

DIVERSITY AND DISTRIBUTION OF ORIBATID MITE FAUNA (ACARI: ORIBATIDA) IN THE FOREST FLOOR OF SATKOSIA BASIPALLY WILD LIFE SANCTUARY, ODISHA, INDIA***SHELLEY ACHARYA AND ADITI DUTTA**Zoological Survey of India,
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E mail: acharya.shelley@gmail.com**Received : 28.02.2017; Accepted : 26.04.2017****ABSTRACT**

The studies were mostly concentrated in Nine forest ranges of the WLS including the core areas. The soil of this region mostly is dry, red and with iron and silica content. Though the soil mites are prevalent in moist humid condition, we got a diversified population of 20 different species under 14 genera which is less than average probably due to the soil condition. *Protoribates magnus* is the dominant species in this study. The species with larger ranges were *Scheloribates curvialatus*.

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KEY WORDS : Biological Diversity, Distribution, Oribatid mite, Wild Life Sanctuary

Introduction

Oribatid mites are often the most diverse and numerically dominant arthropods in organic layers of forest soils, where they feed primarily on decomposing higher plant material and on fungi. We conducted our survey in nine different forest ranges of Satkosia and Basipally Wild Life Sanctuary covering thirty one spots from different forest floor habitat and adjacent agricultural fields. Several core areas were also explored during the collection. The value of any biodiversity analysis and the adequacy of conservation measures depend on the quality of basic taxonomic data⁴. No comprehensive work has been done on this group from this region earlier. So it is a first attempt to give a preliminary knowledge on the current state of soil oribatid mite fauna present in that sanctuary.

Material and Methods**Study area**

This Satkosia Basipally Wild life sanctuary includes areas from the four districts of Angul, Budh, Cuttack and Nayagarh. The Angul subdivision comprises of the mountainous parts of the Satkosia Basipally Sanctuary. The vegetative cover of the sanctuary consists of moist deciduous, dry deciduous and moist peninsular sal, kendu forests.

The 22 km long Satkosia Gorge has been cut by the River Mahanadi across the Eastern Ghats. The reserve has an area of 963.87sq km with 523.61sq km as core area. The area is also a part of the Mahanadi elephant reserve. Satkosia is the meeting point of two bio-geographic regions of India; the Deccan Peninsula and the Eastern Ghats,

ACKNOWLEDGEMENTS : The authors express their deep gratitude and reverence to Dr. Kailash Chandra, Director, Z.S.I., for extending all facilities. They are indebted for the excellent support extended by the Divisional Forest Officers and the Field Director of both Nayagarh and Angul division. The thanks are due to all rangers, forest guards and the general people of Odisha for all help and wonderful hospitality. Authors are also thankful to the staff of Acarology Section, ZSI for their timely support.

TABLE- 1 : Systematic account of the oribatid mites recorded from the protected area

	District	Collection site	Species collected	Latitude	Longitude	Elevation
1.	Nayagarh	Bhuchundabugura,	<i>Annectacarus mucronatus</i>	20°42.951' N	084°48.662361' E	931 ft.
2.	Angul	Mankaro Khaikhali Point, Purnakote Range	<i>Multioplia</i> sp.	20°40.564' N	084°48.590' E	618 ft.
3.	Angul	Mankaro Khaikhali Point, Purnakote Range	<i>Chaunoproctus sisiri</i>	20°40.564' N	084°48.590' E	618 ft.
4.	Nayagarh	Basaganda Point	<i>Annectacarus mucronatus</i>	20°29.433' N	084°47.821' E	291 ft.
5.	Nayagarh	Basaganda Point	<i>Lamellobates palustris</i>	20°29.433' N	084°47.821' E	291 ft.
6.	Nayagarh	Basaganda Point	<i>Scheloribates curvialatus</i>	20°29.433' N	084°47.821' E	291 ft.
7.	Nayagarh	Basaganda Point	<i>Protoribates magnus</i>	20°29.433' N	084°47.821' E	291 ft.
8.	Nayagarh	Bhaluchaba Point	<i>Lamellobates palustris</i>	20°30.756' N	084°44.311' E	514 ft.
9.	Nayagarh	Bhaluchaba Point	<i>Scheloribates curvialatus</i>	20°30.756' N	084°44.311' E	514 ft.
10.	Nayagarh	Bhaluchaba Point	<i>Protoribates magnus</i>	20°30.756' N	084°44.311' E	514 ft.
11.	Nayagarh	Dhobathuba	<i>Protoribates magnus</i>	20°24.840' N	084°43.840' E	23 ft.
12.	Nayagarh	Dhobathuba	<i>Multioplia stellifera</i>	20°24.840' N	084°43.840' E	23 ft.

