



## DIVERSITY AND DISTRIBUTION OF EARTHWORMS OF HOSAPETE TALUKA OF BALLARI DISTRICT, KARNATAKA, INDIA.

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**ABSTRACT** A detailed survey was conducted to know the diversity of earthworms of Hosapete taluka upto gramapanchayat level and collected earthworms from 30 spots in different habitats like gutter, garbage, near water taps, pastures, grasslands and irrigated fields. In our study we have totally identified 13 earthworm species belonging to 5 families and 8 different genus viz *Lampito mauritii*, *Polypheretima elongata* athecomorph, *Polypheretima elongata* thecomorph, *Dichogaster affinis*, *Dichogaster modigliani*, *Perionyx koboensis*, *Octochaetona prashadi*, *Octochaetona parva*, *Octochaetona suriensis*, *Eudrilus eugeniae*, *Drawida modesta*, *Drawida species* and *Thaonia species*. These earthworms belong to the family Megascolecidae, Octochaetidae, Moniligastridae, Eudrilidae and Ocnerodrilidae respectively. Highest number of species were found near the tap water and Least number of species were found in gutter, pasture, bore well and grassland. The study also revealed that *Thaonia* species showed higher percentage presence among these species. In these species *Drawida modesta* is recorded for the first time from this region of Karnataka. Soil chemical characteristics of their habitats are ranging pH 6.0 to 8.2, electrical conductivity (EC) 0.4 to 2.0 mohs/cm, organic carbon (OC) 0.57 to 4.69%, phosphorous (P) 10.9 to 84.1 kg/acre and potassium (K) 76 to 330 kg/acre.

**KEYWORDS** : Earthworm, Diversity, Hosapete, Habitat, Soil.

### INTRODUCTION

Of all the members of the soil macrofauna earthworms constitute a major component; their biomass can be as much as 60-80% of below ground macro invertebrate biomass (Lavelle et al., 1995; Turbe et al., 2010). Earthworm belongs to the phylum annelida and class oligochaeta. Since long earthworms have been known as "Farmers Friend", "Natures Best fertilisers" and "Intestine of Earth" (Aristotle). They occur in most temperate soils and many tropical soils. In terms of biomass and overall activity, these organism dominate the world of soil invertebrates. Earthworms perform multitude ecological functions like altering soil structure, increase infiltration, improve water-holding capacity of soil, provide channels for root growth, bury and shred plant residue, stimulate microbial activity and earthworm's has long association with medicine (Reynolds,1972).

Globally 6200 species have been categorized, out of which around 3000-3500 are valid (Csuzdi, 2012) and about 150 species are described as peregrine on a global scale (Blakemore 2002, 2009, 2012).

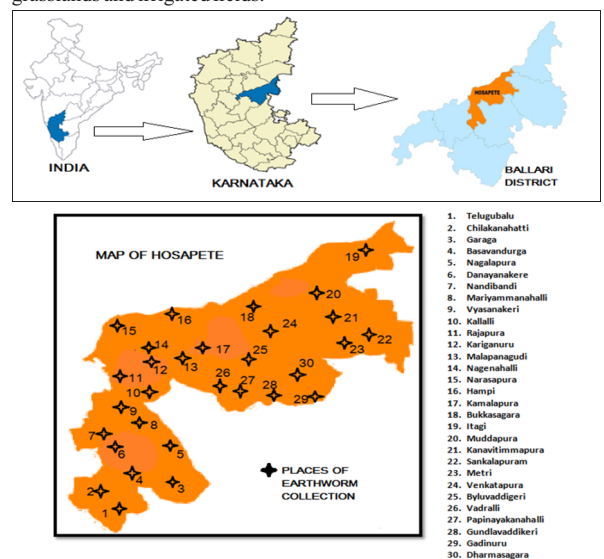
The Indian subcontinent has tremendous fauna of Oligochaeta (earthworms) which are represented by 505 species and 67 genera (Kathireswari, 2016). Savingny (1826) first shed light on diversity of earthworms of Paris. In our Indian subcontinent earthworm studies were initiated by Robert Templeton (1844), a British zoologist. From 1901 to 1947 world-renowned workers like Wilhelm Michaelsen, John Stephenson and G.E. Gates contributed a lot to the world of oligochaeta. It is followed by other taxonomist notably J. M Julka (1965-1988), Bhaduria and Ramakrishnan (1989), Julka and Paliwal (1986,1990,2000), Tripathi and Bharadwaj (2004), Sinha et al (2013), Sharma and Poonam (2014), Goswami and Mondal (2015). S.N.Rai (2018) reported a total of 22 species of earthworms belonging to 6 families were found from different pedoecosystems of Varanasi, Mirzapur, Allahabad, Ghazipur and Ballia districts of eastern Uttar Pradesh, India.

