

First record of exotic *Dichogaster saliens* (Beddard, 1893) and *Metaphire posthuma* (Vaillant, 1868) (Annelida: Clitellata) from Kerala state, Southern India

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Abstract

Among the 102 species of earthworms known from Kerala, *Dichogaster saliens* (Beddard, 1893) of the Family Benhamiidae and *Metaphire posthuma* (Vaillant, 1868) of the Family Megascolecidae were not recorded till date. The presence of exotic earthworms *D. saliens* and *M. posthuma* are documented herewith for the first time from Kerala, based on specimens collected from Ernakulam, Palakkad and Wayanad districts. Their descriptive account and distribution is provided.

Keywords: Exotic Species, Earthworms, New Addition, Western Ghats

Introduction

A total of 426 earthworm species/subspecies placed under 67 genera and 10 families are recorded from India (Julka, 2014; Ahmed & Julka, 2017; Mandal *et al.*, 2017; Narayanan *et al.*, 2017, 2019a; Kharkongor, 2018). The Western Ghats biodiversity hotspot together with the plains of west coast considered as the region with maximum species diversity in India (Julka & Paliwal, 2005). Kerala, a small Indian state at the southwest of the Western Ghats, harbors a rich array of earthworms. However, according to Narayanan *et al.* (2016a) major portion of the earthworm species in the state were reported around a century back and several species are known only from the original description. As of now, 102 species are recorded from Kerala, of which 19 are exotic (Narayanan *et al.*, 2016 a,b, c; 2017; 2019 a,b,c.), namely, *Octolasion tyrtaeum* (Savigny, 1826), *Eisenia fetida* (Savigny, 1826), *Pontoscolex corethrurus* (Müller, 1857), *Eudrilus eugeniae* (Kinberg, 1867), *Gordiodrilus*

elegans (Beddard, 1892), *Nematogenia panamaensis* (Eisen, 1900), *Ocnerodrilus occidentalis* (Eisen, 1878), *Dichogaster affinis* (Michaelsen, 1890), *D. annae* (Horst, 1893), *D. bolauui* (Michaelsen, 1891), *Amyntas alexandri* (Beddard, 1900), *A. corticis* (Kinberg, 1867), *Metaphire bahli* (Gates, 1945), *M. houlleti* (Perrier, 1872), *M. peguana* (Rosa, 1890), *Pithemera bicincta* (Perrier, 1875), *Polypheretima elongata* (Perrier, 1872), *P. taprobanae* (Beddard, 1892) and *Pontodrilus litoralis* (Grube, 1855). However, diversity and distribution of exotic earthworms of the state are still not completely comprehended (Narayanan *et al.*, 2016d). A recent survey of the earthworms at Parambikulam Tiger Reserve, Kulivayal and Eroor has discovered the existence of two exotic peregrine earthworms *Dichogaster saliens* (Beddard, 1893) and *Metaphire posthuma* (Vaillant, 1868) for the first time from the Kerala state. Here we are reporting the first record of these two exotic species from the state.

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Material and Methods

Earthworms were collected by digging and hand sorting method (Julka, 1990). The collected specimens were narcotized first and then preserved in 5% formaldehyde. All anatomical characters were observed by dissecting the specimens beneath a stereomicroscope (Nikon SMZ800N). The specimens were identified based on standard references (Stephenson, 1923; Gates, 1972; Julka, 1988; Blakemore, 2012). Collected specimens were deposited at the museum of the Advanced Centre of Environmental Studies and Sustainable Development, Mahatma Gandhi University, Kerala, India.

Results

Family BENHAMIIDAE

Dichogaster saliens (Beddard, 1893)

1893. *Microdrilus saliens* Beddard, *Proc. Zool. Soc. Lond.*, 1892: 683.

2017. *Dichogaster saliens*: Kumari *et al.*, *Megadrilogica*, **22**(1): 25.