13.	Nayagarh	Dhobathuba	<i>Galumna (Galumna) crenata</i>	20°24.840' N	084°43.840' E	23 ft.
14.	Angul	Rangabati Point, Tikarpada	<i>Protoribates magnus</i>	20°40.564' N	084°48.590' E	954 ft.
15.	Angul	Saranaro, Pampasar range	<i>Rhabdoribates siamensis</i>	20°40.564' N	084°48.590' E	572 ft.
16.	Nayagarh	Salapadra Point	<i>Protoribates magnus</i>	20°29.433' N	084°47.821' E	291 ft.
17.	Nayagarh	Sillati Nara, Diphisahi Section Bit, Banigochha East Range	<i>Galumna flabellifera</i>	20°31.100' N	084°47.258' E	440 ft.
18.	Angul	Mankaro Khaikhali Point, Purnakote Range	<i>Protoribates magnus</i>	20°40.564' N	084°48.590' E	618 ft.
19.	Angul	Mankaro Khaikhali Point, Purnakote Range	<i>Rhabdoribates siamensis</i>	20°40.564' N	084°48.590' E	618 ft.
20.	Angul	Mankaro Khaikhali Point, Purnakote Range	<i>Chaunoproctus orientalis</i>	20°40.564' N	084°48.590' E	618 ft.
21.	Nayagarh	Bugura Village, Banigochha East Range	<i>Cryptogalumna cryptodontata</i>	20°30.756' N	084°44.311' E	514 ft.
22.	Nayagarh	Bugura Village, Banigochha East Range	<i>Schelorbates curvialatus</i>	20°30.756' N	084°44.311' E	514 ft.

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23.	Nayagarh	Bugura Village, Banigochha East Range	<i>Protoribates magnus</i>	20°25.193' N	084°43.098' E	59 ft.
24.	Nayagarh	Bugura Village, Banigochha East Range	<i>Galumna flabellifera</i>	20°25.193' N	084°43.098' E	59 ft.
25.	Nayagarh	Basaganda Point	<i>Protoribates magnus</i>	20°29.433' N	084°47.821' E	291 ft
26.	Nayagarh	Basaganda Point	<i>Acrogalumna ventralis</i>	20°24.840' N	084°43.840' E	291 ft
27.	Nayagarh	Kuanria Dam Area	<i>Peloribates grandis</i>	20°21.183' N	084°48.186' E	512.8 ft.
28.	Angul	Saranaro, Pampasar	<i>Lamellobates palustris</i>	20°42.907' N	084°48.827' E	954 ft.
29.	Nayagarh	Kuanria Dam Area	<i>Lamellobates palustris</i>	20°21.183' N	084°48.186' E	512.8 ft.
30.	Nayagarh	Kuanria Dam Area	<i>Galumna flabellifera</i>	20°21.183' N	084°48.186' E	512.8 ft.
31.	Nayagarh	Salapadra Point	<i>Multioppia stellifera</i>	20°30.535' N	084°44.518' E	572 ft.
32.	Angul	Baghamunda, Purnakote Range	<i>Schelorbates huancayensis</i>	20°42.607' N	084°47.361' E	996 ft.
33.	Angul	Baghamunda, Purnakote Range	<i>Protoribates magnus</i>	20°42.607' N	084°47.361' E	996 ft.
34.	Nayagarh	Kuanria Dam Area	<i>Protoribates magnus</i>	20°21.102' N	084°48.231' E	497.2 ft.

