

## SYSTEMATICS OF EARTHWORMS FROM JHARKHAND. II. OCTOCHAETIDAE AND OCNERODRILIDAE

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### ABSTRACT

Three earthworm species namely *Dichogaster affinis* (Michaelsen), *Pellogaster bengalensis* (Michaelsen) and *Ocnerodrilus occidentalis* (Eisen) have been collected from different habitat of Jharkhand and described for the first time from this region. First two species belonged to family Octochaetidae and the third species belonged to family Ocnerodrilidae of order Haplotaxina. A note on eco-biology of the species has been given.

**Key Words** : Octochaetidae, Ocnerodrilidae, *Dichogaster affinis*, *Pellogaster bengalensis*, *Ocnerodrilus occidentalis*.

### INTRODUCTION

Up to the present no Megascolobid species of earthworm has been described from different habitats of Jharkhand. Considering the importance of earthworms as soil managers as well as bioconverters and also the gap of knowledge pertaining to earthworm diversity from Jharkhand the present project of earthworm survey and taxonomic description has been started for the first time in the region since 1999. The present communication is an attempt with the objective to fill the lack of knowledge on earthworm fauna with a note on eco-biology from Jharkhand.

Michaelsen (1910) provided the first records of earthworms from Bihar and adjoining states. Subsequently, several species were described by Stepienson (1914, 1915, 1916, 1917, 1921, 1923, 1926) from different parts of India. Juika (1976, 1978, 1981) also described earthworms from different parts of India. Due to their importance in the soil ecosystem, significant work has been carried out on the ecology and biology of the Orissan earthworms during the last three decade by Dash and Patra (1977), Senapati and Dash (1979), Dash and Senapati (1980), Senapati et al. (1979) and Senapati (1980). Recently important contribution

on earthworm has been made by Sinha *et al.* (2000, 2003a, 2003b), and Sinha and Srivastava (2001) from Jharkhand. In addition, some unpublished observations on their ecology and biology and new records derived from recent collections are presented for the first time. For a detailed synonymy of the species, the works of Gates (1972) and Julka (1976, 1978) may be referred. In this work the classification of Oligochaeta into orders and suborders as proposed by Brinkhurst and Jamieson (1971) and the division of the suborder Lumbricina into superfamilies and families as given by Sims (1980) are followed. The classificatory schemes and systematic details have been followed similar to Julka and Senapati (1987). All specimens are kept in the museum of Department of Zoology, Ranchi University, Ranchi.

### MATERIAL AND METHOD

Earthworms were collected from different habitats viz agroecosystems, grassland, forest, pasture and garbage sites from different parts of Jharkhand following the monolith method as described by Dash and Patra (1977). Sampling was done up to 40 cm. depth of soil. The earthworms were hand sorted and preserved in 5% formaldehyde solution with some amount of glycerine after spreading them in ice-cold water.

### SYSTEMATIC ACCOUNT

Order Haplotaxida belongs to class Oligochaeta of Phylum Annelida.

#### Order HAPLOTAXIDA

**Diagnosis.** Testes and Male funnels interseptal; male funnels at least one segment anterior to that bearing the male pores.

#### Suborder LUMBRICINA

**Diagnosis.** Male pores at least 2 segments posterior to testes. Cl. telum formed from multiple layers of cells.

#### Superfamily MEGASCOLECOIDEA

**Diagnosis.** Ovaries large, fan to rosette-shaped with the oocytes forming several egg strings.

#### Family OCTOCHAETIDAE

**Diagnosis.** Body cylindrical. Dorsal pores present. Male pores behind xvi. Spermathecae in pre-testicular segments; prostates tubular with central canal. Last pair of hearts posterior to xi. Metanephric.

**Distribution.** Australasia, Tropical America and Africa, India, Burma.

#### Genus *Dischogaster* Beddard

**Diagnosis.** Setae lumbricina. Male pores paired, in seminal grooves on xvii or 17/18; prostatic

pores one pair on *xvii* or *xix*, or 2 pairs on *xvii* and *xix*. Oesophagus with 2 gizzards anterior to septum 8/9 and one pair of extramural calciferous glands, each glands trilobed, a vertically ren form lobe in each of segments *xv-xvii* with common duct opening into gut in *xvi*; intestinal caeca and supra-intestinal glands absent; typhlosole simple, lamelliform, micromeronephridia astomate, enteronephric paired tufts in *ii-iv*, several exonephric on the body wall in *v* and posterior segments, arranged in longitudinal rows posterior to the prostatic region; paired, stomate, exonephric megameronephridia in a few posterior most segments.

**Distribution.** Tropical Africa and America. India. Species of belaur group widely transported to various parts of the world.

1899 *Benharria affinis*, Michaëlsen, *Jb. hamb. wiss. Anst.* 7 (1) : 29 (Type locality: Quillimane Zanzibar).

1972. *Dichogaster affinis*, Gates, *Trans. Am. phil. Soc.* 62(7): 278; Right et al., 1978, *Acta Amazonica*, 8 (3) suppl. 1:380.

