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RECORD AND ABUNDANCE OF EARTHWORMS AT BETHUADAHARI WILDLIFE SANCTUARY, NADIA, WEST BENGAL

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INTRODUCTION

For the conservation of biological diversity, the idea of establishment of 'Conservation Areas', such as, Biosphere Reserve, National Parks, Wildlife Sanctuary, etc. has been conceptualized. Owing to the paucity of information on the fauna of Conservation Areas, Zoological Survey of India has taken up the faunal explorations of different Conservation Areas of our country. With a view to study the earthworm fauna of Bethuadahari Wildlife Sanctuary, Nadia, and also to study the effects of the devastating flood during September, 2000, three study tours were conducted during 2000-2002.

A devastating flood started on 18th September, 2000 and lasted for 7 days, *i.e.*, up to 24th September, 2000 with a maximum height of 8 to 9 feet of water. Most of the places of the sanctuary remained under water during this period. It was reported from the sanctuary people that several varieties of earthworms are usually seen in the area during rainy season. It was further reported that during last flood period the area remained under 8 to 9 feet of water for a period of about one week. During that time numerous earthworms were found crawling and ultimately died.

From the relevant literature (Halder, 1998; Julka, 1988; Stephenson, 1923) it appears that there is no published information on the earthworms fauna of Bethuadahari Wildlife Sanctuary, Nadia. Hence, the present authors made a sincere attempt to study and record the availability of the earthworms of Bethuadahari Wildlife Sanctuary, and also recorded the revival of the natural earthworm fauna of the sanctuary.

ABOUT THE SANCTUARY

The sanctuary, with a land area of 67.86 hectare, is only 140 km from Kolkata and only 25 km north of Krishnanagar, is situated by the side of N.H. 34, and is well connected by road and rail.

The Bethuadahari town and the Railway Stn. are barely half a kilometer away. Lalgola bound train can be availed from the Sealdah stn. Nearest Airport is Dumdum, Kolkata. Altogether 12 stations were selected for the present study purpose (Fig. 1).

In 1969, a pair of chital and a fawn were brought in from the Zoological Garden, Alipur. Thereafter 13 Chitals, 3 barking deers and 4 Sambars were introduced in 1970, from the Nandankanan Zoological Garden, Orissa. The current population of chital is around 290 to 300, whereas, other two species could not survive there.

Important plants and animals of the Sanctuary :

Trees observed :

Common Name	Scientific Name	Common Name	Scientific Name
1. Khair	*Acacia catechu*	8. Hijul	*Baringtonia acutangula*
2. Babla	*Acacia nilitica*	9. Amloki	*Emblica officinalis*
3. Bael	*Aegle marmelos*	10. Zeol	*Lannea indica*
4. Kala Siris	*Albizzia lebbek*	11. Jarul	*Lagerstroemia speciosa*
5. Sada Siris	*A. procera*	12. Sal	*Shores robusta*
6. Atha	*Anona reticulata*	13. Segun	*Tectona grandis*
7. Kadam	*Anthocephalus kadamba*	14. Arjun	*Terminalia arjun*

GROUND VEGETATION

1. *Arum* spp.
2. *Calotropis gigantea*
3. *Colocasis* sp.
4. *Croton* sp.

THE FOLLOWING ANIMALS WERE OBSERVED/REPORTED

Birds : Blue throated Barbet [*Megalaima asiatica asiatica* (Latham)], Coppersmith [*Megalaima haemacephala indica* (Latham)], Crow Pheasant [(*Centropus sinensis sinensis* (Stephens)], White breasted King Fisher [*Halcyon smyrnensis fusca* (Boddaert)], Magpie Robin [*Copsychus saularis* (Linnaeus)], Red vented Bulbul [*Pycnonotus cafer bengalensis* Blyth], Crested Serpent Eagle [*Spilornis cheela* (Latham)], King Vulture [*Sarcogyps calvus* (Scopoli)], Indian Tree pie [*Dendrocitta vagabunda vagabunda* (Latham)], Golden Oriole [*Oriolus oriolus kundoo* Sykes], Common Myna