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35.	Angul	Torba Vill., Pampasar Range	<i>Scheloribates giganteus</i>	20°42.014' N	084°50.286' E	812 ft
36.	Nayagarh	Basaganda Point	<i>Protoribates magnus</i>	20°29.433' N	084°47.821' E	291 ft.
37.	Nayagarh	Basaganda Point	<i>Acrogalumna ventralis</i>	20°29.433' N	084°47.821' E	291 ft.
38.	Nayagarh	Kuanria Dam Area	<i>Peloribates grandis</i>	20°21.102' N	084°48.231' E	497.2 ft.
39.	Angul	Saranaro, Pampasar	<i>Lamellobates palustris</i>	20°42.907' N	084°48.827' E	954 ft.
40.	Nayagarh	Kuanria Dam Area	<i>Lamellobates palustris</i>	20°21.102' N	084°48.231' E	497.2 ft.
41.	Nayagarh	Kuanria Dam Area	<i>Galumna flabellifera</i>	20°21.183' N	084°48.186' E	512.8 ft.
42.	Nayagarh	Sapapatra, Banigochha W Range	<i>Scheloribates curvialatus</i>	20°25.193' N	084°43.098' E	59 ft.
43.	Angul	GBS Plantation, Baghamunda	<i>Galumna (Galumna) crenata</i>	20°42.467' N	084°47.361' E	1050 ft
44.	Angul	GBS Plantation, Baghamunda	<i>Scheloribates curvialatus</i>	20°42.467' N	084°47.361' E	1051 ft
45.	Angul	GBS Plantation, Baghamunda	<i>Lamellobates palustris</i>	20°42.467' N	084°47.361' E	1052 ft
46.	Nayagarh	Khallikana Point Dusingh Bit area, Banigochha (E)	<i>Scheloribates huancayensis</i>	20°30.866' N	084°44.187' E	567 ft.

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47.	Nayagarh	Khalikana Point Duisingh Bit area, Banigochha (E)	<i>Protoribates magnus</i>	20°30.866' N	084°44.187' E	567 ft.
48.	Nayagarh	Khalikana Point Duisingh Bit area, Banigochha (E)	<i>Galumna</i> sp.	20°30.866' N	084°44.187' E	567 ft.
49.	Nayagarh	Khalikana Point Duisingh Bit area, Banigochha (E)	<i>Hoplophorella scapellata</i>	20°30.866' N	084°44.187' E	567 ft.
50.	Nayagarh	Bhaluchaba Point	<i>Protoribates magnus</i>	20°30.756' N	084°44.311' E	514 ft.
51.	Nayagarh	Dabakhali Point, Badamali Beat	<i>Schelorbates curvialatus</i>	20°29.750' N	20°29.750' N	
52.	Nayagarh	Bugura Vill	<i>Trachyoribates (Rostrozetes)</i> <i>ovulum</i>	20°25.193' N	084°43.098' E	59 ft.
53.	Nayagarh	Bugura Vill	<i>Lamellobates palustris</i>	20°25.193' N	084°43.098' E	59 ft.
54.	Nayagarh	Bugura Vill	<i>Schelorbates curvialatus</i>	20°25.193' N	084°43.098' E	59 ft.
55.	Nayagarh	Rangmatia Vill., Banigochha W Range	<i>Oppia kuehnelti</i>	20°22.189' N	084°47.125' E	543.4 ft.
56.	Nayagarh	Rangmatia Vill., Banigochha W Range	<i>Schelorbates albialatus</i>	20°22.189' N	084°47.125' E	543.4 ft.

contributing immense biodiversity.

Bio-geographically Basipalli WLS falls under Nayagarh district. Three ranges of Banigochha East, West and Chhamundia Range of the sanctuary area were covered. Similarly Satkosia falls under Angul district and 5 ranges of Tikarpada, Pampasar, Purnakote, Jillinda, Raigoda were surveyed. We explored total 31 sites with all possible habitats like leaf litter, moss, under bark, soil and agricultural field adjacent to the forest area (Table-2).

The present Nayagarh district was a princely state before 1948, and after independence it became the sub-division of Puri district. Following the recognition of the districts in Odisha in 1993, Nayagarh was formed as a separate district and the district started functioning w.e.f. 01.04.1993, with the headquarters as Nayagarh. It lies between 19 0 54' to 23 0 32' North Latitude and 84 0 29' to 85 0

27' Longitude. The border of Nayagarh district touches the districts of Angul and Cuttack in North and North-West, Boudh and Kandhamal in the West, Ganjam in the South and Khurda in the East.

For taxonomic study of oribatid mites, litter, soil and humus samples from all possible habitats were collected. The samples collected by shovel from upper 10 cm soil profile were kept in polythene bags. Total 69 packets of soil samples were collected and by using modified Tullgren funnels and extracted mite specimens which were collected in glass tubes containing 70% alcohol.

