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Diversity of earthworm (Lumbricidae) in India: A review

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Abstract

Earthworms are known to be farmer's friend due to its major role in maintaining the soil integrity and its fertility. Earthworm has greater diversity throughout world, specifically in tropical and temperate regions. Lumbricidae is the one of the most important family of earthworms due to its beneficial impacts to the mankind. Because a very less information is available about the diversity patterns of Lumbricidae family in India, hence an effort is made to record the species richness and distribution patterns of Lumbricidae earthworms from different regions of India. The present study is conducted to record the past and existing fauna of earthworms (Lumbricidae) from different states of India.

Keywords: Earthworm, Lumbricidae, specifically, earthworms, fauna, earthworms

Introduction

Earthworms belonging to phylum Annelida, Class Oligochaetes known to be Farmer's Friend due to its great role in the maintaining of soil integrity and maintaining of soil fertility. About 80% population from the total soil biomass belongs to the species of earthworm. Around 4400 species of earthworms are present in the world especially in tropical and temperate region with each having their own different behavioural characteristics, biological activities and physical appearance. Out of 80% from the total population of earthworm. The percentile record of earthworm species from India as comparison with the world record, stands for the 11.1%. Most of the earthworm species in India are native^[8]. Lumbricidae is one of the families in the class Oligochaete, of phylum Annelida. Lumbricidae family is considered to be one of the most important family of earthworms among the other families due to its beneficial impacts to the mankind. As members of Lumbricidae can colonize the new soil very efficiently due to its higher reproductive potential to dominate the new area^[5]. Lumbricidae earthworms play important role in various biogeochemical cycles such as nitrogen and carbon cycles, soil fertility which are beneficial for maintain the ecological balance^[21]. The current study represented the records of past 10-12 years (from 2011-2023) studies throughout India. This review comprises the records of past and current diversity of earthworm species from the Lumbricidae family from different states of India.

Earthworm Diversity in Kashmir

Conducted the report on the population of earthworm in the state of Kashmir. The report has provided an update with the list of total 8 species from the 3 different families of earthworm. Out of total 6 species is found in the family Lumbricidae named as *Aporrectodea caliginosa trapezoids*, *Eisenia fetida*, *Aporrectodea caliginosa caliginosa*, *Aporrectodea parva*, *Octolasion cyaneum*, *Aporrectodea rosea rosea*^[15].

Conducted survey on the earthworm fauna of India. Report based on the study of total 115 species of earthworms belonging to the different families. Out of total identified species of earthworm 7 species were identified in the Lumbricidae family which were named as *Aporrectodea caliginosa caliginosa* (Savigny), *Eisenia fetida* (Eisen), *Bimastos parvus* (Eisen), *Aporrectodea caliginosa trapezoides* (Dugès), *Octolasion tyrtaeum* (Savigny), *Dendrodrilus rubidus* (Savigny), *Aporrectodea rosea rosea* (Savigny)^[3].

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Earthworms Diversity in Himachal Pradesh

Explored the earthworm diversity of District Solan of Himachal Pradesh. Therefore the report provided an update with the list of 32 species and 7 families of earthworm. From the total species of earthworm, 7 number of species were found in family Lumbricidae *Aporrectodea caliginosa caliginosa* (Savigny, 1826) *Aporrectodea caliginosa trapezoides* (Duges, 1828) *Aporrectodea rosea rosea* (Savigny, 1826) *Bimastos parvus* (Eisen, 1874) *Eisenia fetida* (Savigny, 1826) *Eiseniella tetraedra tetraedra* (Savigny, 1826) *Octolasion tyrtaeum* (Savigny, 1826) [2].