In Karnataka the distribution and abundance of earthworms was carried out by Kale and Krishnamoorthy (1978). Subsequently, earthworm studies were added by various workers, notably Rao (1979). The new species of earthworm *Mallehulla indica* was reported by Julka and Rao (1982), Krishnamurthy and Ramachandra (1988), Bano and Kale (1991), Siddharaju et al (2010, 2013). Deepthi and Kathireswari (2016). Harish Kumar.T.S et al. (2018) reported a total of fourteen species of earthworms belonging to four families from Udupi district, Karnataka. Mubeen and Hatti (2019) were worked on earthworm diversity of randomly available spots and reported total of 10 species from Bidar District,Hyderabad Karnataka region. Little information is available about the diversity and distribution of earthworms of Hosapete region. So, the present survey therefore undertaken to study detailed diversity and distribution of earthworms up to Grama Panchayat level.

### MATERIALS AND METHODS

#### Study Area

Hosapete taluka (Fig.1) is one of the major talukas of Ballari district. It lies between 15° 26' 89" N latitude and 76° 39' 09" E longitude . It covers an area about 934 sq.km. The city comes under arid zone. The average annual rain fall of the study area is 593.8 mm. The maximum temperature is 40°C and minimum is 27°C. Climate of the district is hot with summer spreading from February to June, hottest months being March, April and May with temperatures exceeding normally 40°C. This area presents unique geographical setting in terms of topography and the natural resources. The surrounding can be divided into two parts southern part and northern part. The southern peripheral part of the town is highly elevated, characterized by barren lands and hilly areas with rich iron ore content that is why mining activities are predominant. In contrast the northern periphery part is flat terrain, characterized by fertile black cotton soil, with abundant irrigation facilities, red sandy soils also occur in northern part of this region. The characteristics of sandy soils are brown to deep red colour, with poor water holding capacity. The collection were made from following sites which includes gutter, garbage, Near water taps, pastures, grasslands and irrigated fields.



**Fig.1:** Map showing the location of study area of Hosapete region, Karnataka, India.

#### Method Of Collection

The earthworms were collected by digging and hand sorting method

(Julka, 1988) and parameters like temperature, humidity and location were recorded. Morphological characteristics like length, diameter, body colour of earthworms were noted. Earthworms were first anesthetized in 70% alcohol for 20-60 seconds, later transferred to a flat tray with 10% formalin solution in straightened position for fixation, for at least 24 hours. After fixation, these worms were stored in 5% formalin solution (Julka and Paliwal, 1993) and preserved earthworm specimens were identified using key charts (Stephenson 1923; Gates 1972; Julka 1988) in the laboratory and reconfirmed by Zoological survey of India, Kolkata. Soil samples of earthworm's habitats were collected for its physicochemical analysis like pH, electrical conductivity, organic carbon, phosphorous, potassium. Soil analysis was carried out at Agriculture Soil testing laboratory, Kalaburgi.