The body of most of the oribatid mite is heavily sclerotized and opaque. The extracted material were made ready for taxonomic study following the usual procedure of keeping the specimen in solution of 90% alcohol and lactic acid (v/v) as advocated by worker¹. For microscopic

TABLE -2 : Families with species

Family: PHTHIRACARIDAE	10. <i>S. albialatus</i>
1. <i>Hoplophorella scapellata</i>	11. <i>S. curvialatus</i>
Family: LOHMANIIDAE	12. <i>S. huancayensis</i>
2. <i>Annectacarus mucronatus</i>	Family: HAPLOZETIDAE
Family: OPPIIDAE	13. <i>Peloribates grandis</i>
3. <i>Oppia kuehnelti</i>	14. <i>Protoribates magnus</i>
4. <i>Multioppia</i> sp.	15. <i>Trachyoribates (Rostrozetes) ovulum</i>
5. <i>Multioppia stellifera</i>	Family: ORIBATELLIDAE
Family: CHAUNOPROCTIDAE	16. <i>Lamellobates palustris</i>
6. <i>Chaunoproctus sisiri</i>	Family: GALUMNIDAE
7. <i>Chaunoproctus orientalis</i>	17. <i>Acrogalumna ventralis</i>
Family: ORIBATULIDAE	18. <i>Cryptogalumna cryptodontata</i>
8. <i>Rhabdoribates siamensis</i>	19. <i>Galumna (Galumna) crenata</i>
9. <i>Scheloribates giganteus</i>	20. <i>Galumna (Galumna) flabellifera</i>