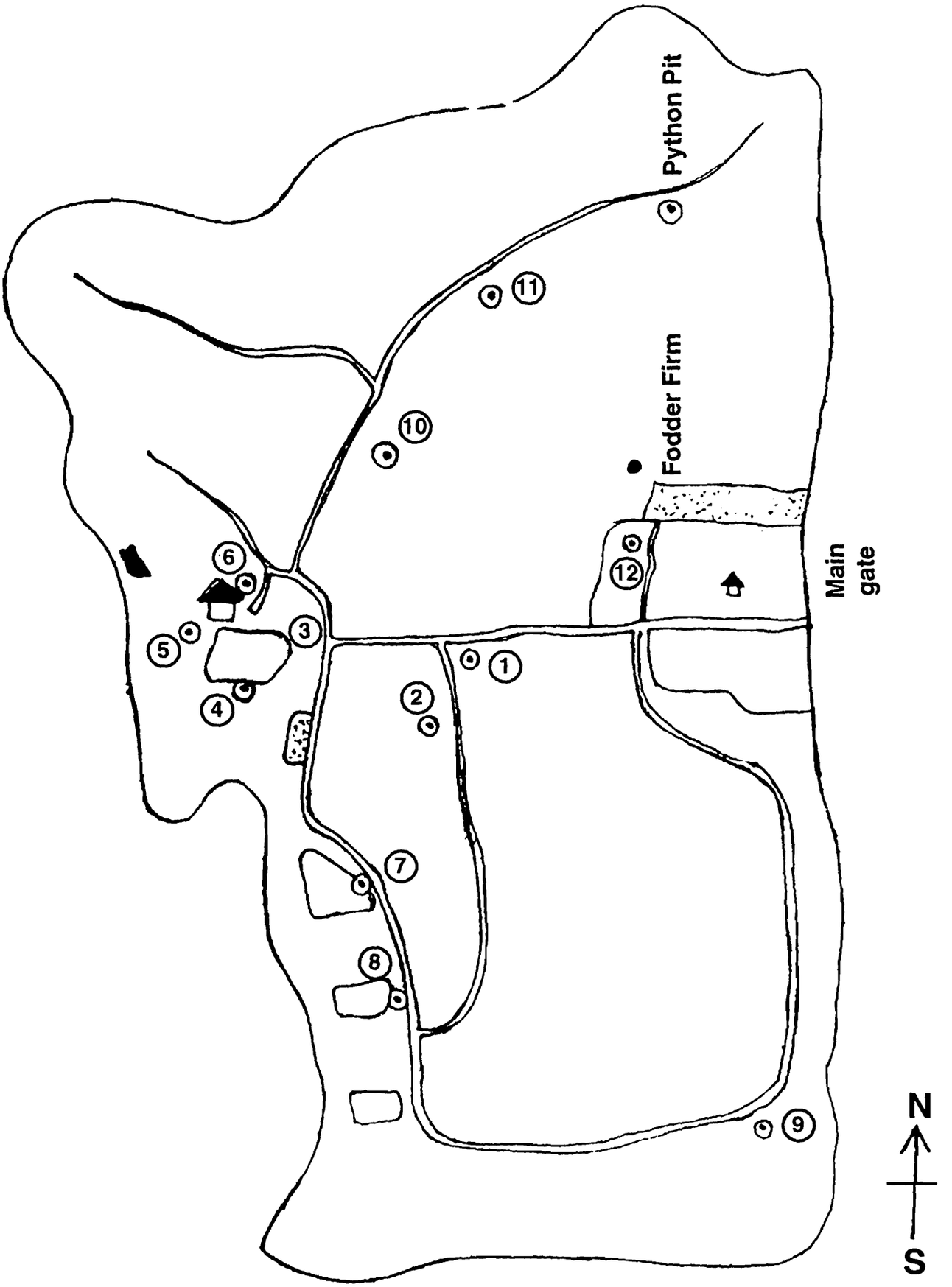

Fig. 1. : Map of Bethuadhari Wildlife Sanctuary, Nadia (Not to scale).
[○ indicates station]

[*Sturnus contra* Linnaeus], Black Drongo [*Dicrurus adsimilis* (Bechstein), Roseringed Parakeet [*Psittacula krameri* (Scopoli)].