**Key For The Identification Of Earthworms Of Hosapete Region.**

1. Testes and male funnels intraseptal, male pores at the posterior margin of the segments as their corresponding tests; clitellum single cell thick; eggs large, yolky -----MONILIGASTRIDAE (*Drawida modesta*)
2. Prostatic glands present -----3
3. Spermathecal pores in or posterior to testis Segments (always associated with ovaries or oviducts)-----EUDRILIDAE
4. Last pair of hearts in segment xi -----OCNERODRILIDAE  
Last pair of hearts posterior to segment xL-----5
5. Prostatic glands racemose without central canal-----MEGASCOLECIDAE  
Prostatic glands tubular with central canal-----6
6. Holonephric-----ACANTHODRILIDAE
7. Meronephric-----OCTOCHAETIDAE
8. A Y-shaped gland opens through own porophore into into Copulatory chamber-----*Eudrilus eugeniae*
9. Nephridia astomate, at least in some parts-----12  
Two pairs of spermathecal openings at 7/8/9-----10
10. Spermathecal diverticula absent-----11
11. Calciferous glands absent-----*Perionyx koboensis*
12. Gizzard in V-----*Lampito mauritii*  
Gizzard behind 7/8-----13
13. Spermathecae present-----14
14. Spermathecae absent-----*Polypheretima elongata* thecomorph
15. Five pairs of spermathecae arranged in two rows in 5/6/7-----*Polypheretima elongata* thecomorph
16. Oesophagus with single gizzard-----17  
Oesophagus with two gizzard-----23
17. Two pairs of spermathecae, opening in 7/8/9-----*Octochaetona prashadi*  
Two pairs of spermathecae, opening in 8 and 9-----18
18. Testis metandric-----19
19. Seminal vesicles 2 pairs, in ix and xii, or xi and xii-----20
20. Seminal vesicles in xi and xii-----*Octochaetona parva*
21. Last pair of heart in xiii-----22
22. Spermathecal pores on or close to setal arcs of viii and ix; In tes tine begins in xv-----23
23. Testes and male funnels enclosed in a sac-----*Octochaetona suriensis*
24. Calciferous glands posterior to xiii -----25
25. Female pores paired-----26
26. Median genital markings present-----*Dichogaster affinis*  
Genital markings absent-----*Dichogastemodigliani*

**RESULTS**

**Table.1. Systematic position of earthworm species present in Hosapete taluk of Ballari district.**

Order	Family	Genera	Species
Moniligastrida	Moniligastridae	Drawida	<i>Drawida modesta</i>
			<i>Drawida</i> species
Haplotaxida	Eudrilidae	Eudrilus	<i>Eudrilus eugeniae</i>
	Ocnoderilidae	Thatonia	<i>Thatonia</i> species
	Megascolicidae	Lampito	<i>Lampito mauritii</i>
		Perionyx	<i>Perionyx koboensis</i>
		Polypheretima	<i>Polypheretima elongata</i> thecomorph
			<i>Polypheretima elongata</i> atecomorph

	Octochaetidae	Dichogaster	<i>Dichogaster affinis</i>
			<i>Dichogaster modigliani</i>
		Octochaetona	<i>Octochaetona parva</i>
			<i>Octochaetona prashadi</i>
			<i>Octochaetona suriensis</i>

A total of 13 earthworm species belonging to 5 families and 8 different genus were recorded in our studies and these earthworms belonged to the families Moniligastridae, Eudrilidae, Ocnoderilidae, Megascolicidae and Octochaetidae.

In this study Megascolicidae and Octochaetidae families found to be quiet dominant with 7 different species each, followed by the families Moniligastridae 2 species, Ocnoderilidae and Eudrilidae with each 1 and 1 species. Also *Drawida modesta* earthworms were recorded for the first time from this region (Table.1).

The Earthworm species identified in Moniligastridae family is *Drawida modesta* and *Drawida* species. In family eudrilidae is *Eudrilus eugeniae*. In family ocnoderilidae is *Thatonia* species. In family megascolicidae total 3 genera and 4 species are identified viz. *Lampito mauritii*, *Perionyx koboensis*, *Polypheretima elongata* atecomorph, *Polypheretima elongata* thecomorph. Family octochaetidae 2 genera and 3 species are identified viz. *Dichogaster affinis*, *Dichogaster modigliani*, *Octochaetona parva*, *Octochaetona prashadi* and *Octochaetona suriensis* (Table.1).