Material examined: 2 clitellate, Regn. No. ACESSD/EW/649, India, Kerala, Palakkad District, Vagapallam in Parambikulam Tiger Reserve, 10°27'38.7"N 76°43'01.1" E, alt. 652 m, 3.vii.2016, from elephant dung and soil below in moist deciduous forest, coll. S.P. Narayanan, S. Sathrumithra, T. Augustine and V. Vijayan; 2 clitellate, Regn. No. ACESSD/EW/875, India, Kerala, Wayanad District, Kulivayal, 11°46'44" N 76°31'3.0"E, 24.iii.2018, rubber plantation, coll. B. Thomas (Figure. 1).

Description: Length 37-49 mm, diameter 2 mm, segments 83-121; lumbricine, closely paired; prostomium epilobous; first dorsal pore at intersegmental furrow 13/19; clitellum saddle shaped, in segments 13-19; male pores paired, minute, posterior ends of seminal grooves, close to 17/18; prostatic pores paired, minute, at anterior ends of seminal grooves on segment 17; female pores paired, presetal, surrounded by a circular epidermal thickening in segment 14; spermathecal pores paired, minute, at intersegmental furrows 7/8/9; genital markings present, disc like in 15/16; gizzards 2; oesophageal calciferous glands 3 pairs, in segment 15-17; intestine begins in segment 19; typhlosole present; meronephric; prostate tubular, one pair in segment 17; penial setae sinuous ectally, ornamented;

spermathecae paired, each shortly stalked, diverticulum ventrally directed at about the middle of slightly bulbous duct, smaller than ampulla.

Distribution: INDIA: Kerala (Kulivayal [Wayanad district] and Vagapallam [Palakkad district] – present records, Arunachal Pradesh, Assam, Himachal Pradesh, Karnataka, Meghalaya, Odisha, Sikkim, Tamil Nadu (Kathireswari *et al.*, 2008; Goswami *et al.*, 2013; Rajkhowa *et al.*, 2015; Kumari *et al.*, 2017), West Bengal (Stephenson, 1920). *Elsewhere*: It is a peregrine species with cosmopolitan distribution, so far recorded from Asia (Christmas Island, Indonesia, Myanmar, Malaysia, Taiwan, Sri Lanka, Vietnam), Africa (Angola, Democratic Republic of Congo, Ghana, Madagascar, South Africa, Swaziland, Uganda), Europe (Sweden), Americas (Argentina, Bolivia, Brazil, Cuba, El Salvador, Galapagos Islands, Hawaii Islands, Mexico, Panama, Peru, Venezuela, United States of America) and Pacific (Australia) (Gates, 1972; Julka, 1988; Blakemore, 2012).

Family MEGASCOLECIDAE

Metaphire posthuma (Vaillant, 1868)

1868. *Perichaeta posthuma* Vaillant, *Ann. Sci. Nat.*, Ser. 5, **10**: 228.

2012. *Metaphire posthuma*: Blakemore, *Cosmopolitan Earthworms*: 499.

Material examined: 1 clitellate, Regn. No. ACESSD/EW/876, India, Kerala, Ernakulam District, Eroor, 9°58'6.96"N 76°19'42.6"E, 15.vi.2018, coll. K.S. Sunish (Figure. 1).

Description: Length 160 mm, diameter 5.5 mm (dorso-ventrally flattened due to bad transportation), segments 111; perichaetine; prostomium epilobous; first dorsal pore at intersegmental furrow 12/13; clitellum annular, in segments 14-16; male pores paired, in segment 18, longitudinal crescent like slits in copulatory pouches; female pore on 14; spermathecal pores paired, at intersegmental furrows 5/6/7/8/9; genital markings present, paired, equatorial, disc like in segments 17 and 19; gizzard in segment 8, intestinal caeca simple in 27-24; typhlosole present; meronephric; prostates racemose, latero-mesially flattened, in 16-21, prostatic duct long, thick and sinuous at the ectal end; spermathecae four pairs, ducts shorter than ampulla, diverticulum long,

