Abundance and diversity of soil Oribatid Mites (Acari: Oribatida) from North-East India - A review

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ABSTRACT

The diversity and abundance of soil organisms significantly contribute to the ecosystems as well as in human welfare as we are very much dependent on the productivity of the soil. The oribatid mites are one of the most abundant species of soil microarthropods, spread all over the world and their effective role in soil ecological processes is indeed significant. Moreover, North-East (N-E) India is a hub of diverse life forms and rich in endemicism with comprehensive ecological habitats that make it suitable to harbour a large number of organisms. The richness of soil mites in this region of the country has not been explored adequately and most of the part remains unexplored due to lack of survey, awareness of its beneficial role and scientific vigilance. In spite of the richness and abundance of fauna in this part of Indian subcontinent the acarine fauna of this region remain unattended by the acarologists for the reasons best known to them. The present work is a review article on oribatid soil mites and is based mainly on the work done so far and recent studies from north-eastern states along with the records of its distribution and abundance to enhance the knowledge about this soil micro fauna, their distribution, impacts on soil health and gap areas that need to be explored in future.

Key words: North-East India, Oribatid mites, Diversity, Abundance, Distribution.

INTRODUCTION

The soil, domicile for a diverse form of life that supports different types of mesofauna. Soil Oribatida are generally known as ‘moss mites’ or ‘beetle mites’ and their body size usually range between 100-1000 µm. They explore almost all types of possible habitats and express the maximum degree of diversity in terms of abundance and species composition (Schneider et al., 2004; Subias, 2004; Erdmann et al., 2007; Sharma and Parwez, 2017). The N-E region of India includes eight states and part of the globally recognized Indo-Burma biodiversity hotspot. This province is categorised as one of the undisturbed part of the world harbouring a wide range of ecological habitats with diverse flora and fauna, along with rich endemic species (Tripathi et al., 2016). A nationwide study from Great Britain reported that subclass Acari were the most abundant group of soil invertebrates in terms of distribution in the soil as recorded in 94% of all soil samples (Black et al., 2003). Several studies reported mites as a potential bio-indicator of ecosystems; their composition reflects the state of stress in the ecosystems. Oribatida are extremely sensitive towards all sorts of soil disturbance, their long life span, gradual development, low fecundity and dispersion indicates the status of the environment. Structural changes in the dominance of mite communities proposed as a prior cautioning measure for the level of stress in mite communities (Gulvik, 2007). The anomalous taxonomical diversity of oribatids all around the globe and site-specific predominance strongly support their importance in the soil. In forest and grassland soils oribatids are the most numerically abundant group of soil mites under Acari. They play a significant role in the process of decomposition and mineralization through which promote sustaining agro-ecosystem and considered as most successful among all soil arthropods. They possess a diverse mode of feeding starting from the degraded plant materials to decaying faecal matter. However, most of the oribatid mites are either obligate or facultative fungivores (Anderson, 1975; Wallwork, 1983; Labandeira et al., 1997; Culliney, 2013; Sharma and Parwez, 2017). Oribatids also play a crucial role in biodegradation through digesting the bulk amount of plant materials with the help of the enzymes produced by their gut microbiome. Organically rich excretory wastes of Oribatids accelerate soil fertility and enhance both plant growth and productivity (Haq, 2016). Moreover, soil mites were model organisms for toxicological tests due to their prominent attribute including diverse and cosmopolitan nature of distribution, smaller body size, utilization of specific soil niches, concise reproductive period, feeding habits etc. (Huguer et al., 2015). Some of the important soil mite species standardised for soil ecotoxicity tests are Mulierculain expectata (Owojori et al., 2019).

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that 60% of the Indian oribatid fauna is recorded from West Bengal. But the data available is not sufficient to draw any inference about the faunal richness of the states, as all the states except West Bengal has been little explored, resulting in poor representation of the oribatids (Sanyal, 1992; Channa Basavanna and Viraktamath, 1989).