The physicochemical analysis of soil, Location and locality is shown in (Table.3). It was found that soil chemical characteristics of their habitats are ranging from pH 6.0–8.2, electrical conductivity (EC) 0.4–2.0 mohs/cm, organic carbon (OC) 0.57–4.69%, phosphorous (P) 10.9–84.1 kg/acre and potassium (K) 76–330 kg/acre. (Table.3)

*Drawida modesta* (Rao,1921); Body colour is unpigmented. The setae start from 2<sup>nd</sup> segment, closely paired. Male pores have prominent anterior and posterior lips. clitellum on 9-14<sup>th</sup> segments. Dorsal pores are absent. Prostomium epilobitic type; Length is about 70 -100mm, diameter 3.5- 4.5 and number of segments are about 150-200. It is a endogeic species. This species found in Bukkasagar and Venkatapura villages in the irrigated field.(Table.2 and 3)

*Drawida* species; Body colour is greyish. Length is about 35-96mm and number of segments are 50-100. It is a endogeic species. This species found in Malapanagudi and Narasapura villages. *Eudrilus eugeniae* also found along with *Drawida* species. This shows species association.

*Eudrilus eugeniae* (Kinberg, 1867) ; Body Colour is dark purple , more restricted to upper side. Setae are 4 pairs, present throughout the body. Clitellum on 14-18<sup>th</sup> segments. Male pores minute and paired, at tips of penes, retractable into copulatory chambers. Female pores paired, large transverse slits, close to sides of the body and present on 14<sup>th</sup> segment. Prostomium is epilobitic type. No dorsal pores. Length 95-180 mm; width 4-7.5mm; Number of segments about 165-215. It is epigeic species. This species was found in Byluvaddigeri (borewell), Muddapura (garbage), Nandibandi (garbage), Telugubalu (near water tap), Vyasanakeri (near water tap). In Nandibandi along with this species *Dichogaster affinis* was also found. It is also an example for species association.

*Thatonia* species; Body is pale red in colour,40-50mm in length, 1.5-2mm in diameter and has 50-95 segments. This species found in 7 places which includes Danayanakere (irrigated field), Gadinuru (gutter), Hampi (irrigated field), Kamalapura (gutter), Mariyammanahalli (gutter), Nagalapura(gutter) and Papinayakanahalli (gutter). It is epigeic species.

*Lampito mauritii* (Kinberg, 1867); Body Colour is brownish; many setae per segment. Clitellum covering segments from 14-17. Male pores on 18<sup>th</sup> segment. A pair penial setae emerge out from each male pore. Spermathecal pores 3 pairs, in intersegment furrows 6/7/8/9. Female pores paired on segment 14. Prostomium is epilobitic type. Dorsal pores present in intersegment furrow 10/11-11/12. Length is 80-150mm, diameter 3.5-4.5mm and segments are about 85-165. It was found in following villages viz Chilakanahatti (near water tap),

Kanavittimmapura (grass field), Sankalapuram (garbage), Kallalli (garbage) and Metri (near water tap).

*Perionyx koboensis* (Stephenson, 1912); Body colour is dorsally dark purple, ventrally pale; length 90-100 mm, diameter 2.5-3 mm, 135-145 segments. Prostomium is epilobitic type. First dorsal pore in 8/9. Clitellum ranging from 13-16. Single female pore in 14. Paired male pore in 18. It is epigeic. It was found in Basavanadurga village in irrigated field.

*Polypheretima elongata* atecomorph (Perrier, 1872); Body colour is cream grey, length 205-210 mm, diameter 4-5 mm, 210-225 segments. Prostomium alobous type. Clitellum ranging from 14-16<sup>th</sup> segment. One pair of male pore in 18<sup>th</sup> segment. Single female pore in 14<sup>th</sup> segment. Five pairs of genital markings from 19-23<sup>rd</sup> segment. It was found in Gundlavaddikeri village near water tap. It is endogeic species.

*Polypheretima elongata* thecomorph (Perrier, 1872); Body colour cream grey, length 205-210 mm, diameter 4-5 mm, 210-225 segments. Prostomium alobous type. Clitellum ranging from 14-16. One pair of male pore in 18<sup>th</sup> segment. Single female pore in 14<sup>th</sup> segment. Five pairs of genital markings from 19-23<sup>rd</sup> segment. It was found in Vadralli village near water tap.

*Dichogaster affinis* (Michaelsen, 1891); Body color light brown, length 28-60 mm, diameter 1-2 mm, 105-135 segments. Prostomium epilobitic type. Clitellum ranging from 13-22 segments. First dorsal pore in 5/6. Paired male pore in 18<sup>th</sup> segment, Paired female pores in 14<sup>th</sup> segment. This species found in Kariganuru (garbage) and Garaga (near water tap) villages. It is endogeic. In Kariganuru along with this species *Thatonia* species also found. It is also an example for species association.