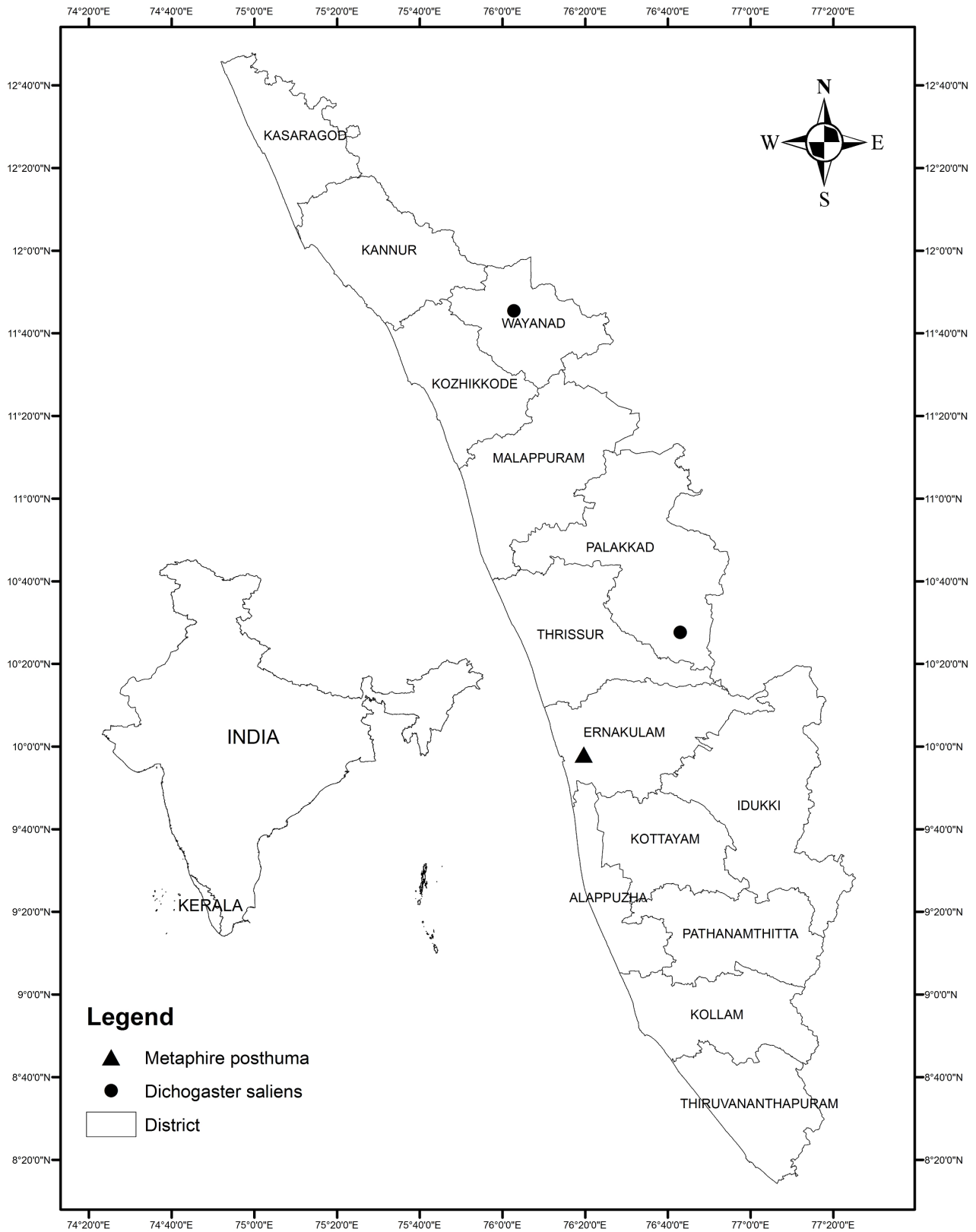


Figure 1. Distribution of *Dichogaster saliens* and *Metaphire posthuma* in Kerala.

stalk short. Ingesta fine sand, tiny quartz, minute bits of bark and colloids.