**Diversity and distribution of soil Oribatida in North-East India**

The geographical area of N-E India is 262,180 km² covered by about 8% of the country’s total area. The eight states of N-E India include Assam, Arunachal Pradesh, Meghalaya, Manipur, Mizoram, Nagaland, Sikkim and Tripura. Diversity in soil, slope and altitudes with vast ecological conditions makes this region expedite to support a wide range of life (Roy et al., 2015). The diversity of soil organisms significantly contribute to ecosystems as well as in human welfare as we are very much dependent on the productivity of land and soil, since these small arthropods play a profound role in soil formation and stabilization processes (Culliney, 2013).

**Meghalaya**

Oribatid mites of Meghalaya were first explored by W. Wittmer, Natural History Museum Basel, who first collected a specimen of oribatid mite from the state of Meghalaya and first studied by Bayoumi and Mahunka (1979a, 1979b) upon receiving it in 1979. Subsequently, they described the specimen *Hoplophthiracarus indicus* as new to science. Later Sanyal (1988) took on the mantle and recorded seven species belonging to seven genera under six families from Meghalaya. Of these, three species viz., *Mesotritia indica*, *Euphthiracarus meghalayensis* and *Eremobelba shillongensis* were described as a new record and four other species *Rhyssotritia ardua*(Koch) *var.otaeheitensis*, *Dolicheremaeus corona*us, *Suctobelba quadricarinata* and *Galumna cre* *nat*a were noted as new to the state. Then in 1995 gave a consolidated account of the oribatids of Meghalaya surveyed by him and his associates in 1991 and the previous work done by him and other researchers in the state of Meghalaya in the State Fauna Series 4: Fauna of Meghalaya, Part 2 in which he included 42 species belonging to 32 genera under 22 families. Of these, 34 species, 25 genera and 16 families were reported for the first time from Meghalaya. They also reported the genus *Phyllocarabodes* with one species as the first record from India. The species studied were deposited in the National Zoological Collection, Zoological Survey of India. This compiled account provided by Sanyal (1995) showed that 12.5% of Indian oribatid fauna was known from Meghalaya. It was also reported that the genus *Phyllocarabodes* and five other species were to be considered as endemic. Furthermore, the species *viz.*, *Allonothrus russe* *lo*us, *Tectecephus velatus*, *Schelorbitates parvus*, *S. sas* *wati*, *Rostrozetes foveolatus*, *Xylobates seminodus*, *Un* *guizetes clavatus* and *Lamellobates palustris* were considered to be common and abundant. The account showed that the soil oribatid faunal richness of the East
Garo Hills district occupied the highest position in respect of faunal composition.

In between this works mentioned above, researchers like Paul and Alfred (1984, 1995), Reddy (1984), Hattar et al. (1992) also worked upon the soil microarthropods of the state of Meghalaya. Reddy (1984) investigated the seasonal fluctuations of soil and litter microarthropod populations in a pine plantation of Meghalaya. One interesting observation from the study was that there was a negative correlation between the Collembola and Acarina groups which may be due to an antagonistic relationship between the two, due to predation of mites on Collembola (Nijima, 1971; Reddy, 1980). Another study on soil microarthropods in the state of Meghalaya was conducted by Hattar et al. (1992) who tried to compare the distribution and diversity of mesofauna with particular reference to Collembola and Acarina in pine forest soil and adjacent cultivated land at four different soil depths. Altogether 8 species of Acarina were recorded in pine forest whereas 5 species of Acarina were recorded in the cultivated land. In a pine forest, the species Scheloribates albialatus was found to be dominant in the upper 0-10 cm and 10-20 cm soil depth whereas in the 20-30 cm and 30-40 cm soil depths the most dominant species found were Scheloribates huancayensis and Epilohmannia spp. respectively. In cultivated land, on the other hand, Parasitus diversus was found to be dominant in both these depths. Results also indicated a higher density, lower abundance (no. of species) and greater species richness of soil mesofauna in the forest as compared to cultivated land.