*Dichogaster modigliani* (Rosa, 1896); Body color is unpigmented, length 25-55 mm, diameter 1-2 mm, 75-155 segments. Prostomium prolitic type. Clitellum ranging from 13-20 segment. First dorsal pore in 5/6. Paired male pore in 18, Paired female pore in 14<sup>th</sup> segment. It was found in Rajapura near borewell. It is endogeic species. *Dichogaster affinis* was also found with this species, another example for species association.

*Octochaetona parva* (Gates, 1945); Body color is unpigmented, length 75-100 mm, diameter 3.5-4 mm, 50-100 segments. Prostomium epilobitic type. Clitellum ranging from 13-17<sup>th</sup> segment. First dorsal pore in 12/13. Paired male pore in 18<sup>th</sup> segment. Paired female pore in 14<sup>th</sup> segment. Genital markings present. It was found in Nagenahalli (near water tap). Here *Octochaetona parva* and *Lampito mauritii* found together are the example for species association.

*Octochaetona prashadi* (Stephenson, 1920); Body color unpigmented. Length 55-67 mm, diameter 2.5-3 mm, 130-155 segments. Prostomium epilobitic type. Clitellum ranging from 13-16<sup>th</sup> segment. First dorsal pore in 12/13. Paired male pore in 18<sup>th</sup> segment. Paired female pore in 14<sup>th</sup> segment. Genital markings present. It was found in Dharmasagar village in garbage. *Thatonia* species was also found along with these earthworms.

*Octochaetona suriensis* (Michaelsen, 1910); Body color unpigmented, length 65-145 mm, diameter 2.5-5 mm, 110-175 segments. Prostomium epilobitic type. Clitellum ranging from 13-16. First dorsal pore in 12/13. Paired male pore in 18. Paired female pore in 14<sup>th</sup> segment. Genital markings absent. It is endogeic species. It was found in Ittigi (pasture), *Drawida modesta* was also found along with these species.

The domination of a species in a set of species can be assessed by measuring their abundance. The study revealed that *Thatonia* species showed higher percentage i.e 23% in total. *Lampito mauritii* and *Eudrilus eugeniae* represents 17%. *Drawida modesta*, *Drawida* species and *Dichogaster affinis* represents 7%. *Perionyx koboensis* represents 4%. *Polypheretima elongata* atecomorph, *Polypheretima elongata* thecomorph, *Dichogaster modigliani*, *Octochaetona parva*, *Octochaetona prashadi* and *Octochaetona suriensis* represents 3% each in totality (Fig.2).

Number of species observed in different habitat is as followed highest number of species are found near the tap water next second highest in the garbage, followed by 3 species in irrigate field. Least number of species were found gutter, pasture, borewell and grassland one in each habitat. Details shown in (fig.3).

**Table 2. Morphological Characteristics With Ecological Categories of Earthworm Species of Hosapete Taluk, District Ballari, Karnataka, India.**

Species	Pigment	Length (mm)	Diameter (mm)	No. of segments	Ecologic category
<i>Dichogaster affinis</i>	Light brown	28-60	1-2	105-135	Endogeic
<i>Dichogaster modigliani</i>	Unpigmented	25-55	1-2	75-115	Endogeic
<i>Drawida modesta</i>	Unpigmented	70-100	3.5-4.5	150-200	Endogeic
<i>Drawida</i> species	Greyish	35-96	2-3	50-100	Endogeic
<i>Eudrilus eugeniae</i>	Dark purple	95-180	4-7.5	165-215	Epigeic
<i>Lampito mauritii</i>	Brownish	80-150	3.5-4.5	85-165	Aneceic
<i>Octochaetona parva</i>	Unpigmented	75-100	3.5-4	50-100	Endogeic
<i>Octochaetona prashadi</i>	Unpigmented	55-67	2.5-3	130-155	Endogeic
<i>Octochaetona suriensis</i>	Unpigmented	65-145	2.5-5	110-175	Endogeic
<i>Perionyx koboensis</i>	Dark purple	90-100	2.5-3	135-145	Epigeic
<i>Polypheretima elongata</i> atecomorph	Unpigmented	205-210	4-5	210-225	Endogeic
<i>Polypheretima elongata</i> thecomorph	Light brown	205-210	4-5	210-225	Endogeic
<i>Thatonia</i> species	Pale red	40-50	1.5-2	50-95	Epigeic