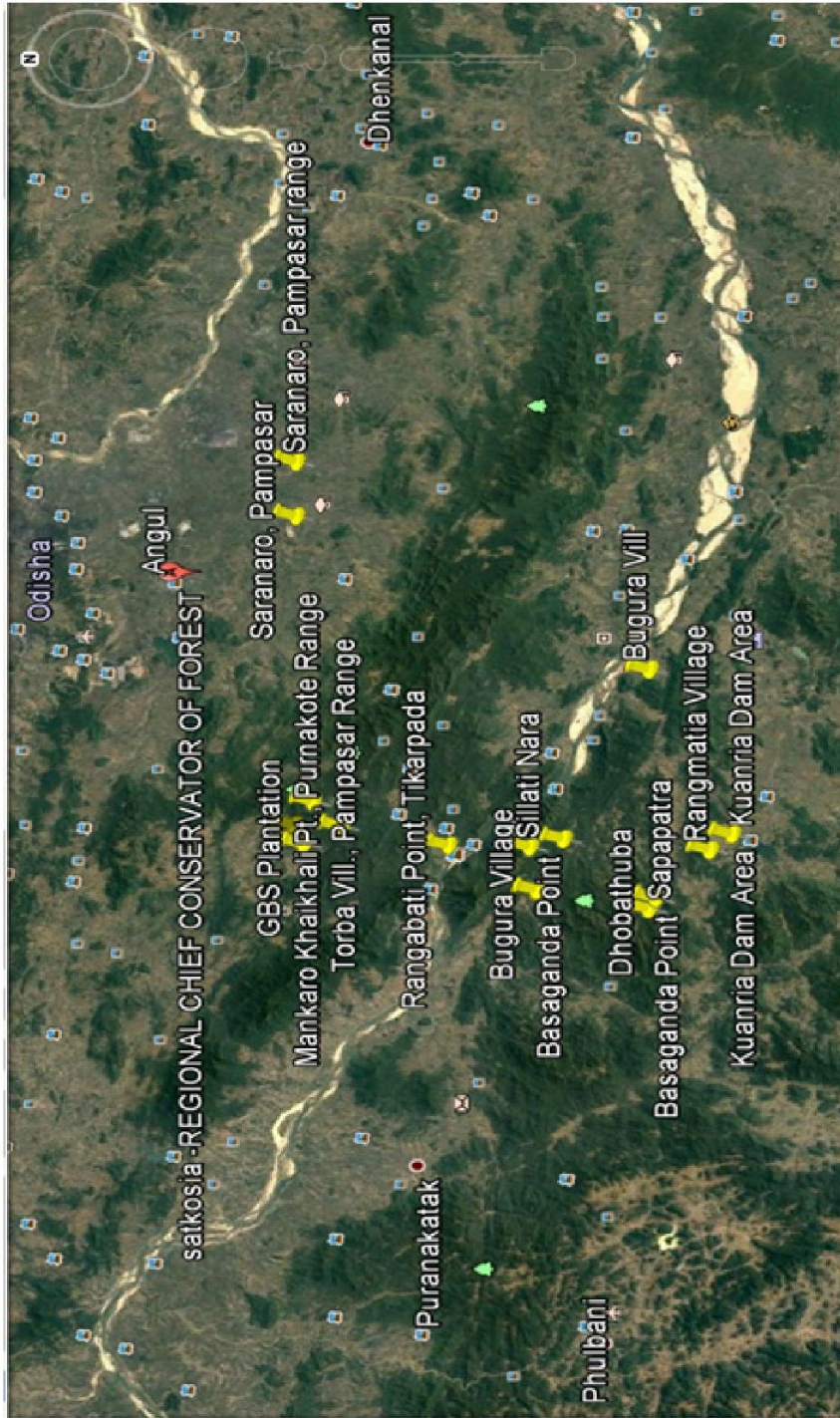


Fig. 1 : Satellite overview map of study area

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observations, temporary mounting in lactic acid was followed¹. After necessary microscopic observations the specimen was transferred in small glass vials containing 90% alcohol. The vials were then properly labelled and stored.

The specimens were studied under Nikon Eclipse, 50i microscope. In this study, the classification was followed².

All specimens are deposited in the National Zoological Collections of Zoological Survey of India, Kolkata.

Diversity was estimated in terms of Shannon-Wiener index, which combines richness and abundance into a single measure³. Fisher's alpha indexing was also used to study the abundances .

TABLE- 3 : List of sampling locations along with GPS coordinates

Sites	Fisher alpha
Baghamunda, Purnakote Range	0.5757
Basaganda Point	1.713
Bhaluchaba Point	1.028
Bhuchunda bugura, Pampasar Range	0
Bugura Village	1.453
Bugura Village, Banigochha East Range	2.471
Dabakhali Point, Badamali Beat	0.3017
Dhobathuba	0.8635
GBS Plantation, Baghamunda	1.284
Khallikana Point Duisingh Bit area, Banigochha (E)	1.871
Kuanria Dam Area	3.878
Mankaro Khaikhali Point, Purnakote Range	2.626
Rangabati Point, Tikarpada	0
Rangmatia Village, Banigachia West Range	1.051
Salapadra Point	0.6853
Sapapatra, Banigochha West Range	0.3759
Saranaro, Pampasar range	1.235
Sillati Nara, Diphisahi Section Bit, Banigochha East Range	0
Torba Village, Pampasar Range	0.7959

