Research Paper

Volume : 5 | Issue : 3 | March 2016 • ISSN No 2277 - 8179 | IF : 3.508 | IC Value : 69.48

Identification and Classification of Earthworms in Agro-Climatic Zone: North Eastern Ghat of Odisha, India

Life Science

KEYWORDS : Earthworm diversity, agro-climatic zones, North eastern Ghat, Taxonomy

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ABSTRACT

Around 4000 species of earthworms are known to occur globally and from India so far 418 species, referable to 67 genera and 10 families, have been reported. Further earthworms have gained renewed scientific attention in India as well abroad 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. Objective of this study is to identify different earthworms collected from different habitats of study selected in order to contribute to a study of the diversity, the abundance and the biogeography of the fauna of earthworms in the regions of North eastern Ghat, Odisha. Out of 180 specimens collected from different habitats/experimental sites seven species were identified from the region of north eastern ghat Odisha, such as Octochaetona portoscolex, Pontoscolex corethrurs, Octochaetona surensis, Lampito mauritti, Parionyx excavates, Octochaetona serrata and Pheretima alexandri which belongs to three different Families viz. Megascolecidae, Octochaetidae and Glossocolecidae.

Introduction:

Earthworms are now highly regarded as a rich biological resource with a multitude of uses having commercial and environmental applications. These biological engineers have the efficiency of converting organic substrates to composts. They are now widely used in vermicomposting for waste management, production of soil amendments, and such kind of several utilizations. They can be used in removing soil pollutants through bioremediation. Heavy metals and other pollutants can be taken up by the worms and removed from the soil. Earthworms change the structure of their soil environments. Different types of earthworms can make both horizontal and vertical burrows, some of which can be very deep in soils. Earthworms are also play a vital role in mixing soil layers and incorporating organic matter into the soil.

Earthworms secretes enzymes proteases, lipases, amylases, cellulases and chitinases which are brings about rapid biochemical conversion of the cellulosic and the proteinaceous materials in the variety of organic wastes which originate from homes, gardens, dairies and farms (Rajiv *et al*, 2004). Earthworms are hermaphrodites and they can double their population in one month in ideal conditions of temperature, moisture, and food, which is organic, matter. (Harender and Bhardwaj 2001)

The work available on the systematics of earthworms is mostly by Stephenson, (1923), who provided massive taxonomic information on oligochaeta in his book, "Fauna of British India". According to current estimation the number of existing species is far from complete. The most

recent account of earthworm diversity comprises 3627 earthworm species described worldwide, with an average annual addition of 68 species (Reynolds, 1994). More than 3000 species of earthworms are known or identified.

Earthworms form the bulk of the Oligochaete fauna in the Indian land mass and are represented by 509 species and 67 genera (Julka, 1993). Blanchart and Julka (1997) assessed the effects of anthropic disturbance on earthworm communities collected at the end of the rainy season in a wide range of milieu and found 28 species of earthworms belong to the families Octochaetidae (18), Megascolecidae (3) and Moniligastridae (7). At present the Indian earthworm fauna comprises about 408 species placed in 10 families and 69 genera (Dash, 2012) There was no clear relationship between these community characteristics and the vegetation, topography as pastures and forests supported high or low densities (or biomasses)or soil properties. Nevertheless, some species were restricted to forests, some species to pastures, and some species were found in all type of milieux.

Earthworm population dynamics in relation to different soil types has influence of vegetation on population dynamics of earthworm but it was not well been studied in several parts of Odisha. In addition, no such strong report on distribution and abundance of earthworms are available this region. This information is very essential to take necessary steps to study and work with earthworm which has impact in environment. Therefore the present study was aimed to determine the actual condition of the earthworm biodiversity in Odisha. This particular study is done in the regions of North eastern ghat with respect to selected habitats and soil conditions.

Materials and Methods:

Site of Study:

North eastern Ghat region in Odisha situated on geographical location between 19° 10' 0" North, 83°25' 0" East of India. The survey and collection of sample was done for six months, starting from the month of July 2014 to Dec 2014. A total 40 sampling sites were selected for study by the replacement sampling method every week**.** The identified earthworm sampling sites in North eastern Ghat region are depicted (Fig.1).

Figure 1. Study site of Earthworm diversity in the region North eastern Ghat, Odisha, India

Earthworm sampling:

Earthworms were collected by conventional digging and hand

sorting method (Anderson and Ingram 1993) from each quadrate. A hole of one square feet was dug of depth: (a) epigeic (1 cm to 5 cm depth), (b) aneceic (10 cm to 30 cm depth), (c) endogeic (30 cm to 50 cm depth) with the help of spade and scrapper in each selected site. Collections were made twice in a month in the following habitats agroecosystems, grassland, pasture, forest and garbage sites. Collection, preservation and counting of the earthworm species was based on age structure and preliminary morphological view (a) juveniles, (b) non-clitellates and (c) clitellates and habitat. Earthworms were collected by digging in several locations in each land use system (total area sampled variable). Sampled spots within each site were selected according to soil characteristics, where we thought it was more likely to find earthworms; i.e., humid conditions or presence of burrows and surface casts. Earthworms were counted and narcotized by dropping them in 70% ethyl alcohol. They were removed from alcohol after their movement stopped. Then worms were transferred to 10% formalin for fixation and identification. A label with site name, plot number, date is affixed to each vial. Abiotic factors like soil temperature, soil moisture and pH values recorded at the time of collection.