**Diagnosis.** Length 27-60 mm, diameter 1-2 mm, 105-140 segments. Prostomium epilobed tongue closed. First dorsal pore 5/6. Clitellum annular, *xiii, xiv-xxi, xxii*. Setae *aa-3ab-bc-3cd-0.07 dd* on *xii* *aa=4.5-4.7 ab=1.4-1.5 bc=4.5-4.7 cd=0.14 dd* on *xxiv*. Male pores paired, minute, in seminal grooves linking prostatic pores on the setae arc of *xviii*, at *a*. Prostatic pores paired, minute, at the ends of almost straight or slightly concave seminal grooves, on *xvii* and *xix* at *a*. Female pores paired, presetal, minute, at or slightly lateral to *a*. Spermathecal pores paired, minute, in 7/8/9, at or near *a*. Genital markings often present, unpaired and median on 8/9/10, sometimes on 7/8, 10/11.

Septa 4/5, 7/8-12/13 slightly muscular, 5/6/7 absent. Gizzards between septa 4/5 and 7/8, typhlosole *xxi* to *lxviii-lxxvi, xc-xci*. Last pair of hearts in *xii*. Holandric, testes and male funnels enclosed in unpaired sacs formed by the peripheral apposition of septa 9/10/11/12 in *x* and *xi*; seminal vesicles in *xi* and *xii*, vestigial. Penial setae slightly sinuous ectally, ornamented with scalelike markings or teeth in the sinuosities, tip bluntly rounded, knobbed or truncate, 0.29-0.43 mm long, 4-7 $\mu$  diameter. Spermathecae paired, in *vii* and *ix* each with a shortly stalked ental diverticulum. Genital marking glands circular to slightly dome-shaped, underneath longitudinal muscle layer.

**Distribution.** India: Jharkhand, Orissa, Arunachal Pradesh, Meghalaya, Madhya Pradesh, Gujarat, Maharashtra, Karnataka, Kerala, Sri Lanka, Burma, Thailand, Pacific Ocean Islands, Cape Verde Island, Southwest Africa, Madagascar, Zanzibar, Comoro Island, Mexico, El Salvador, French Guiana, Brazil, West Indies.

In Jharkhand specimens were collected from Ranchi, Morhabadi, Harmu, Ramgana, Hezaribagh, Dhanbad, Bokaro, Chaibasa, Chakardharpur and Jamshedpur.

#### Genus *Pellogaster* Gates

**Diagnosis.** Setae lumbricine. Male pores paired, in seminal grooves on *xviii*. Prostatic pores paired, at the ends of seminal grooves, on *xvii* and *xix*. Female pores on *xiv*. Oesophagus

with 2 gizzards in v-vi and 4 pairs of discrete extramural calciferous glands, in x-xiii; intestinal caeca and supra intestinal glands absent, typhlosome simple, lamelliform. Micromeronephridia astomate, exonephric, paired tufts in ii-ix, a few on the body wall in xii-xix arranged in 2-3 longitudinal ranks posterior to prostatic region on each side; paired stomate exonephric megameronephridia present in caudal segments.

**Distribution.** India (northern portion of the peninsula from Jharkpur to Orissa including Bihar and Jharkhand and W. Bengal)

1910. *Eudichogaster bengalensis* Michaelsen, *Abh. Ges. Naturw. Hamburg* **19**: 86 (Type locality: Tribeni, W. Bengal, India).

1939. *Pallogaster bengalensis*, Gates, *Rec. Indian Mus.* **41**: 201; Julka, 1978, *Mitt. Zool. Mus. Berlin*, **54**: 194.

**Diagnosis.** Length 40-84 mm, diameter 2-5 mm, 94-140 segments. Prostomium tanylopic. First dorsal pore 10/11 or 11/12. Clitellum annular  $\frac{1}{2}$  xiii, xiv-xvi, xvii. Setae aa=2.6-3 ab = 1.1 2 bc = 1.6-2.1 cd = 0.26-0.27 dd on xii, aa = 2.8 ab = 1.8 bc = 1.8 cd = 0.27 dd on xxiv, a on viii and ix absent. Male pores minute s. ts. at ab. Prostatic pores minute, at ab; seminal grooves straight. Female pores paired, presetal within a line. Spermathecal pores paired, tiny, transverse or crescentric slits, at or close to the sites of missing a setae, on viii and ix. Genital markings tiny circular to oval, paired, close to the spermathecal pores on viii-ix, presetal on xvii and postsetal on xix, at ab, sometimes on the setal annuli of x and xx, posterior margin of xix and in or slightly posterior to 19/20, at aa

Septa 4/5/6 delicate 8/7-9/10 muscular, 10/11 slightly muscular. Intestine begins in xvi, typhlosome xvii to lxxiii. Last pair of hearts in xii. Holandric, testes and male funnels free, in x and xi; seminal vesicles in xi and xii. Penial setae ornamented with c. 15 irregular broken circles of fine to triangular spines, tip claw-shaped to pointed or bluntly rounded, 0.7-1.3 mm long 16-20  $\mu$  diameter. Spermathecae paired, in viii and ix, each with a sessile ental diverticulum

**Distribution.** India: Jharkhand (Ranchi, HEC area, Ormanjhi, Ramgarh, Hazaribagh, Peterwar, Chaibasa, Chatra, Dallonganj), Orissa, West Bengal, Madhya Pradesh.