**Table 3. Showing Presence Of Earthworms In Different Locations And Their Habitat Soil Analysis.**

Name of the Earthworm	Grama panchayat name (GP)	Area	Location	Locality	pH	Electrical conductivity (mohs/cm)	Organic carbon (%)	Phosphorous (P) (Kgs/Acr)	Potassium (K) (Kgs/Acr)
<i>Drawida modesta</i>	Bukkasagara GP	Venkatapura	15°19'53" N 76°30'49" E	Irrigated field	7.7	0.8	1.87	9.7	109
	Bukkasagara		15°20'59" N 76°31'55" E	Irrigated field	7.9	0.8	3.03	19.0	134
<i>Drawida</i> species	Malapanagudi GP	Malapanagudi	15°16'23" N 06°23'02" E	Pasture	7.2	0.8	2.37	21.9	143
	Hampi GP	Narasapura	15°20'02" N 76°25'02" E	Pasture	7.5	0.8	1.76	63.4	254
<i>Eudrilus eugeniae</i>	Bylurvaddigeri GP	Bylurvaddigeri	15°14'24" N 76°31'50" E	Borewell	7.6	0.6	1.71	34.2	166
	Muddapura GP	Muddapura	15°23'13" N 76°35'44" E	Garbage	6.1	1.8	2.59	11.8	187
	Danayanakere GP	Nandibandi	15°08'42" N 76°19'09" E	Garbage	7.8	0.9	1.29	33.8	208



	Chilakanahatti GP	Telugubalu	15°04'05" N 76°21'03" E	Near Water tap	7.4	0.8	3.00	25.3	102
	Mariyammanahalli GP	Vyasanakeri	15°26'88" N 76°39'09" E	Near Water tap	7.4	1.0	4.69	33.4	76
Thationia species	Danayanakere GP	Danayanakere	15°07'35" N 76°21'55" E	Irrigated field	8.1	2.0	0.93	10.9	152
	Gadinuru GP	Gadinuru	15°13'15" N 76°35'45" E	Gutter	8.2	0.8	1.98	31.7	187
	Hampi GP	Hampi	15°20'11" N 76°27'42" E	Irrigated field	7.9	0.7	1.40	34.2	99
	Kamalapura (Taluk panchayat)	Kamalapura	15°18'16" N 76°28'34" E	Gutter	6.6	1.1	0.80	33.8	120
	Mariyammanahalli GP	Mariyammanahalli	15°09'38" N 76°20'45" E	Gutter	8.0	0.7	1.43	20.3	182
	Nagalapura GP	Nagalapura	15°06'45" N 76°23'47" E	Gutter	6.0	1.1	1.40	33.4	109
	Papinayakanahalli GP	Papinayakanahalli	15°05'33" N 77°79'53" E	Gutter	7.8	0.7	2.07	50.7	122
	Lampito mauriti	Chilakanahatti GP	Chilakanahatti	15°14'05" N 76°37'67" E	Near Water tap	7.7	0.8	0.77	29.6
Muddapura GP		Kanavitmmapura	15°20'51" N 76°34'32" E	Grass land	7.8	0.6	2.62	35.1	162
Ramasagara GP		Sanklapuram	15°16'44" N 76°40'26" E	Garbage	8.0	0.7	1.43	20.3	182
Kallalli GP		Kallalli	15°15'59" N 76°20'27" E	Garbage	8.0	1.1	0.57	35.1	249
Metri GP		Metri	15°18'37" N 76°37'19" E	Near water tap	7.3	0.32	2.70	11.8	301
Perionyx koboensis.	Chilakanahatti GP	Basvanadurga	15°09'06" N 76°38'11" E	Irrigated field	8.0	0.6	0.71	38.9	150
Polypheretima elongata athecomorpha	Bylurvaddigeri GP	Gundlavaddikeri	15°19'11" N 76°30'09" E	Near water tap	7.4	1.1	0.85	27.9	276
Polypheretima elongata athecomorpha	Papinayakanahalli GP	Vadralli	15°14'15" N 76°28'18" E	Near water tap	7.8	1.0	2.81	50.7	330
Dichogaster affini	Hospet (CMC)	Karignuru	15°15'11" N 76°25'44" E	Garbage	7.9	0.7	1.18	31.7	226
	Nagalapura GP	Garaga	15°09'06" N 76°38'11" E	Near Water tap	7.5	0.4	1.35	25.3	125
Dichogaster modigliani	Kallalli GP	Rajapura	15°14'24" N 76°23'13" E	Borewell	7.7	0.9	1.26	38.0	134
Octochaetona parva	Nagenaghalli GP	Nagenaghalli	15°18'11" N 76°24'13" E	Near Water tap	7.6	0.5	1.57	18.6	242
Octochaetona prashadi	Bylurvaddigeri GP	Dharmasagara	15°14'06" N 76°33'43" E	Garbage	7.9	0.6	2.04	21.1	173
Octochaetona suriensis	Sanapura GP	Ittigi	15°26'54" N 76°40'39" E	Pasture	7.4	0.32	1.66	84.1	236

