joined to single duct; diverticulum 2–5 small shining ovoid sacs .....*M. tripartitus* Stephenson, 1925
5. Penial setae present.....6  
- Penial setae absent.....7
6. Anisochaetine, penial setae almost straight, with paired long narrow pointed spines at intervals, does not extend up to the tip.....*M. avicula* Aiyer, 1929  
- Perichaetine, penial setae bow-shaped, spines arranged like pinnae of a fern, reaches up to the tip ...  
.....*M. filiciseta* Stephenson, 1915
7. Longer (length 143–150 mm; segments 218); male pores are somewhat elongated slits on lateral sides of the triangle converging posteriorly, lips of the slits are slightly swollen; prostates confined to segment 18, slightly bulging in front and behind.....  
.....*M. triangularis* Stephenson, 1925  
- Smaller (length 80 mm; segments 185); male pores in setal zone on small roundish papillae, a median ventral male field, somewhat depressed, shield-shaped, extending backwards to setal zone of segment 19; prostate extends through 10 segments.....  
.....*M. travancorensis ghatensis* Michaelsen, 1910  
- Smaller (length 65 mm; segments 85); male pores on slightly raised rather indefinitely circular porophores, in or perhaps slightly in front of setal zone; prostate

- confined to segment 18.....  
.....*M. pheretima* Michaelsen, 1921
8. Spermathecal pores in line with *a* or *ab* setal lines...9  
- Spermathecal pores otherwise.....15
  9. Penial setae present, curved into semi-circle or s-shaped, tip flattened.....  
.....*M. porphyrozonus* Stephenson, 1924  
- Penial setae absent.....10
  10. Male field limited by a transversely elliptical or oval wall.....11  
- Male field not so limited.....12
  11. Male field has a kidney-shaped cushion; spermathecal ampulla elongated and cylindrical, without sharp demarcation from the duct.....  
.....*M. cochinensis phaseolus* Stephenson, 1915  
- Male field lacks kidney-shaped cushion; spermathecal ampulla ovoid, sharply demarcated from the duct.....*M. cochinensis cochinensis* Stephenson, 1915
  12. Body long > 100 mm.....13  
- Body has more usual proportions < 85 mm.....14
  13. Prostomium with a retractable proboscis-like organ; dumbbell-shaped copulatory cushion present at segments 7/8/9; gizzard in segment 5.....  
.....*M. travancorensis proboscidea* Aiyer, 1929  
- Prostomium lacks proboscis-like organ; copulatory cushion absent; gizzard in segment 6.....  
.....*M. travancorensis travancorensis* Michaelsen, 1910
  14. Prostate extends in 7-8 segments; ectal spermathecal diverticulum.....*M. papparensis* Lone, Thakur, Tiwari, James & Yadav, 2022  
- Prostate extends in 10 segments; ental spermathecal diverticulum.....*M. travancorensis quilonensis* Michaelsen, 1910
  15. Spermathecal pores in line with *b*, about in *b*, or *bc* setal lines.....16  
- Spermathecal pores in line with *d* setal lines or beyond.....25
  16. Metandric.....17  
- Holandric.....18
  17. Anisochaetine, prostate extends over 3–4 segments .....  
.....*M. auriculata* Aiyer, 1929  
- Perichaetine throughout, prostate extends in 10 segments.....*M. peermadensis* Aiyer, 1929



18. Spermathecae bidiverticulate; penial setae present ..... *M. lawsoni* (Bourne, 1886)  
- Spermathecae unidiverticulate; penial setae absent ..... **19**
19. Number of segments > 255 segments ..... **20**  
- Number of segments < 255 segments ..... **22**
20. Spermathecal ampulla sac-like in its ental end, narrow in its ectal portion ... *M. travancorensis bonaccordensis* Michaelsen, 1913  
- Spermathecal ampulla sausage-shaped, bent ..... **21**
21. Male field pentagonal in shape, with an inverted T-shaped depression; ental spermathecal diverticulum ..... *M. pentagonalis* Stephenson, 1916  
- Male field with two projected U-shaped grooves connect male pore papillae; ectal spermathecal diverticulum ..... *M. vazhichlensis* Lone, Thakur, Tiwari, James & Yadav, 2022
22. Spermathecal ampulla large, ovoid, with ental diverticulum ..... *M. pumilio* Stephenson, 1916  
- Spermathecal ampulla club-shaped, sac-like, smooth or flattened ovoid, with ectal diverticulum ..... **23**
23. Intestine begins in segment 21 ... *M. eunephrus* Cognetti, 1911  
- Intestine begins anterior to segment 21 ..... **24**
24. Intestine begins in segment 16; last heart in segment 13 ..... *M. trivandranus* Stephenson, 1916  
- Intestine begins in segment 14; last heart in segment 13 ..... *M. insignis* Michaelsen, 1910  
- Intestine begins in segment 19; last heart in segment 14 ..... *M. kavalaianus* Stephenson, 1915
25. Genital markings present ..... **26**  
- Genital markings absent ..... **29**
26. Genital markings intersegmental, circular, more than 2 pairs ..... *M. ratus* Cognetti, 1911  
- Genital markings segmental, transversely elliptical depression, 2 pairs ..... **27**
27. Prostate extents in segments 18–20 .....  
..... *M. jamiesoni* Narayanan & Paliwal, sp. nov.  
- Prostate confined to segment 18 ..... **28**
28. Spermathecae adiverticulate .....  
..... *M. quadripapillatus* Narayanan & Paliwal, 2024  
- Spermathecae unidiverticulate, ectal diverticulum .....  
..... *M. jeyporeghatiensis* Narayanan & Paliwal, 2024
29. Prostate large, mop-like, duct thick and fairly long; spermathecal ampulla pear-shaped .....  
..... *M. konkanensis konkanensis* Fedarb, 1898  
- Prostate small, bushy, duct short, widens at ectal end; spermathecal ampulla elongated oval .....  
..... *M. konkanensis longus* Stephenson, 1915
30. Spermathecal pores, 3 pairs in intersegmental furrows 6/7/8/9 ..... *M. imperatrix* (Bourne, 1894)  
- Spermathecal pores, numerous on each side in intersegmental furrows 7/8/9 ..... **31**
31. Spermathecae adiverticulate .....  
..... *M. polytheca polytheca* Stephenson, 1915  
- Spermathecae unidiverticulate ..... **32**
32. Spermathecal duct rather longer than ampulla .....  
..... *M. polytheca zonatus* Stephenson, 1915  
- Spermathecal duct 4 times longer than ampulla .....  
..... *M. polytheca unicus* Aiyer, 1929