**Material examined.** 10 juvenile, 21 adult male, 11 clitellate specimens in September 2001.

#### FAMILY OCNERODRILIDAE

**Diagnosis.** Body cylindrical. Dorsal pores rarely present. Male pores posterior to xvi. Spermathecae in pre-testicular segments; prostates tubular with central canal; last pair of hearts or its homoetic equivalent in xi. Holonephric, nephridia avascular

**Distribution.** Tropical America, Tropical and Southern Africa, some Indian Ocean Island, South India and nearby areas.

Genus *Ocneroдрilus* Eisen

**Diagnosis.** Setae lumbricinae. Male pores on xviii; prostatic pores one pair, combined with male pores, on xvii, seldom a second pair on xviii; male genitalia degraded due to parthenogenesis in some species. Oesophagus without gizzard, but with a pair of extramural calciferous glands in ix; intestinal caeca, supra-intestinal glands and typhlosole absent.

**Distribution.** Tropical America and Tropical Africa. Peregrine species transported to several parts of the world.

1875 *Ocneroдрilus occidentalis* Eisen. *Nova Acta R. Soc. Sci. Upsaliensis*, 3, 10 (4) : 218 (Type locality : California, USA) ; Gates, 1972. *Trans. Am. phil. Soc.*, 62(7) : 273. Gates, 1973. *Bull. Tall Timbes Res. Stat.*, 14(7) : 14.

**Diagnosis.** Length 12-69 mm, diameter 1-2 mm. 70-84 segments. Prostomium epilobic, tongue open, sometimes closed. Clitellum annular xiii, xiv-xix, xx. Setae aa=bc, dd=1/2 C. Male pores (combined with prostatic pores) paired, minute, at centres of whitish porophores on xvii, each porophore lateral to b. Female pores paired, on xiv, at or slightly to b. Spermathecal pores and genital marking absent.

Septa present from 4/5, 7/8=10/11 slightly muscular. Intestine begins in xii. Holandric, testes and male funnels free, in x and xi; seminal vesicles absent. Prostates paired, in xvii, sometimes extending to xviii-xxx. Spermathecae absent.

**Distribution.** India: Jharkhand (Ranchi, Hazaribagh, Bokaro, Khunti, Burdu, Jamshedpur), Orissa, Uttar Pradesh, Rajasthan, Maharashtra, Kerala, Andaman Islands, Burma, Pakistan, Sri Lanka, U.S.A., Mexico, St. Thomas island, Denmark, Italy, Greece, Cape Verde Island, Rhodesia, Southwest Africa, Great Comoro Island, Palestine, Lebanon, Central Asia, Singapore, China, Japan, Philippine Islands, New Hebrides, British Solomon Island.

**Material Examined.** Several juvenile, immature and mature worms from Morabadi, Hatia, Harmu and Kanke in Ranchi district during Oct'99 to Sept'2000.

**Remarks.** *Ocneroдрilus occidentalis* is polymorphic. It is known from parthenogenetic morphs without spermathecae and seminal vesicles. Morphs with degraded male terminalia (in various forms: absence of testes, male gonoducts, prostates and male pores) have also been recorded.

**Habitat.** Found in a wide range of moist habitats in alkaline sandy loam and clay loam soils, especially in lowland and upland pastures, crop fields, compost pits and sewage.

**Biology.** A maximum population of about 7600/m<sup>2</sup> from a protected upland pasture has been recorded by Singh *et al.* (unpublished), while Dash and Patra (1977) and Senapati (1980) observed about 550/m<sup>2</sup>. Clitellate worms are available during the rainy season and juveniles are abundant during the post-rainy season period. Reproduction by parthenogenesis is suspected as cocoons were not observed in the field as well as in the laboratory cultures. This species undergoes diapause at low soil moisture (<15g%).

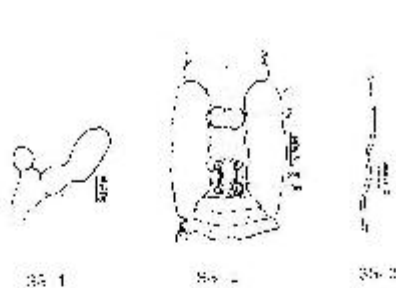


Fig. SS-1-3: *Dichogaster affinis* (Michaelsen)

1. Spermatheca
2. Male genital area
3. Penial setae

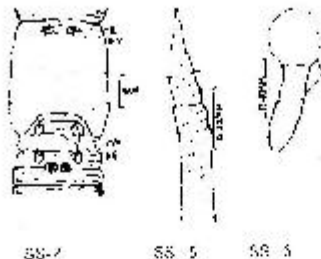


Fig. SS-4-6: *Pellogaster bengalensis* (Michaelsen)

4. Male genital region
5. Penial setae
6. Spermatheca



(C)

a : *Dichogaster affinis*. b : *Pellogaster bengalensis*. c : *Ocneroditus occidentalis*

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