**Tripura**

Subias and Sarkar (1982) first initiated the study of oribatid mites in Tripura and described three new species. Since then, many studies regarding soil mites of Tripura had been done by various researchers like Sarkar and Subias (1982, 1983, 1984), Sarkar (1983, 1992), Subias and Sarkar (1983, 1984), Bhattacharya and Halder (1984), Bhattacharya et al. (1985), Boudjema et al. (1991), Chakrabarty and Bhattacharya (1992), Saha and Sanyal (1996), Sanyal and Saha (1996), Cencela da Fonseca and Sarkar (1998) and Sanyal et al. (2000) but most of the works were restricted to the western and southern parts of Tripura and reported a considerably high number of genera and species. Bhattacharya and Chakrabarty (1995) showed the vast abundance of soil mite species in an old rubber plantation and adjacent wasteland area in Ballamukha village of Belonia, South Tripura. Altogether 46 oribatid species under 37 genera and 21 families were recorded from the study sites and reported as a dominating group of soil arthropods over the two study area. Scheloribates praecicusinterruptus was the most common species in both the sites in terms of abundance followed by Haplochthonius simplex in the wasteland and Cosmochthonius lanatus diversiseta in the rubber plantation. Wasteland area had a significantly higher species diversity index (H) then the rubber plantation plot.

Till 2003, the total numbers of taxa of oribatid mites known from the soils of Tripura were 160 species belonging to 98 genera under 44 families and representing nearly 40% of the total Indian oribatid fauna and occupying the second position among the Indian states. The distribution of soil oribatids in Tripura shows that they have adapted themselves to live in different habitats like grassland, forest, cropland and fallow land. On the basis of data available Sanyal (2003a) reported the account of the diversity of soil oribatid mites in the Records of the Zoological Survey of India, in which it is mentioned that out of the 36 species of oribatid mites that were endemic to India, 24 of them were from this state. In addition, it is also reported that 72 species across 42 genera were not found anywhere in India other than Tripura though found elsewhere in the world. The oribatid species recorded from Tripura exhibited maximum similarity with species of the Pacific region. The other regions in order of degree of similarity are Neotropical, Ethiopian, Palaeartic and Nearctic. Only four genera viz., Trimalacconothrus, Oppia, Scheloribates and Galumna were found to occur both in Tripura and Antarctica though there is no species similarity found. Sanyal (2003a) also showed that there is a very little exploration of these mites in the Northern district of Tripura compared to the southern and western districts as only 15 species were recorded from the northern part whereas the Southern and Western districts recorded 83 and 108 species respectively. Western district alone represented 72.7% of families, 65.3% of genera and 68.0% of species out of the total soil oribatid taxa known from Tripura and occupied numerically the highest position among the districts. Among all the genera recorded Scheloribates, Galumna and Lamellobates were found to be numerically dominant and Scheloribates praecicusinterruptus, S. jimbratioideis, Galumna flabellifera, Lamellobates palustris, Xylobates seminudus, Oppia yodai, Archegozetes magnus longisetosus were considered to be numerically the most dominant species in Tripura (Sanyal, 2003a). The current diversity and abundance of soil mites in Tripura must take into account the recent studies and surveys conducted such as Sanyal et al., in 2006 and 2008 reported the presence of two new oribatid species Unguiszetes grallulatus and Eremsul indicus belonging to families Mochlozetidae and Eremsulidae respectively from Tripura. The type specimens were deposited in the National Zoological Collection, Zoological Survey of India, Kolkata. Eremsul indicus closely resembles the species E. berlese from Geneva. The genera Eremsul has seven species recorded from all over India, from which three species viz., E. jyotsnai, E. nigerosetos, E. truncatus are known from the state of Tripura.