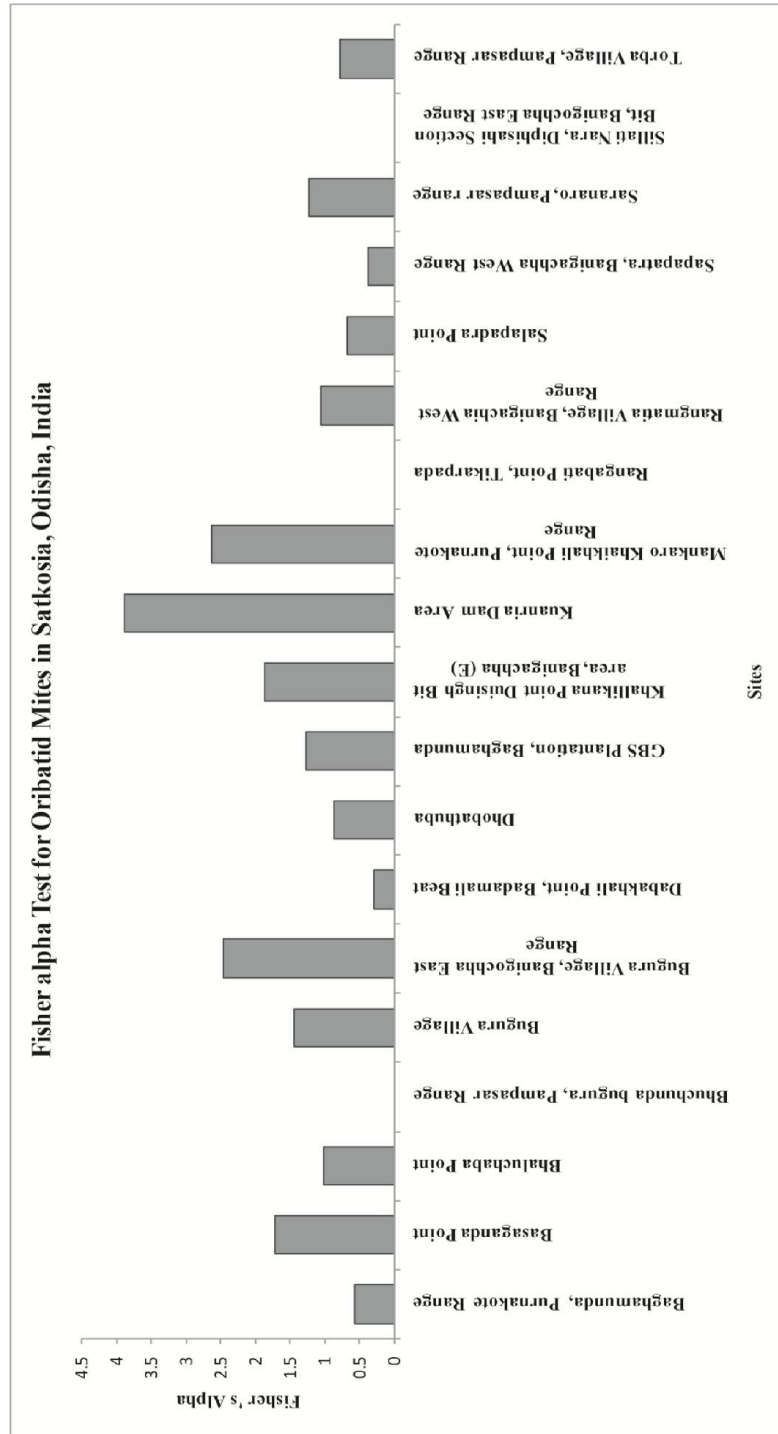


Fig. 2 : Graph showing the diversity index of the mites

Results and Discussion

Observations reveal 20 species of oribatid mite under 14 genera belonging to 8 families (Table- 1). Since there is no previous published records available only the faunal account of present study has been incorporated. The collection of soil samples were done in 31 sites and mostly from the leaf litter, soil of the forest floor and agricultural

fields adjacent to the forest. The soil of this forest area is less humid and red soil with mostly iron and silica content which might be the reason behind the less diversity.

The Fisher's alpha test (Fig.2) shows that the highest value of fisher's alpha was at Kuanria Dam Area which is (3.878) and the lowest is at Bhuchunda Bugura, Rangabati point and Silati Nara

TABLE - 4 : List of species with abundance

Species list	Abundance	Standard Error
<i>Acrogalumna ventralis</i>	0.105263158	±0.105
<i>Annectacarus mucronatus</i>	0.105263158	±0.072
<i>Chaunoproctus orientalis</i>	0.105263158	±0.105
<i>Chaunoproctus sisiri</i>	0.052631579	±0.053
<i>Cryptogalumna cryptodontata</i>	0.052631579	±0.053
<i>Galumna flabellifera</i>	0.263157895	±0.149
<i>Galumna sp.</i>	0.631578947	±0.352
<i>Hoplophorella scapellata</i>	0.157894737	±0.158
<i>Lamellobates palustris</i>	0.894736842	±0.323
<i>Multioppia sp.</i>	0.052631579	±0.052
<i>Multioppia stellifera</i>	0.315789474	±0.217
<i>Oppia kuehnelti</i>	0.210526316	±0.210
<i>Peloribates grandis</i>	0.105263158	±0.105
<i>Protoribates magnus</i>	6	±1.624
<i>Rhabdoribates siamensis</i>	0.157894737	±0.115
<i>Trachyoribates (Rostrozetes) ovulum</i>	0.157894737	±0.158
<i>Scheloribates albialatus</i>	0.105263158	±0.105
<i>Scheloribates curvialatus</i>	2.473684211	±0.821
<i>Scheloribates giganteus</i>	0.105263158	±0.105
<i>Scheloribates huancayensis</i>	0.473684211	±0.328