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**Table 1.** Comparison of the characters of *Megascolex jamiesoni* Narayanan & paliwal, sp. nov., with three closely related similar sized species (adapted and modified based on Naik *et al.* 2024).

| Character        | <i>M. ratus</i> Stephenson, 1911 <sup>1,2,3,4,5</sup>  | <i>M. quadripapillatus</i> Narayanan & Paliwal, 2024 <sup>5</sup>  | <i>M. jeyporeghatiensis</i> Narayanan & Paliwal, 2024 <sup>5</sup>   | <i>M. jamiesoni</i> Narayanan & Paliwal, sp. nov.   |
|------------------|--|--|--|---|
| Length           | 230–315 mm   | 273–308 mm   | 221–281 mm   | 229–269 mm  |
| Diameter         | 7–10 mm  | 9–10 mm  | 8–10 mm  | 7.5–9 mm  |
| Segments         | 162–218  | 188–190  | 168–189  | 162–167   |
| Prostomium       | Tanylobic, epilobic ½ or proepilobic   | Proepilobic, with a mid-dorsal groove  | Proepilobic or closed epilobic, with a mid-dorsal groove   | Proepilobic, with a mid-dorsal groove   |
| Clitellum        | Saddle-shaped, in segments 14–18 (= 5)   | Annular, in segments ½13–19 (= 6½)   | Annular, in segments ½13, 13, 14–18, ½19, 19 (= 6½–7)  | In segments ¾13, 13–19 (= 6¾–7), 13–16 annular, 17–19 saddle shaped   |
| Number of setae  | About 180 on segment 10, about 135 on each segment at middle regions of the body   | 58–66 on segment 5, 56–66 on segment 9, 58–66 on segment 12, 65–70 on segment 20, 70–71 on segment 25  | 58–64 on segment 5, 64–80 on segment 9, 62–82 on segment 12, 64–86 on segment 20, 62–84 on segment 25  | 54–60 on segment 5, 58–64 on segment 9, 56–58 on segment 12, 58–60 on segment 20, 64–76 on segment 25               |
| Genital markings | Several pairs, about circular, close to mid ventral line, on intersegmental furrows 16/17, 19/20, 20/21, and 21/22, sometimes on 14/15, 15/16, and 22/23 | Two pairs, transversely elliptical depression, anterior pair in segments 17–18, posterior pair occupies segments 19–20                             | Two pairs, segmental, transversely elliptical depression confined to segments 17 and 19, each depression is divided by a longitudinal dyke at the mid-ventral line | Two pairs, segmental, transversely elliptical depression confined to segments 17 and 19, longitudinal dyke absent   |
| Gizzard          | Large, in segment 5 or 6?  | Large, in segment 7  | Large, in segment 6  | Large, in segment 7   |
| Intestine origin | In segment 14  | In segment 20  | In segment 16  | In segment 20   |
| Spermathecae     | Ampulla more or less ovoid, duct abruptly marked off; unidiverticulate, ental diverticulum   | Ampulla large, more or less ovoid, sac-like, ampulla and duct well marked off; adiverticulate  | Ampulla sac-like, ampulla and duct well marked off; unidiverticulate, ectal diverticulum   | Ampulla large, more or less ovoid, sac-like, ampulla and duct well marked off; unidiverticulate, ental diverticulum |
| Prostate         | Large, in segments 19–22, lobed at the margins; duct strong, cylindrical, curved   | Large, erect, incised, lobed, thick, irregularly rectangular, flattish, confined to segment 18; duct hidden in glands, somewhat straight, muscular | Small, fan-like, slightly incised, somewhat dorsoventrally flattened, confined to segment 18; duct thick, straight, ental portion branched                         | Fairly large, lobed, longitudinally placed, lightly incised, in segments 18–20; duct, obliquely placed, muscular    |

Data from: <sup>1</sup>Cognetti (1911); <sup>2</sup>Stephenson (1923); <sup>3</sup>Aiyer (1929); <sup>4</sup>Sathrumithra *et al.* (2018); <sup>5</sup>Naik *et al.* (2024)

