

# NEW RECORDS OF EARTHWORMS FROM SUGAR-BELT OF HARYANA

POONAM BHARDWAJ\*<sup>1</sup> AND R. K. SHARMA<sup>1</sup>

Department of Zoology,  
Kurukshetra University, Kurukshetra -136 119, INDIA  
e-mail: anubhardwaj12@gmail.com

## KEYWORDS

Diversity  
Earthworm  
Epigeic  
Eastern Haryana

Received on :  
19.09.2015

Accepted on :  
17.02.2016

\*Corresponding  
author

## ABSTRACT

Efforts have been made in the present study to estimate the current status of earthworm diversity in sugar belt of Haryana (i.e., Kurukshetra and Yamuna Nagar). During the present study different locations were surveyed and three earthworm species *Bismastos parvus* (Eisen), *Perionyx simlaensis* (Michaelsen) and *Dichogaster bolau* (Michaelsen), belonging to three different families were recorded. All the three species were epigeic in nature and reported for the first time from this belt of Haryana. In live condition *P. simlaensis* was found to be the largest worm measuring (90-190mm) and *D. bolau* was the smallest (19-30mm) among the species. The recorded species were found in organic rich environment, but showed restricted distribution in the surveyed area.

## INTRODUCTION

Earthworms are important soil fauna on earth, constituting 80 percent of soil invertebrate. The Greek philosopher, Aristotle, named them the "Intestine of Earth". Earth worms form the most important components of soil biota creating biogenic structures (casts and burrowing systems) and contributing to the soil litter decomposition process in terms of soil formation (Bhadauria and Saxena 2010). Comprehensive taxonomic and distribution survey of Oligochaeta particularly of earthworms has been carried out by many researchers (Michaelsen, 1900; Stephensen, 1923; Gates, 1972; Julka and Senapati, 1987; Julka, 1988; Julka and Paliwal, 2005; Julka et al., 2009).

The regional earthworm biodiversity and species dispersal pattern is influenced by a variety of biotic and abiotic factors. Julka and Paliwal (2005) have reported 418 species of earthworms belonging to 10 families from India. The biodiversity, taxonomy and species habitat relationship of earthworms are well studied in different parts of India (Hatti, 2013; Chaudhary et al. (2013); Chadran et al. (2012); Dash and Saxena, 2012; Nayar and Khan, 2011; Karmegam and Daniel, 2007; Sathianarayanan and Khan, 2006; Tripathi and Bhardwaj 2004; Sinha et al. (2003).

The most diverse area of earthworm diversity in this country is West Coast and Ghat regions along with Eastern Himalayan and Northeast hills (Julka, 1993). On the contrary, hot dry region of Rajasthan, Punjab, Haryana and Gujarat has been designated as areas with poor earthworm diversity (Tripathi and Bhardwaj, 2004). Dhiman and Batish (2006) have studied some species from Ambala District (Haryana). Sharma and

Bhardwaj (2014) have recorded nine taxa of earthworms from different parts of eastern Haryana. Since earthworms have gained renewed scientific attention because of their wide application in the production of vermicompost, bioremediation of soil and as a source of readily digestible animal protein for domestic animals. The purpose of present study was therefore to conduct a survey in sugar belt of Haryana, to record exotic and native species to add and validate existing literature on earthworm diversity.

## MATERIALS AND METHODS

An extensive survey was conducted between 2013-2014 in different habitats of Yamuna nagar (latitude 30°08 and longitude 77°16) and Kurukshetra (latitude 30°12 and longitude 77°04) districts of Haryana, India. There is a very good network of canals throughout the state providing irrigating facilities. The soil is generally alluvial. The altitude of Haryana varies between 700 ft to 900ft above the sea level with mean annual rainfall 70-125 cm.

Earthworms were collected by digging soil monolith with a shovel or spade (50x50x25cm) with slight modification which mainly depends on habitat of the earthworms. Soil lumps were broken and sifted to collect the earthworms. Collected worms were sacrificed using 70% ethyl alcohol and fixed in 5-10% formalin for 24 hour. These fixed worms were stored in suitable size vials containing 5-10 % formalin depending upon their size (Julka, 1988). A label with locality name, date and collectors name was added to each vial and sent to Dr. R. Paliwal, Officer-in Charge, ZSI, Solan (H.P) for identification. Body colour and pigmentation of worms were recorded

## RESULTS

During random survey in different habitats of two districts (Yamuna Nagar and Kurukshetra) of Haryana a total of three species of earthworms were recorded. The descriptions of these species are given below:

### *Bismastos parvus* (Eisen, 1874)

Family: Lumbricidae  
Origin: Exotic  
Date of collection: 15.05.2014

#### Distributon

Kashmir, Punjab, West Himalayas, Pratabgarh, Haryana (New record)

#### Original home

North America has been thought to be the original home of the species but no area of endemcity has yet been recognized. Further its distribution attributed to transport through man and other agencies.