Conducted the report on earthworm diversity of Himachal Pradesh. In the report they states the 47 species under 6 families of earthworm. Out of total, 14 number of species were found in family Lumbricidae named as *Aporrectodea caliginosa trapezoides* (Dugès, 1828) *Bimastos parvus* (Eisen, 1874) *Aporrectodea caliginosa caliginosa* (Savigny, 1826) *Aporrectodea rosea rosea* (Savigny, 1826) *Dendrobaena octaedra* (Savigny, 1826) *Eisenia fetida* (Savigny, 1826) *Dendrobaena hortensis* (Michaelsen, 1890) *Dendrodriilus rubidus* (Savigny, 1826) *Lumbricus castaneus* (Savigny, 1826) *Eiseniella tetraedra tetraedra* (Savigny, 1826) *Octolasion tyrtaeum* (Savigny, 1826) *Lumbricus terrestris Linnaeus*, (1758) *Octolasion lacteum* (Örley, 1881) *Octolasion cyaneum* (Savigny, 1826) [1].

Conducted a study to record the diversity and distribution of earthworms of Mandi district of Himachal Pradesh. In this study, they reported 17 species identified under 4 different families of Earthworm. Out of total, 7 number of species were found in family Lumbricidae named as *Octolasion tyrtaeum* (Savigny 1826), *Bimastos parvus Eisen*, 1874, *Eisenia fetida* (Savigny 1826), *Aporrectodea caliginosa caliginosa* (Savigny 1826), *Dendrodriilus rubidus* (Savigny 1826), *Aporrectodea rosea rosea* (Savigny 1826), *Aporrectodea caliginosa trapezoids* (Duges, 1828) [24].

Presented a checklist on a diversity and population of earthworm in India. During their study they found 14 species of earthworm under the family Lumbricidae in the state of himachal Pradesh, and name of the species are *Octolasion tyrtaeum* (Savigny, 1826), *Lumbricus terrestris Lennaeus*, 1758, *Eiseniella tetraedra tetraedra* (Savigny, 1826), *Octolasion cyaneum* (Savigny, 1826), *Eisenia rosea* (Savigny, 1826), *Eisenia foetida* (Savigny, 1826), *Dendrobaena rubida* (Savigny, 1826), *Eisenia hortensis* (Michaelsen, 1890), *Bimastos parvus* (Eisen, 1874), *Apporectodea turgida* (Eisen, 1874), *Apporectodea rosea rosea* (Savigny, 1826), *Apporectodea tuberculata* (Eisen, 1874), *Apporectodea caliginosa caliginosa* (Duges, 1828), *Apporectodea trapezoids* (Duges, 1818) [7].

Earthworm Diversity in Uttarakhand

Checking up the earthworm diversity and population in the different region of the state Uttarakhand, and report of the survey was depend upon on the basis of list of total 12 species from the 2 different families were found in the particular region of Kumaun . Out of total only 4 speies of the earthworm were found in the family Lumbricidae and name of the species is *Eisenia fetida*, *Octolasion Cyaneum* (Savigny, 1826), *Aporrectodea trapezoids*, *Octolasion tyrtaeum* and *Octolasion Cyaneum* was recorded for the first time from this region [21].

Reviewed the earthworm fauna of India. Report based on the study of total 115 species of earthworms belonging to the

different families. Out of total 6 number of species were found in the Uttarakhand region, which were named as *Eisenia fetida* (Eisen), *Aporrectodea caliginosa trapezoides* (Dugès), *Bimastos parvus* (Eisen), *Octolasion tyrtaeum* (Savigny), *Dendrodriilus rubidus* (Savigny), *Aporrectodea rosea rosea* (Savigny) [3].

Explored the diversity of earthworm in the state of Uttarakhand. The report provided an update with the list of total 52 species and 8 families of earthworm. Out of total the 9 species were found in the family Lumbricidae named as *Aporrectodea rosea* (Savigny, 1826) *Dendrodriilus rubidus* (Savigny, 1826) *Aporrectodea trapezoides* (Dugès 1828) *Bimastos eiseni* (Levinsen, 1884) *Eisenia fetida* (Savigny, 1826) *Bimastos parvus* (Eisen, 1874) *Eiseniella tetraedra* (Savigny, 1826). *Octolasion tyrtaeum* (Savigny, 1826) *Octolasion cyaneum* (Savigny, 1826) [12].