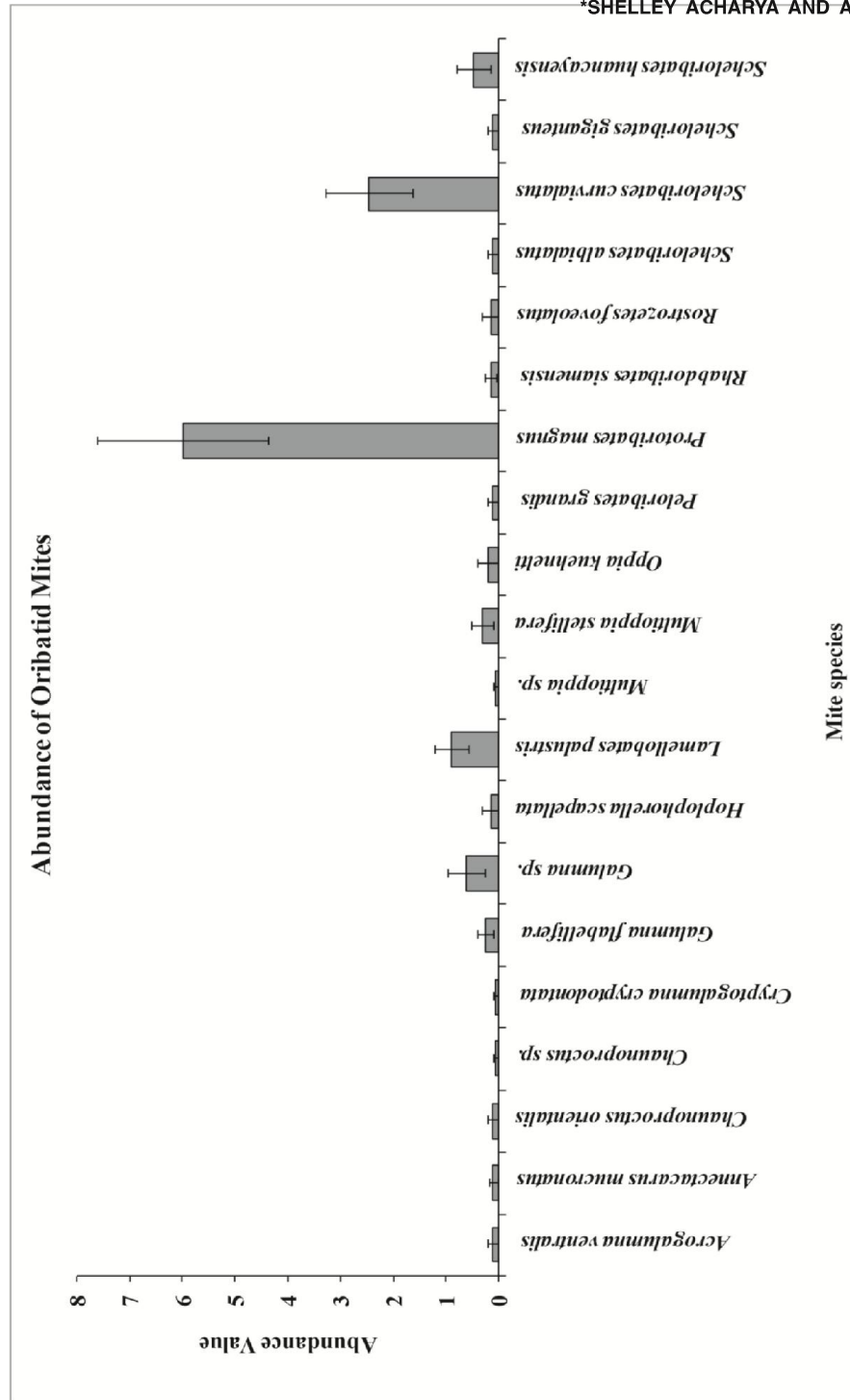


Fig. 3 : Graph showing the abundance of mites

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which is (0).

Analysis shows that *Protoribates magnus* is the most abundant species followed by *Scheloribates curvialatus*. Whereas *Chaunoproctus sisiri*, *C. orientalis*, *Cryptogalumna cryptodontata* and *Multioppia* are the less abundant

species in the Satkosia and Basipalli wild life sanctuary. The oribatid mites are fungi feeder and mostly prevalent in moist humid soil. But the soil in most of the places are very dry with iron and silica content which might be the cause of less species richness.

TABLE-5 : Depiction of sites

Sites	Shannon_H
Baghamunda, Purnakote Range	0.5908
Basaganda Point	0.8412
Bhaluchaba Point	0.958
Bhuchunda bugura, Pampasar Range	0
Bugura Vill	1.089
Bugura Village, Banigochha East Range	1.089
Dabakhali Point, Badamali Beat	0
Dhobathuba	0.8037
GBS Plantation, Baghamunda	1.078
Khallikana Point Duisingh Bit area, Banigochha (E)	1.376
Kuanria Dam Area	1.352
Mankaro Khaikhali Point, Purnakote Range	1.205
Rangabati Point, Tikarpada	0
Rangmatia Vill., Banigachia W Range	0.6365
Salapadra Point	0.5623
Sapapatra, Banigochha W Range	0
Saranaro, Pampasar range	0.5004
Sillati Nara, Diphisahi Section Bit, Banigochha East Range	0
Torba Vill., Pampasar Range	0