#### Ecology

It was collected from sewage soil in Kurukshetra and Yamuna-Nagar having pH 7.8- 8.0 and organic matter 2.32- 3.12%. Their castings were small and usually spherical to spindle shape. Previously it was recorded from soils wetted by waste effluents from human habitations, near wood areas, garden field and dumps from different parts of India.

#### Description

Length 20-35 mm, diameter 2-3.1 mm, no. of segments 92-115, colour brownish red, Prostomium epilobus (tongue open). Dorsal pore at inter-segmental furrow 5/6. Clitellum saddle shaped xxiv- xxx. Setae paired (lumbricine). Spermethecal pore absent. Male pore small, on xiv.

### *Perionyx simlaensis* (Michaelsen, 1907)

Family: Megascolecidae  
Origin: Native  
Date of collection: 15.05.2014, 23.06.2014 and 6.07.2014  
Distribution: Himachal Pradesh, West Bengal, Haryana (New record).

#### Original home

Eastern and western Himalayan.

#### Ecology

The present samples of *P. simlaensis* were collected near irrigation channels in Yamuna-Nagar district near Kalesar wild life sanctuary. Earthworms inhabit soil having pH 8.0 and

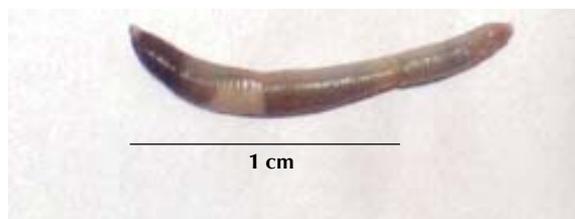


Figure 1: *Bismastos parvus* (Eisen, 1874)

organic matter 2.66-3.39 %. No casting was observed during their collection.

#### Description

Length 90-190 mm, diameter 3-6mm, No. of segments 118-139, Colour dorsally purple reddish and ventrally dark pale. Prostomium epilobus (tongue open). First dorsal pore on 4/5. Setal ring complete (Perichaetine). Clitellum annular (xiii-xvii). Male area occupying whole of xviii, depressed, rectangular with rounded angles, bounded laterally by raised glandular regions, and containing a pair of nearly circular cushions. The male pores are in the middle of the cushions. Spermathecal pores in 7/8 and 8/9.

### *Dichogaster bolau* (Michaelsen, 1891)

Family: Octochaetidae  
Origin: Exotic  
Date of collection: 19. 04. 2014 and 15.05.2014

#### Distributon

Rajasthan, Himachal Pradesh, Uttar Pradesh, Orissa, West Bengal, Sikkim, Arunachal Pradesh, Meghalaya, Madhya Pradesh, Gujarat, Maharashtra, Goa, Andhra Pradesh, Karnataka, Tamil Nadu, Andaman and Nicobar Islands, Haryana (Hisar), Present record from Yamuna-Nagar and Kurukshetra.

#### Original home

The original home of this species is somewhere in West Africa and it is exotic in India (Julka, 1988). *Dichogaster bolau* is a circum- mundane species and its widespread distribution is attributable to transportation, through the agency of man (Gate, 1972).

#### Ecology

*D. bolau* were collected near sewage (pH 7.9 - 8.2 and organic matter 2.32- 3.12 %) in Yamuna-Nagar and Kurukshetra district. It usually inhabits top 5 cm soil layer and deposit its casting on the soil surface in the form of small heaps of tiny globular pellets.