Explored the diversity of earthworms in 9 different regions of Uttarakhand. The report provided an update with the list of total 18 species and 5 families of earthworm. Out of total the 5 species were found in the family Lumbricidae named as *Eisenia fetida*, *Aporrectodea caliginosa*, *Octolasion tyrtaeum*, *Ap. Trapezoids*, *Ap. Rosea* [13].

Checking up the earthworm diversity and population by using the different land system in the Champawat District, of the state Uttarakhand and the result of the checklist based upon the list of total 13 species of earthworm in 3 different families. Which were named as *Aporrectodea caliginosa trapezoids*, *Allolobophora parvus*, *Eisenia fetida* [27].

Earthworm Diversity in Punjab

Conducted the report on earthworm population of Punjab region. During the study a total of 6 earthworm species belonging to different families were documented. Out of total, 1 species of earthworm from the Lumbricidae family were documented. Which were named as *Bimastos parvus* [14].

Reviewed the earthworm fauna of India. During the study a total of 115 species of earthworms belonging to different families were documented. Out of total 2 species of earthworm from the Lumbricidae family were found in the region of Punjab named as *Bimastos parvus* (Eisen), *Aporrectodea caliginosa trapezoides* (Dugès) [3].

Earthworm Diversity in Chandigarh

Reviewed the earthworm fauna of India. During the study a total of 115 species of earthworms belonging to the different families were documented in the Indian region. In this study of diversity and fauna of earthworm in the different regions of Chandigarh, the result carries only one species of earthworm in the family Lumbricidae and name of the species is *Eisenia fetida* (Eisen) [3].

Earthworm Diversity in Haryana

Conducted the report on the population of earthworm in Yamuna Nagar and Kurukshetra of Haryana state. The report provided an update with the list of total 3 species from 3 different families. Out of total 1 species is found in the family Lumbricidae named as *Bimastos parvus* (Eisen, 1874) [4].

Conducted the report on the diversity and population of earthworm in the District of Yamuna Nagar from the state Haryana. The report provided an update with the list of total 14 species from the 4 different families. Out of total 1 species is found in the family Lumbricidae which were named as *Bimastos parvus* (Eisen) [6].

Earthworm Diversity in Delhi

Reported a checklist on the fauna of the earthworm species in the different regions of the India. In the report they listed only one species of earthworm under the family Lumbricidae in the Union territory of Delhi, which is named as *Eisenia foetida* (Savigny, 1826) [7].

Reviewed the earthworm fauna of India. During the study a total of 115 species of earthworms belonging to the different families were documented in the Indian region. In this study of diversity and fauna of earthworm in the different regions of Delhi, the result carries only one species of earthworm in the family Lumbricidae and name of the species is *Eisenia foetida* (Eisen) [3].

Earthworm Diversity in Uttar Pradesh

Explored the diversity of earthworm in the state of Uttar Pradesh. The report provided an update with the list of total 50 species and 6 families of earthworm. From the total species of earthworm, 6 number of species were found in family Lumbricidae named as *Glyphidrilus tuberosus* (Stephenson, 1916) *Eisenia foetida* (Savigny, 1891) *Allolobophora papillatus* (Eisen, 1909) *Pontoscolex corethrurus* (Michaelsen, 1898) *Glyphidrilus papillatus* (Rosa, 1890) *Amyntas morrisi* (Beddard, 1892) [20].

Reviewed the earthworm fauna of India. During the study a total of 5 species of earthworm were found under the family Lumbricidae in the different regions of the Indian state Uttar Pradesh and name of the species were *Eisenia foetida* (Savigny, 1891), *Allolobophora papillatus* (Eisen, 1909), *Glyphidrilus papillatus* (Rosa, 1890), *Glyphidrilus tuberosus* (Stephenson, 1916), *Pontoscolex corethrurus* (Michaelsen, 1898) [19].