Reptiles : Monitor Lizard [*Varanus bengalensis* (Daudin)], Python [*Python molurus* (Linnaeus)], Cobra [*Naja naja* (Linnaeus)], Krait [*Baungarus fasciata* (Schneider)], Rat Snake [*Ptyas mucosus* (Linnaeus), Riverine Turtle [*Lissemys punctata* Bonnaterre and *Kachuga kachuga* Gray].

Mammals : Chital [*Axix axis* (Erxleben)], Jungle cat [*Felis chaus* (Schreber)], Common Palm Civet Cat [*Paradoxurus hermaphroditus* (Pallas)], Asiatic Jackal [*Canis aureus* Linnaeus], Indian Crested Porcupine [*Hystrix indica* Kerr], Mongoose [*Herpestes edwardsii* (E. Geoffrey Saint-Hilaire)].

LIST OF SPECIES OF EARTHWORMS COLLECTED FROM BETHUADAHARI WILDLIFE SANCTUARY, NADIA

Class OLIGOCHAETA

Order MONILIGASTRIDA

Family MONILIGASTRIDAE

Genus ***Drawida***

1. *D. nepalensis* Michaelsen

Order HAPLOTAXIDA

Family ALMIDAE

Genus ***Glyphidrilus***

2. *G. tuberosus* Stephenson

Family OCTOCHAETIDAE

Genus ***Eutyphoeus***

3. *E. incommodus* (Beddard)
4. *E. orientalis* (Beddard)

Genus ***Ochtochaetona***

5. *O. beatrix* (Beddard)

Family MEGASCOLECIDAE

Genus ***Amynthas***

6. *A. alexandri* (Beddard)

Genus ***Lampito***

7. *L. mauritii* Kinberg

Genus ***Metaphire***

8. *M. houlleti* (Perrier)
9. *M. posthuma* (Vaillant)

Genus ***Perionyx***

10. *Perionyx excavatus* Perrier

Genus ***Polypheretima***

11. *P. elongata* (Perrier)

Key to the species of Earthworms collected from Bethuadahari Wildlife Sanctuary

1. Male pore paired in 10/11, and just in front of female pore, clitellum in IX to XIV; dorsal pores absent ..... *Drawida nepalensis*

— Male pore behind 10/11, and behind female pore; dorsal pore either present or absent 2

2. Male pore inconspicuous, ventral to the lateral protruberance or wings in clitellar segments; inhabit submerged soil with high organic matter; dorsal pores absent ..... *Glyphidrilus tububerosus*

— Male pore on the ventral surface of the body behind female pore (behind 10/11), habitat otherwise; dorsal pores present 3

3. Seta lumbricine; prostate tubular 4

   Seta perichaetine; prostate racemose 6

4. Two pairs of prostate glands ..... *Octochaetona beatrix*

   One pair of prostate gland 5

5. Clitellum on XIII to XVIII; penis absent ..... *Eutyphoeus incommodus*

— Clitellum on XIV to XVII; penis present and short ..... *E. orientalis*

6. Spermathecal pores 2 pairs (closely paired); penial seta present on XVIII; female pore single on XIV; colour purple dorsally and pale ventrally; holonephric ..... *Perionyx excavatus*

— Spermathecal pores at least one pair (widely paired); female pore one pair or single on XIV segment; colour otherwise; meronephric 7