#### Description

Length 19-30 mm, diameter 1.0-2.5 mm, number of segments 70-96. Colour pink. Prostomium epilobic, with tongue closed. First dorsal pore in intersegmental furrow 4/5 or 6/7. Clitellum annular, xiii-xx, xxi. Setae four pairs on each segment. Male pores minute, paired in parenthesis-like seminal grooves on the setal arc of xviii; prostatic pores paired, minute, at ends of seminal grooves on xvii and xix, at a. Female pore single, median, presetal, on segment xiv. Spermathecal pores minute, paired, in intersegmental furrows 7/8 and 8/9. Genital papillae absent. Unpigmented, Gizzards two, in a space between septa



Figure 2: *Perionyx simlaensis* (Michaelsen, 1907)



Figure 3: *Dichogaster bolau* (Michaelsen, 1891)

4/5 and 7/8. Calciferous glands one pair, discrete, extramural, trilobed, lobes vertically reniform, each lobe in each of segments xv-xvii with a common duct opening into oesophagus in xvi. Intestine begins in segment xix; intestinal caeca absent; typhlosole in the form of a simple lamella, beginning in segment xxii. Last pair of hearts in xii. Seminal vesicles vestigial in xi and xii. Prostates tubular, two pairs, in segments xvii and xix. Penial setae two types, unornamented or ornamented Spermathecae paired in segments viii and ix

## DISCUSSION

*B. parva* is the member of family Lumbricidae showing its endemicity throughout the palaearctic region and eastern North America, but a number of species of this family have been introduced into other zoogeographical regions of the world. Peregrine lumbricids acquired domicile in India at hill resorts with a temperate like climate at Himalayas and Nilgiri and Palni hills in the peninsular (Gates, 1972). But now lumbricids are found in other parts of the country mainly introduced by humans. In the present study *B. parvus* was recorded only from sewage site from both the districts. Similarly, this earthworm species was also seen in restricted habitat of soil rich in organic waste and sewage along with decaying plants material in Punjab (Dhiman and Battish, 2006; Mohan, et.al., 2013).

*Perionyx* sp. belongs to endemic genera (Julka, 1993). It is mostly found in peninsular, eastern and western Himalaya and Burma. *P. simlanensis* was recorded near the irrigation channel in Yamuna Nagar district. Here the species showed abundant but restricted distribution. Haryana is situated in the north between 27°34 to 30°35 latitude and between 74°28 to 77°36 longitude.

The state has four main types of terrain: Shivalik Hills, Ghaggar Yamuna Plain, Semi- Desert Sandy Plain and Aravalli Hills. Ghaggar Yamuna Plain is divided into two parts- the higher one is called Bangar while the lower one is called Khaddar. Both Yamuna Nagar and Kurukshetra district comes under Khaddar area (low land) which is a flooded and fertile region of Haryana. The possibility of occurrence of these two species in the area may be due to humans and rainy streams from

lower Himalayan regions. According to cropping pattern both district comes under sugarcane belt. Here vegetation is relatively rich and soils are predominantly better for soil fauna. Julka (1999) gave the categories for vermicomposting species according to which *B. parva* can also be used as composting species for the reduction of organic waste in Haryana.

Again, during the present study *D. bolau* was collected from sewage from both the districts of Haryana. It was the smallest among all the species recorded during the survey. *D. bolau* is active throughout the year in sewage. Similar results were observed by Tripathi and Bhardwaj (2004). Because of tolerance to high organic matter like sewage, *D. bolau* may be valued for their use in vermiculture in different part of the country (Dash and Sexena, 2012; Bhardwaj and Sharma, 2015). All the three species discussed above belongs to epigeic categories with patchy distribution in some restricted habitats. The present report increase the previous data of Haryana earthworms by giving new report of three species i.e., *Bismastos parva*, *Perionyx simlaensis* and *Dichogaster bolau*.

## ACKNOWLEDGEMENT

Dr. Poonam Bhardwaj is grateful to the Department of Science and Technology, Government of India, New Delhi for providing financial support under Women Scientist (WOS-A) scheme to complete the present research work and Dr. R. Paliwal (ZSI, Solan, H.P.) for identifying the species.