Results & Discussion:

There is an urgent need to produce a reliable and comprehensive guide to the earthworms of North eastern Ghat regions of Odisha that is accessible to the non-specialist and should be regularly updated. Studies on different region of the India and on different ecosystems have revealed that the earthworm diversity is highly variable owing to geographical position, climatic condition and disturbances in habitat concerned. The majority of native species were restricted to natural habitats.

In this study species diversity, ecological distributions and abundance of different earthworms were estimated on the basis of habitat of earthworm (Table 1, 2). Earthworm species were collected and identified generally according to their morphological characteristics and Habitats. Out of 180 samples collected from different habitats/experimental sites seven species were identified from the region of north eastern ghat Odisha, such as Octochaetona *portoscolex*, Pontoscolex *corethrurs*, Octochaetona *surensis*, Lampito *mauritti*, Parionyx *excavates*, Octochaetona *serrata* and Pheretima *alexandri* which are listed in Table 1. Among all identified species L.*mauritti* and species belongs to Perionyx are common across all the regions and are available mostly in the habitats of forests as well agro ecosystems.

Another frequently observed in most of the regions are Octochaetona *surensis* in the habitats like grass lands, agro agro-ecosystems and in forests. Among all the earthworm species identified, species belong to Octochaetona are frequently available in the districts of Rayagada and gajapati. The concentration of Lampito mauritti species was more in the districts of both Rayagada as well Koraput.

Highest earthworm abundance was recorded in mid southern region of North eastern Ghat (60) where the soil was clay loamy, Alluvial soil On the other hand, the lowest abundance of earthworms was observed in south east localities (12) and recorded very few and most of the sampling area they were completely absent. Reports (Fragoso *et al.* 1999) suggest that the species number in a given earthworm community, which is the easiest measure of species diversity, range from 3-17 in tropical and temperate ecosystems. In this respect, North eastern Ghat region, with earthworm communities having 3 to 6 species, exhibit the similar diversity. The group distribution of earthworm population with maximum immature number of worms than mature worms at most of their active period of life observed. The factors that influence the diversity of earthworm community at a given locality, apart from the type of soil, climate and the available organic resources, are the land use pattern and disturbance (Edwards & Bohlen 1996).

Table 1.Systematic position of earthworm species present in North eastern Ghat

Order	Family	Genera	Species
Haplotaxidae	Octochaetidae	Octochaetona	portoscolex
	Glossocolecidae	Pontoscolex	corethrurs
	Octochaetidae	Octochaetona	surensis
	Megascolecidae	Lampito	mauritti
	Megascolecidae	Parionyx	excavates
	Octochaetidae	Octochaetona	Serrata
	Megascolecidae	Pheretima	alexandri

Table 2. Earthworm diversity and their relative abundance in different habitats.

Name of earthworm species	Agro ecosystem	Grass-lands	Pasture	Forest	Garbage site	Total
Portoscolex	-	2	3	5	1	11
Corethrurs	-	2	1	4	-	7
Surensis	4	4	3	7	2	20
Mauritti	12	15	8	24	7	58
Excavates	1	-	2	4	1	8
Serrata	-	3	2	4	-	9
Alexandri	2	3	3	5	1	14
						128

Table 3. Survey records of earthworm biodiversity in North eastern Ghat

Month of survey 2014	Zone	Collection no.	Districts covered	Type of soil
July	Mid southern	A1-B60	Rayagada	Red loam soil
August	Mid southern	C61-D85	Rayagada	Alluvial soil
September	South east	E86-F130	Gajapati	Clay loam
October	South east	G131-H160	Gajapati	Sandy loam
November	Southern	I161-J175	Koraput	Mixed red
December	Southern	K176-L180	Koraput	Alluvial soil

Conclusion:

Earthworms represent a major component of the soil macrofauna, in most terrestrial ecosystems, they dominate in biomass. They are often presented as bioindicators in term of biodiversity of the soil quality. In the present study we provide some of evidence that exotic earthworms present in the area of North eastern Ghat, Odisha have altered species richness and diversity, abundance, and composition of earthworms. A data is collected about specific species richness with respect to different habitat. Our knowledge is always limited of earthworm in some parts of the region of Odisha. Thus, this study will be useful to complete the fauna of Odisha, as well India. We hope that these results will be useful for understanding the diversity of species in the regions of North eastern Ghat, Odisha.

Acknowledgment:

We highly thankful to the School of life sciences, Sambalpur University, Odisha for providing laboratory and equipments, UGC New Delhi for providing financial support to carry out this research work. We are especially grateful to Zoological survey of India, Kolkata for their support in identifying the species.

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Volume : 5 | Issue : 3 | March 2016 • ISSN No 2277 - 8179 | IF : 3.508 | IC Value : 69.48

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