7. Male pore on XVIII; female pore paired; gizzard in V; penial seta present on XVIII ..... *Lampito mauritii*

— Male pore on XVIII; female pore single and median; gizzard in VIII; penial seta absent 8

8. Polythecal (spermatheca more than one pair per segment), spermathecal pores on 5/6–6/7; male pore on XVIII; copulatory papillae widely paired, 3–7 pairs on XIV and on successive posterior segments ..... *Polypheretima elongata*

— Not polythecal; male pore on XVIII; copulatory papillae either lacking or present with their number and arrangement otherwise 9

9. Spermathecal pores 4 pairs, minute, superficial on 5/6 to 8/9; male pores minute, superficial on XVIII, each in a rather circular disc; copulatory pouches absent ..... *Amynthus alexandari*

— Spermathecal pores 3 or 4 pairs; usually large transverse slits, between 4/5 to 9/10; male pore (combined with prostatic pores) paired within copulatory pouches on XVIII 10

10. Spermathecal pores 4 pairs; genital marking paired circular in setal circle slightly median to male pore line ..... *Metaphire posthuma*

— Spermathecal pore 3 pairs; genital marking lacking externally or present in the vicinity of spermathecal pore ..... *M. houlleti*

SYSTEMATIC ACCOUNT

Class OLIGOCHAETA

Order MONILIGASTRIDA

Family MONILIGASTRIDAE

Genus ***Drawida***

1. ***Drawida nepalensis*** Michaelsen, 1907

1907. *Drawida nepalensis* Michaelsen, *Mitt. naturh. Mus. Hamb.*, **24** : 146.

Material : 1 ex., Stn. 1, 10.12.2000; 6 ex., Stn. 4, 11.10.2001; 3 ex., Stn. 3, 2.4.2002; 3 ex., Stn. 6. 3.4.2002.

Diagnosis : Clitellum in IX to XIV; setae lumbricine; dorsal pore absent; spermathecal pores one pair, transverse slits; male pores pairs in 10/11, and just in front of female pore (11/12); genital marking on small, circular, translucent area.

Remarks : Recorded during all the trips. However, their abundance is very poor.

Family ALMIDAE

Genus ***Glyphidrilus***

2. ***Glyphidrilus tuberosus*** Stephenson, 1916

1916. *Glyphidrilus tuberosus* Stephenson, *Rec. Indian Mus.*, **12** : 349.

Material : 32 ex., Stn. 2, 11.10.2001.

Diagnosis : Clitellum annular on XIV, XV, XVI–XXVIII, XXIX with lateral longitudinal protuberant ridges; male pore inconspicuous; female pores paired, minute, pre-setal on XIV; spermathecal pores 2–4 on each side in 13/14/15; genital markings small rounded papillae postsetal, usually arranged in a set of 6 in a transverse row; gizzard in VII.

Remarks : Prefer moist soil only, and recorded abundantly during post monsoon season.

Family OCTOCHAETIDAE

Genus ***Eutyphoeus***

3. ***Eutyphoeus incommodus*** (Beddard, 1901)

1901. *Typhoeus incommodus* Beddard, *Proc. zool. Soc. Lond.*, **1901** : 200.

Material : 2 ex., Stn. 5, 10.10.2001.

Diagnosis : Clitellum annular on XIII to XVIII; male pores within slight transversely placed fissures; female pores paired; spermathecal pores paired, small, transverse slits in 7/8; genital markings paired; penis absent.

Remarks : Rarely occurring, available only during post monsoon period.

4. ***Eutyphoeus orientalis*** (Beddard, 1833)

1833. *Typhoeus orientalis* Beddard, *Ann. Mag. nat. Hist. (ser. 5)*, **12** : 219.

Material : 14 ex., Stn. 5, 11.10.2001; 19 ex., Stn. 4, 10.10.2001.