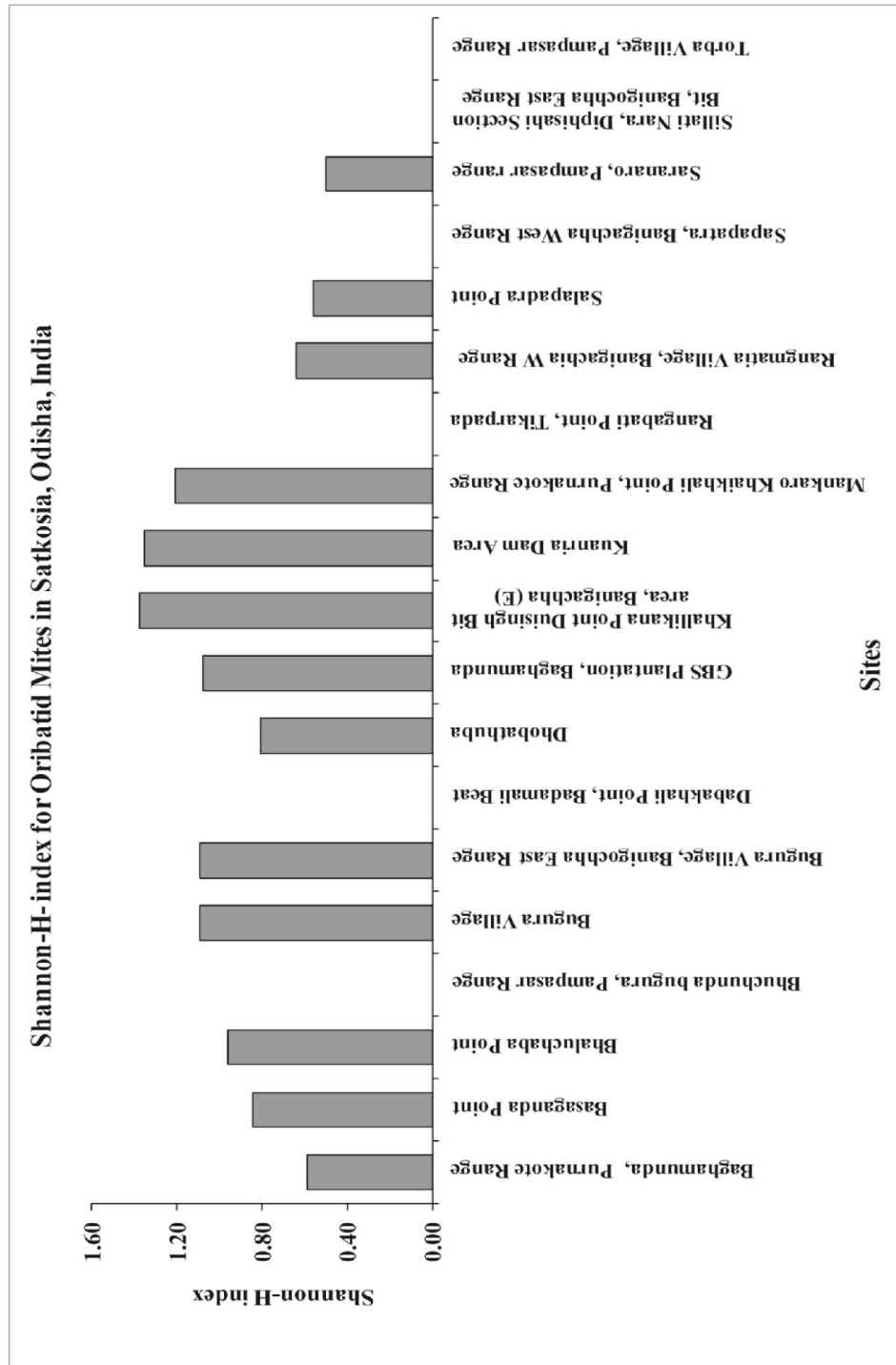


Fig. 4 : Diversity Index of the mites in the sanctuary (H' - Shannon Wiener Diversity Index; H_{even} - Evenness Index).

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The Shannon Wiener Diversity Index (Fig. 4) ranges from (0-1.376) which shows diversity and abundance of soil mites at Kalikhana point is the highest followed by the Bhuchunda bugura,

Dabakhali, Rangabati, Sapapatra, Silati Nara and Toraba as the lowest.

The diversity analysis were done using the software PAST3 and MS EXCEL.

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