Table 4. Showing the presence of number species in different habitat.

Habitat	No. of sites	No. of species
Near water tap	8	6
Garbage	6	4
Irrigated field	5	3
Gutter	5	1
Pasture	3	1
Borewell	2	1
Grassland	1	1

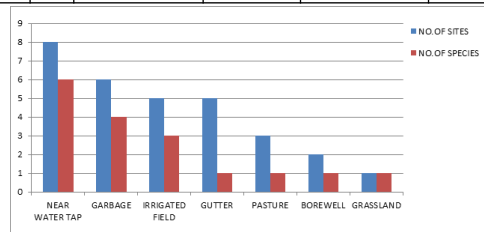


Fig. 3. Number of species diversity in different habitats

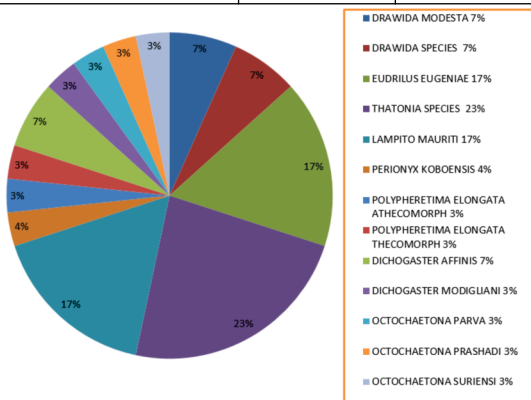


Fig. 2. Richness Of Different Earthworm Species In The Study Area

DISCUSSION.

The present study is the random survey of earthworms at Grama panchayat level of Hosapete Region of Ballari district. In our study *Drawida modesta* was found from Bukkasagara and Venkatapura in irrigated field. This species was also reported from Alavanchi of Nilgiri district, Tamilnadu, (Ebanasar *et al*, 2015). From evergreen forest of Kannur district and abandoned paddy field of Wayanad district, Kerala (S. P. Narayana *et al*, 2017). *Eudrilus eugeniae* was found in Bylurvaddigeri (borewell), Muddapura (garbage), Nandibandi (garbage), Telugubalu (near water tap), Vyasanakeri (near water tap). It was also reported from different habitats of southern Odisha, India (Sankar and Patnaik, 2018). *Lampito mauriti* was found in following villages viz Chilakanahatti (near water tap), Kanavitimmapura (grass field), Sankalapuram (garbage), Kallalli (garbage) and Metri (near water tap). It was also reported from 8 different blocks of Sivagangi district, Tamilnadu (J.Paul, 2017). *Polypheretima elongata species* was found in Gundlavaddikeri and vadralli (near water tap). It was also reported from grass land habitat of Aligarh District, Uttar Pradesh