Diagnosis : Clitellum on XIV-XVII; genital markings paired & post-setal; first dorsal pore at 11/12; spermathecal pores paired; female pore single on left side; penis short and annular; gizzard large.

Remarks : Most commonly occurring, however, recorded only during post monsoon season.

Genus ***Octochaetona***

5. ***Ochtochaetona beatrix*** (Beddard, 1902)

1902. *Ochtochaetus beatrix* Beddard, *Ann. Mag. nat. Hist.* (ser 7), **9** : 456.

Material : 1 ex., Stn. 8, 10.10.2001.

Diagnosis : Clitellum annular on XIII to XVIII; male pores minute; female pore paired; spermathecal pores paired, minute; genital markings absent; gizzard between septa 4/5 & 8/9; two pairs of prostate glands.

Remarks : This is very rare in occurrence in the sanctuary.

Family MEGASCOLECIDAE

Genus ***Amynthas***

6. ***Amynthas alexandri*** Beddard, 1900

1900. *Amyntas alexandri* Beddard, *Proc. zool. Soc. Lond.*, **1900** : 988.

Material : 7 ex., Stn. 5, 11.10.2001.

Diagnosis : Clitellum annular, XIV–XVI, occasionally reaching XVII; spermathecal pores 4 pairs, minute, superficial, in 5/6-8/9; male pores minute, superficial on XVIII, each in a rather circular disc; female pore single, mid-ventral, on XIV; genital markings absent.

Remarks : This is also a rare species, recorded for the first time from Nadia district.

Genus ***Lampito***

7. ***Lampito mauritii*** Kinberg, 1867

1867. *Lampito mauritii* Kinberg, *Ofvers. K. Vetens. Akad. Forhandl. Stockholm*, **23** : 103.

Material : 5 ex., Krishnanagar town near DFO Bungalow, 7.12.2000; 30 ex., Garden of DFO Bungalow, Krishnanagar, 8.12.2000; 1 ex., Stn. 4, 9.12.2000; 1 ex., Stn. 9, 10.12.2000; 1 ex., Stn. 3 and Stn. 10, 11.12.2000.

Diagnosis : Clitellum annular, XIV–XVII or XVIII; spermathecal pores 3 pairs, large, in EG, at 6/7, 7/8, 8/9; male pores in XVIII, at or lateral to B, un paired, circular, slightly raised porophores that extends from A into CE; female pores paired on XIV; genital markings absent.

Remarks : This species is recorded abundantly throughout the year within the sanctuary.

Genus ***Metaphire***

8. ***Metaphire houlleti*** (Perrier, 1872)

1872. *Perichaeta houlleti* Perrier, *Nouv. Arch. Mus. Hist. nat. Paris*, **8** : 99.

Material : 1 ex., Stn. 3, 10.12.2000; 4 ex., Stn. 11, 10.10.2001; 16 ex., Stn. 11, 11.10.2001; 2 ex., Stn. 12, 10.10.2001.

Diagnosis : Clitellum annular, XIV-XVI; seta perichaetine, often present on clitellar segments; spermathecal pores 3 pairs; male pores in XVIII, minute; female pore single, mid-ventral on XIV; genital markings lacking externally; pigment reddish brown; gizzard between septa 7/8 & 10/11.

Remarks : This is a common species, however, recorded mostly during post monsoon periods.

9. ***Metaphire posthuma*** (Vaillant, 1868)

1868. *Perichaeta posthuma* Vaillant, *Annl. Sci. Nat. (ser. 5)*, **10** : 288.

Material : 16 ex., Stn. 3, 9.12.2000; 11 ex., Stn. 4, 9.12.2000; 2 ex., Stn. 3, 10.12.2000; 36 ex., Stn. 5, 10.10.2001; 2 ex., Stn. 7, 3.4.2002.