Reviewed the earthworm fauna of India. During the study a total of 115 species of earthworms belonging to different families were documented. Out of total 6 species of earthworm from the Lumbricidae family were found in the state of Uttar Pradesh, named as *Dendrodrilus rubidus* (Savigny), *Aporrectodea rosea rosea* (Savigny), *Bimastos parvus* (Eisen), *Octolasion tyrtaeum* (Savigny), *Aporrectodea caliginosa trapezoides* (Dugès), *Eisenia foetida* (Eisen) [3].

Earthworm Diversity in Meghalaya

Conducted a study to record the diversity and distribution of earthworms in the state of Meghalaya. In the report they states the 32 species under 4 families of earthworm. Out of total 1 species of earthworm belongs to the phylum Lumbricidae and the name of the species is *Aporrectodea trapezoides* (Dugès) [10].

Reviewed the earthworm fauna of India. During the study a total of 115 species of earthworms belonging to the different families were documented in the Indian region. In this study of diversity and fauna of earthworm in the different regions of Meghalaya, the result carries only one species of earthworm in the family Lumbricidae and name of the species is *Aporrectodea caliginosa trapezoides* (Dugès) [3].

Earthworm Diversity in Arunachal Pradesh

Conducted the report on the diversity and distribution of earthworm in the state of Arunachal Pradesh. During the study they reported total 46 species under 8 families of earthworm. Out of total 46, only 1 species of earthworm is found in the family Lumbricidae, named as *Bimastos parvus** [11].

Presented a checklist on a diversity and population of earthworm in India. During their study they found 3 species

of earthworm under the family Lumbricidae in the state Arunachal Pradesh and name of the species is *Dendrobaena rubida* (Savigny, 1826), *Bimastos rubidus* (Savigny, 1826), and *Bimastos parvus* (Eisen, 1874) [7].

Earthworm Diversity in Assam

Explored the diversity and population of earthworms in the different regions of the state Assam. The report provided an update with the total 8 number of earthworm species, from the 4 different families. Out of which one species of earthworm is found in the family Lumbricidae which were named as *Octolasion tyrtaeum* (Savigny, 1826) [22].

Earthworm Diversity in Sikkim

Conducted the study to record the different species of earthworm in the different regions of the state Sikkim. During the study a total of 51 species of earthworm belonging to the 7 different families. Out of total 51 species of earthworm, 7 numbers of species were found in the family Lumbricidae, which were named as *Dendrobaena kempfi* (Steph., 1922) as *Allolobophora* (*Dendrobaena*) *kempfi*, *Aporrectodea trapezoides* (Dugès, 1828) (Julka and Haldar, 1977), *Octolasion tyrtaeum* (Sav., 1826) (Julka and Haldar, 1977), *Aporrectodea rosea* (Sav., 1826) (Julka and Haldar, 1977), *Eiseniella tetraedra* (Sav., 1826) (Julka and Haldar, 1977), *Dendrodrilus rubidus* (Sav., 1826) (Julka and Haldar, 1977), *Eisenia foetida* (Savigny, 1826) (Gates, 1972; Julka and Haldar, 1977; KVK Mangan N. Sikkim, 2018) [26].

Reviewed the earthworm fauna of India. During the study a total of 115 species of earthworms belonging to the different families were documented in the Indian region. Out of total, 5 species of earthworm were found in the family Lumbricidae in the different region of state Sikkim. Species were recorded in the different-different regions for example research area are vegetable ground, forests lands, crop fields with the seasonal variation of crops and name of the following species are *Aporrectodea rosea rosea* (Savigny), *Aporrectodea caliginosa trapezoides* (Dugès), *Dendrodrilus rubidus* (Savigny), *Octolasion tyrtaeum* (Savigny), *Eisenia foetida* (Eisen) [3].