state (Om prakash, 2017). *Octochaetona parva* found in Nagenahalli near water tap. This species was also reported from agriculture land of Moodabidri, Dakshina Kannada District, Karnataka (Siddaraju et al, 2013). *Octochaetona suriensis* was found in pasture of Ittigi, It was also recorded from Hatiara, Kolkata district, West Bengal (Md. Nurul Hasan et al, 2018). *Dichogaster affinis* was found in Kariganuru (garbage) and Garaga (near water tap) villages. It was also reported from near edges of small streams of Surathkal, Dakshina Kannada District, South West Coast, Karnataka (Siddaraju et al, 2013). *Dichogaster modigliani* was found in Rajapura near borewell. It was also reported from hilly areas of Darjeeling district, West Bengal, India (Paliwal, 2013). According to studies conducted at different ecosystem level have revealed that the earthworm diversity is varies owing to the fact of geographical region, climatic condition and modified habitat. The natural habitat disturbed by human interference has resulted into shift of earthworm. In our study, we found 13 earthworm species in Hosapete taluka (Table 1). Ecologically Stable ecosystems have high species richness than that of disturbed environmental areas (May R.M, 1979). Earthworm diversity is high in steady and undisturbed ecosystems than in human interfered habitats (Lee, 1985). This proved in our studies as well. The majority of native species were restricted to natural habitats, whereas, most of the exotic species were found in modified ecosystems. Total of 13 species recorded in our study. Among these recorded species of earthworms *Eudrilus eugeniae*, *Polypheretima elongata*, are the exotic species. Whereas, *Lampito mauritii*, *Perionyx koboensis*, *Octochaetona suriensis*, *Octochaetona prashadi*, *Octochaetona parva*, *Dichogaster affinis*, *Dichogaster modigliani*, *Drawida modesta*, *Drawida* species, *Thaonia* species are the indigenous species.

All the species were found in the places which are moist and damp, in the edges of the standing water where nutrient supply was richly available. Most of the species found in sewage soil in comparison to other pedoecosystem may be correlation with high organic carbon and much higher nitrogen of the sewage system (Tripathi and Bharadwaj 2004). The earthworms distribution is very much dependent on the physicochemical properties of the soil. Nearly 85% of the Taluka is having fine-textured subsoil, of which clay sub soils is more in comparison with sandy clay subsoils. In other words, the soils are potentially quite productive. There is a significant correlation between soil and distribution of the earthworms. This is in reference with studies conducted throughout different parts of India (Ganihar 1996; Tripathi and Bharadwaj 2004). Soil pH in this region varied from slightly acidic to alkaline (6.0-8.2). This shows that earthworms species generally have narrow range in pH. According to Edwards and Lofty (1977) very few being adapted to highly acidic soils. Few species can tolerate acidic or alkaline soils. But the majority of the earthworms prefer neutral soils, The pH values recorded in the present study are within optimum range for the earthworms distribution. It shows that earthworms can survive better in soil which is rich in organic carbon and nitrogen. The present study also have similar observation with other workers (Edwards and Lofty 1977; Appelhof 1981; Lee 1985; Tripathi and Bharadwaj 2004).

The association of earthworm species sharing the same habitat is not uncommon (K.E.Lee, 1985; C. A. Edwards and P. J. Bohlen, 1996). It was observed in our studies as well. In Malapanagudi and Narasapura villages *Eudrilus eugeniae* found along with *Drawida* species. In Nandibandi along with *Eudrilus eugeniae* species *Dichogaster affinis* was also found. In Kariganuru along with *Dichogaster affinis* species *Thaonia* species found. In Rajapur *Dichogaster modigliani* and *Dichogaster affinis* were found together. In Nagenahalli *Octochaetona parva* and *Lampito mauritii* found together. In Dharmasagar *Octochaetona prashadi* and *Thaonia* species were also found together. In Ittigi *Octochaetona suriensis* and *Drawida modesta* were found from same habitat. It was observed that the most of dominating species were endogeic (P.S. Chaudhuri, S. Nath, and R. Paliwal, 2008).

## CONCLUSION:

1. From the present study it is evident that Hosapete region has rich earthworm diversity.
2. Distribution of the species is not uniform in local soils.
3. Out of 13 species, 3 species are exotic and remaining 10 are native species. All the species can be potentially used for vermicomposting process and other vermitechnological applications to help the people of this area.

## Conflicts of Interest:

The authors declare that there is no conflicts of interest.

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