## REFERENCES

- Bhadoria, T. and Saxena, K. P. 2010.** Role of earthworms in soil fertility maintenance through the production of biogenic structures. *Applied and Environmental Soil Science*. 7 pages, doi:10.1155/2010/816073.
- Bhardwaj, P. and Sharma, R. K. 2015.** Vermicomposting efficiency of earthworm species from eastern Haryana. *J. Entomology and Zoology Studies*. 3(3): 191-195.
- Chandran, M. S. S., Siyatha, S., Mohan, M., Julka, J.M. and Ramaswamy, E. V. 2012.** Earthworm diversity in Nilgiri biosphere reserve, western ghats, India. *Biodiversity & Conservation*. 1007/s 10531-012-0365-4.
- Chaudhuri, P. S., Nath, S. and Paliwal, R. 2013.** Earthworm population of rubber plantation (*Hevea brasiliensis*) in Tripura, *Tropical Ecology*. 49(2): 225-234.
- Dash, M. C. and Saxena, K. G. 2012.** Earthworms in the Himalaya and Western Ghats Region of India: A Review. *The Bioscan*. 7(1): 01-08.
- Dhiman, N. and Battish, S. K. 2006.** Earthworms from northern Indian states with *Ocnoderilus occidentalis*, Eisen, 1878 as a new report from Punjab. *Zoo's Print J*. 21(1): 2135-2137.
- Gates, G. E. 1972.** Burmese Earthworm, An introduction to the systematic and biology of Megadrile Oligochaeta with reference to southeast Asia. *Trans. Amer. Phil. Soc.* (62): 1-326.
- Hatti, S. S. 2013.** Taxonomic studies on earthworm species of Gulbarga City, Karnataka, India. *Ind. J. Appl. Res.* 3(7): 34-38.
- Julka, J. M., Paliwal, R. and Kathireswari, P. 2009.** Biodiversity of Indian earthworms - an overview. pp. 36-56. In: *Proceedings of Indo-US Workshop on Vermitechnology in Human Welfare*. C. A. Edwards, R. Jayaraaj and I. A. Jayraaj (eds.) Rohini Achagam,

Coimbatore. pp. 36-56.

**Julka, J. M. 1988.** The fauna of India and the adjacent countries, Megascolecidae: Octochaetidae (Earthworm) Haplotaxida, Lumbricina: XIV, Zoological Survey of India, Calcutta. p. 400.

**Julka, J. M. 1993.** Distribution pattern in Indian earthworms. In: *Earthworm Resources and Vermiculture*. Zoological Survey of India, Solan. pp. 27-31.

**Julka, J. M. and Paliwal, R. 2005.** Distribution of earthworms in different agro-climatic region of India, In: *Soil Biodiversity, Ecological Processes and Landscape*, Ramakrishnan, P. S. Saxena K. G. Swift K. G. and Rauks Maikhuri R. K. (eds), Oxford and ABH Publication Co. Pvt. Ltd. New Delhi. pp. 3-13.

**Julka, J. M. and Senapati, B. K. 1987.** Records of the Zoological Survey of India, Miscellaneous Publication. *Occasional Paper*. 92 Grafic Printall, Calcutta, India. pp. 1-105.

**Karmegam, N. and T. Daniel. 2007.** Effect of physicochemical parameters on earthworm abundance: A quantitative approach. *J. Appl. Sci. Res.* **3**: 1369-1376.

**Michaelsen, W. 1900.** Oligochaeta, *Das Tierreich*. **10**: 1-575.

**Mohan, V. C., Watts, P. and Kaur, A. 2013.** Diversity and Distribution

of Earthworms Species in Guru Nanak Dev University Campus, Amritsar, Punjab, India. *Res. J. Agriculture & Forestry Sci.* **1(2)**: 35-40.

**Najar, I. A. and Khan, A. B. 2011.** Earthworm communities of Kashmir Valley, India. *Tropical Ecology*. **52(2)**: 151-162.

**Sathianarayanan, A. and Anisa, B. Khan. 2006.** Diversity, distribution and abundance of earthworms in Pondicherry region. *Tropical Ecology*. **47**: 139-144.

**Sharma, R. K. and Bhardwaj, P. 2014.** Earthworm Diversity in Trans-Gangetic Habitats of Haryana, India. *Res. J. Agriculture and Forestry Sci.* **2(2)**: 1-7.

**Sinha, B., Bhaduria, T., Ramakrishnan, P. S., Saxena, K. G. and Maikhuri, R. K. 2003.** Impact of landscape modification on earthworm diversity and abundance in the Hariyali sacred landscape, Garhwal Himalaya. *Pedobiologia*. **47**: 357-370.

**Stephenson, J. 1923.** Oligochaeta, The fauna of British India, including Ceylon and Burma. *Taylor and Francis, Ltd. London*. XXIV + 518pp.

**Tripathi, G. and Bhardwaj, P. 2004.** Earthworm diversity and preferences in arid region of Rajasthan, *Zoos, Print J.* **19(7)**: 1515-1519.