Earthworm Diversity in Chhattisgarh

Has given the report on the population of earthworm in the state Chhattisgarh. The report has provided the information of native and non-native, 9 different species from the 5 families of the earthworm. Out of total 1 species is found in the family Lumbricidae named as *Eisenia foetida* (Savigny, 1826) [9].

Earthworm Diversity in Jharkhand

Conducted the report on earthworm population of Jharkhand region. During the study a total of 15 earthworm species belonging to different families were documented. Out of total, 1 species of earthworm from the Lumbricidae family were documented. Which were named as *Eisenia foetida* [25].

Reviewed the earthworm fauna of India. During the study a total of 115 species of earthworms belonging to the different families were documented in the Indian region. In this study of diversity and fauna of earthworm in the different regions of Jharkhand, the result carries only one species of earthworm in the family Lumbricidae and name of the species is *Eisenia foetida* (Eisen) [3].

Earthworm Diversity in Bihar

Reported a checklist on the fauna of the earthworm species in

the different regions of the India. In the report they listed only 1 species of earthworm under the family Lumbricidae in the Indian state of Bihar and the name of the species is *Eisenia foetida* (Savigny, 1826)^[7].

Earthworm Diversity in Kerala

Conducted the report on the diversity and distribution of earthworm in the state of Kerala. During the study they reported total 88 species under 9 families of earthworm. From the total 88 species of earthworm, only 1 species belonging to the family Lumbricidae which were named as *Eisenia foetida* (Savigny, 1826)^[16].

Conducted a study to record the diversity and distribution of earthworms in the different regions of India. During the study they reported only 1 species of earthworm under the family Lumbricidae, which is named as *Eisenia foetida* (Savigny, 1826)^[7].

Earthworm Diversity in Karnataka

Conducted the report on the population of earthworm in the state of Karnataka. Report based on the study of total 6 species of earthworm from the 4 different families. Out of total, 1 species of earthworm from the Lumbricidae family were found, which were named as *Eisenia foetida*^[17].

Presented a checklist on a diversity and population of earthworm in India. During their study they found 1 species of earthworm under the family Lumbricidae in the state of Karnataka, and name of the species is *Eisenia foetida* (Savigny, 1826)^[7].

Earthworm Diversity in Andhra Pradesh

Presented a checklist on a diversity and population of earthworm in India. During their study they found 1 species of earthworm under the family Lumbricidae in the state Andhra Pradesh and the name of the species is *Eisenia foetida* (Savigny, 1826)^[7].

Earthworm Diversity in Andaman and Nicobar

Presented a checklist on a diversity and population of earthworm in India. During their study they found 2 species of earthworm under the family Lumbricidae in the Union territory Andaman and Nicobar. Which is named as *Lumbricus rubellus Hoffmeister, 1843* and the second species is *Eisenia foetida* (Savigny, 1826)^[7].

Reviewed the earthworm fauna of India. During the study a total of 115 species of earthworms belonging to the different families were documented in the Indian region. In this study of diversity and fauna of earthworm in the different regions of Andaman and Nicobar, the result carries only one species of earthworm in the family Lumbricidae and name of the species is *Eisenia foetida* (Eisen)^[3].

Earthworm Diversity in West Bengal

Conducted a study to record the population and diversity of different earthworm species in the Darjeeling District of the state West Bengal. The report carries the list of total 47 species of earthworm from the 6 six different families. Out of total, 8 species of earthworm were found in the family Lumbricidae which were named as *Octolasion cyaneum*, *Bimastos parvus*, *Octolasion Tyrtaeum*, *Aporrectodea rosea rosea*, *Dendrodrilus rubidus*, *Eiseniella tetraedra tetraedra*, *Dendrobaena hortensis*, *Eisenia foetida*^[18].