Diagnosis : Clitellum annular on XIV-XVI; setae perichaetine; spermathecal pores 4 pairs, minute, in 5/6–8/9; male pores in XVIII, minute, each in a small disc on median wall near roof of a copulatory pouch; female pore single, mid-ventral, on XIV; genital markings paired, circular in setal circle slightly median to male pore line; pigment brown; gizzard between septa 7/8 and 8/9.

Remarks : Like *Lampito mauritii*, this is also a commonly occurring species within the sanctuary.

Genus ***Perionyx***

10. ***Perionyx excavatus*** Perrier, 1872

1872. *Perionyx excavatus* Perrier, *Nouv. Arch. Mus. Hist. Nat. Paris*, **8** : 126.

Material : 2 ex., Krishnanagar town near DFO Bungalow, 7.12.2000; 2 ex., Garden of DFO Bungalow, Krishnanagar, 8.12.2000; 3 ex., Stn. 12, 9.12.2000; 1 ex., Stn. 5, 10.12.2000; 5 ex., Stn. 12, 10.10.2001; 23 ex., Stn. 12, 2.4.2002.

Diagnosis : Clitellum annular, XIII-XVII. Spermathecal pores 2 pairs, near mid-ventral line, in 7/8, 8/9; male pores in small transverse protuberances within a single male field, each protuberance with a slightly irregular transverse groove containing apertures of 4–9 perisetal follicles, on XVIII; female pore single, mid-ventral, on XIV; genital markings absent; nephridiopores inconspicuous, in one rather irregular longitudinal rank on each side near mL.

Remarks : This is recorded for the first time from Nadia district. The species is also very common within the sanctuary, however, restricted to the moist humus mixed soil near kitchen drainage.

Genus ***Polypheretima***

11. ***Polypheretima elongata*** (Perrier, 1872)

1872. *Perichaeta elongata* Perrier, *Nouv. Arch. Mus. Hist. Nat. Paris*, **8** : 124.

Material : 3 ex., Stn. 1, 3.4.2002; 1 ex., Stn. 5, 8.4.2002; 2 ex., Stn. 4, 10.10.2001; 1 ex., Stn. 4, 11.10.2001.

Diagnosis : Genital markings transversely elliptical, presetal, on XIX and successive segments in line with or slightly ventral to male pores.

Remarks : This species is recorded for the first time from Nadia district, and recorded during pre-monsoon and post-monsoon periods.

DISCUSSION

The present attempt was made to study the earthworm fauna of Bethuadahari Wildlife Sanctuary, Nadia district, West Bengal, with the idea of getting a baseline information on the group. Moreover, it was also aimed to know the rate of revival of the earthworm fauna after the devastating flood in September, 2000.

The result of the first tour during December, 2000 shows that the population and the diversity of the worms was very poor, and only three species were recorded during that time. However, during the second tour the record of eleven species of earthworms reveals that revival of the earthworm fauna occurs within one year.

The first tour conducted during December, 2000 showed substantial damage of the earthworm fauna of the sanctuary. Only three species of earthworms, namely, *Metaphire posthuma, Lampito mauritii* and *Perionyx excavatus* were commonly observed during the first tour. While during the second tour on October, 2001, 11 species were encountered, which reveals the settlement of the earthworm fauna within a year after devastation during the flood in 2000. Of all the 11 species recorded, nine species, namely *M. posthuma, M. houlleti, L. mauritii, P. excavatus, E. orientalis, D. nepalensis, G. tuberosus, A. alexandri* and *P. elongata* were common, while two species, *E. incommodus* and *O. beatrix* were very rare. Four species, *P. excavatus, P. elongata, A. alexandri* and *M. houlleti* were recorded for the first time from the district Nadia. Only two species *Dichogaster modigliani* and *Eutyphoeus nicholsoni*, recorded earlier from Nadia district were not represented in the present sanctuary.

SUMMARY

The paper deals with eleven species of earthworms under nine genera and four families. In addition, a taxonomic key is also presented to facilitate identification for future workers. The gradual revival of earthworms species is also recorded.

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