Distribution: INDIA: Kerala (Eroor, present record), Andaman Islands, Assam, Bihar, Delhi, Gujarat, Haryana, Himachal Pradesh, Jharkhand, Jammu and Kashmir, Karnataka, Madhya Pradesh, Meghalaya, Maharashtra, Odisha, Punjab, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh, West Bengal (Stephenson, 1922; Halder, 2003; Srivastava *et al.*, 2003; Siddaraju *et al.*, 2010; Mandal *et al.*, 2011; Chaudhari *et al.*, 2012; Rajkhowa *et al.*, 2015). **Elsewhere:** So far, this species has been recorded from various countries of Asia (Bangladesh, Cambodia, China, Christmas Island, Indonesia, Myanmar, Malaysia, Philippines, Pakistan, Thailand, Taiwan, Vietnam), Africa (Seychelles Archipelago), Europe (England, France?), America (Argentina, Bahamas, Mexico, United States of America) and Pacific Islands (Solomon Islands, Vanuatu) (Gates, 1937, 1972; Blakemore, 2012; Kharkongor, 2018).

Discussion

Approximately 150 species are expected as peregrine on a global scale, *Dichogaster saliens* and *Metaphire posthuma* are two among them (Blakemore, 2012). The original home of the genus *Dichogaster* is either tropical Africa or America, or both (Blakemore, 2012). As suggested by Julka (2014), homeland of *D. saliens* is Africa. Before the present report of *D. saliens* from Kerala, it was known from 8 other states of India. Among those, reports from three states (viz., Assam, Himachal Pradesh and Odisha) obtained during last 10 years. Hence, we presume that this exotic species is vastly establishing in various states of India.

According to Gates (1972), the Indo-China region of Asia is presumably the original home of *M. posthuma*. In India and Burma it has been restricted to tropical low lands and found from sea level to an elevation of around

762 m (Gates, 1972). But now it has been reported from various subtropical and higher altitude states/union territories of India, such as Himachal Pradesh, Jammu & Kashmir, Meghalaya and Uttarakhand (Stephenson, 1922; Soota & Halder, 1980; Halder & Ghosh, 1999). According to Stephenson (1923), it has not been recorded from the southern India. But recently Mandal *et al.* (2011) reported it for the first time from south India, from Yercaud (1600 m asl) of Tamil Nadu. With the present record from Kerala, it seems that *M. posthuma* is expanding its range to the southern states. According to Hendrix *et al.* (2008), when an exotic earthworm is naturalized in a new region, it can extremely alter the fundamental profile of soil, its nutrient dynamics, as well as plant and above and below ground animal communities. It is a fact that the effects and implications of alien species in below ground soil ecosystems are not finely recognized (Gonzalez *et al.*, 2006). As per Gates (1972) *M. posthuma* is commonly found in the sandy river banks, sandy soils of gardens and manure piles in open areas. *Lampito mauritii* Kinberg, 1867 and *Megascolex konkanensis* Fedarb, 1898 are the two common native peregrine earthworms species found in such habitats of Kerala state. Hence, we assume that, if the *M. posthuma* naturalize here in the state, it may put severe competition for space with the above mentioned native species and can alter the natural balance of these habitats.

Acknowledgements

We are thankful to Mr. Toms Augustine and Mr. Vishnu Vijayan for the helps offered during the field work at Parambikulam Tiger Reserve and Mr. Karunakaran Akhildev for making the map. The second author extends his sincere gratitude to Dr. Prasadan P.K. for the constant encouragement during the fieldworks at Wayanad. Authors are indebted to the Government of Kerala (Department of Forest and Wildlife), for providing the permission and necessary conveniences.

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