Reviewed the earthworm fauna of India. During the study a total of 115 species of earthworms belonging to the different

families were documented in the Indian region. Out of total 5 species of earthworm from the Lumbricidae family were found in the region of West Bengal and the name of the different species are *Eisenia foetida* (Eisen), *Bimastos parvus* (Eisen), *Octolasion tyrtaeum* (Savigny), *Dendrodrilus rubidus* (Savigny), *Aporrectodea rosea rosea* (Savigny)^[3].

Reported a checklist on the fauna of the earthworm species in the different regions of the India. In the report they listed 8 species of earthworm under the family Lumbricidae in the Indian state of West Bengal. The name of the species are *Octolasion cyanium* (Savigny, 1826), *Eisenia hortensis* (Michaelsen, 1890), *Octolasion tyrtaeum* (Savigny, 1826), *Eiseniella tetraedra* (Savigny, 1826), *Aporrectodea rosea* (Savigny, 1826), *Dendrobaena rubidus* (Savigny, 1826), *Bimastos parvus* (Eisen, 1874), *Eisenia foetida* (Savigny, 1826)^[7].

Earthworm Diversity in Orissa

Conducted the study to record the diversity and population of different species of earthworm in the different districts of the state Orissa. The report carries the list of total 10 species of earthworm from the 5 different families. Out of total 10, only one species of earthworm that is *Eisenia foetida* were found in the family Lumbricidae^[23].

Earthworm Diversity in Tamil Nadu

Reviewed the earthworm fauna of India. During the study a total of 115 species of earthworms belonging to the different families were documented in the Indian region. Out of total 6 species of earthworm were found in the family Lumbricidae were found in the different region of state Tamil Nadu, which were named as *Eisenia foetida* (Eisen), *Aporrectodea caliginosa trapezoides* (Dugès), *Octolasion tyrtaeum* (Savigny), *Bimastos parvus* (Eisen), *Aporrectodea rosea rosea* (Savigny), *Dendrodrilus rubidus* (Savigny)^[3].

Reported a checklist on the fauna of the earthworm species in the different regions of the India. In the report they listed 8 species of earthworm under the family Lumbricidae in the Indian state of Tamil Nadu, and the name of the species are *Eiseniella tetraedra* (Savigny, 1826), *Aporrectodea trapezoides Duges, 1828*, *Eisenia rosea* (Savigny, 1826), *Aporrectodea rosea* (Savigny, 1826), *Dendrobaena rubidus* (Savigny, 1826), *Bimastos parvus Eisen, 1874*, *Eisenia foetida* (Savigny, 1826), *Dendrobaena octaedra* (Savigny, 1826)^[7].

Earthworm Diversity in Gujarat

Reported a checklist on the fauna of the earthworm species in the different regions of the India. During their study they found only 1 species of earthworm under the family Lumbricidae in the state of Gujarat, and name of the species is *Eisenia foetida* (Savigny, 1826)^[7].

Earthworm Diversity in Madhya Pradesh

Reported a checklist on the fauna of the earthworm species in the different regions of the India. During their study they found only 1 species of earthworm under the family Lumbricidae in the state of Madhya Pradesh and name of the species is *Eisenia foetida* (Savigny, 1826)^[7].

Conclusion

The objectives of present study were to investigate the records of existing and previous richness of earthworm fauna (Lumbricidae) throughout India. Earthworm are very

important Annelids as they act as indicators of environmental health and also are soil friendly, so an effort is made to prepare a checklist on earthworm richness (Lumbricidae) from the different regions of the India. During the study different species from the family Lumbricidae were found in the different states of India. The current study concluded that, India has a very few records of Lumbricidae family so further studies must be conducted to document the Lumbricidae diversity in India as these are very important for the maintenance and fertility of soil. Extensive studies on Lumbricidae must be conducted in order to record new species as well as endemic species of earthworm.

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