Recently, work from the northern part of the state by Ghosh’ (2018) attempts to explore the North district of Tripura by recording 14 mite species under 12 genera where the genera Scheloribates, Protoribates and Galumna were the major contributors representing 34.27%, 16.93% and 7.58% of the total population, respectively. He also studied various soil variables which could influence the soil mite diversity, distribution and abundance and found that there was an irregular and significant trend of fluctuation in oribatids abundance
with a maximum in winter and a minimum in the monsoon period. Besides the vegetation cover and edaphic variables also either singly or conjointly exerted significant impacts on the distribution as well as the diversity of the oribatid fauna.

**Sikkim**

Pearce (1906) introduced the study of Oribatid fauna and recorded 18 species of mites from Sikkim Himalaya. After his tremendous work, Dhal and Bhaduri (1980) resumed the study on oribatids and reported 4 species belonging to 3 genera under 3 families. Among them three species of oribatids viz. *Seheloribates sikkimensis*, *S. sasvati* and *Chaunoproctus longisetosus* were described as new to science, whereas *Paralamellobates bengalensis* introduced as new to the state. Sanyal and Party in two of their surveys in 1990 and 1998 explored few more species which were published in state fauna series 9, *Fauna of Sikkim*. Where they explained altogether 85 oribatid species belonging to 63 genera and 45 families including works done by others earlier and recorded 3 species and 2 genera for the first time from India and 64 species, 53 genera and 33 families as the first record from the state of Sikkim (Sanyal, 2003b).

**Manipur**

Oribatid mites of Manipur were first studied by Misra *et al.* (1982). They reported *Atropacarus* (*Hoplophorella*) *manipurenensis* as new to science and recorded three other species viz., *Atropacarus* (*Hoplophorella*) *scapellatus*, *Atropacarus* (*Hoplophorella*) *singularis* and *Hoplophthiracarus kugohi siamensis* from Manipur. Afterwards, Sanyal published a compiled account of the oribatid mites of Manipur surveyed by him and his associates in 1992 and the work done by Misra *et al.*, in 1982. Altogether 28 species belonging to 20 genera and 17 families were incorporated in the paper taking into account the four species reported by Misra *et al.* (1982). All the species studied by Sanyal (2004) were deposited in the National Zoological Collection, Zoological Survey of India. This compiled account provided by Sanyal showed that 7% of Indian oribatid fauna are known from the State of Manipur. It also reports the presence of two species *Atropacarus* (*Hoplophorella*) *manipurenensis* and *Hoplophthiracarus kugohi siamensis* that were known only from Manipur in India. Since then some works has been taken up by other workers regarding different aspects of soil microarthropods in the recent past such as Sitlhou and Singh (2019) investigating the post-fire soil microarthropod abundance in the disturbed forest ecosystem of Koubru Hills, Manipur. The study showed that wildfire had a significant effect on soil microarthropod abundance which was found to be lower in the burned area compared to the adjacent unburned area. Though Collembola was found to be the most abundant group, Acari stood close second followed by other soil microarthropods in both burned and unburned areas. Acari and Collembola consisted of 44.3% and 45.2%, respectively in total numbers while others constituted only about 10% of the total population. Waikhom and Singh (2018) studied the abundance and relationship of Acarines and Collembolas with the organic carbon, Cu, Fe, Zn and Mn of phumdi soil of Keibul Lamjao National Park (KLNP), Manipur. In this study, Acari had a higher population density than Collembola as the correlation coefficient of Collembola with all C, Cu, Fe, Zn and Mn were found to be negatively correlated. Whereas with Acari significant positive correlations were obtained with Cu, Fe and Zn.

**Nagaland**

In this state Ghosh and Bhaduri (1979) explored the Oribatid fauna for the first time and recorded five species, among them species *Eremobolba indica* and *Allonothrus monensis* were found new to science. Later Darlong and Alford (1993) continued investigations and reported 11 species, mostly identified up to generic level. The oribatids of Nagaland has so little been explored that out of more than 400 species of oribatids known so far from India (Alford *et al.*, 1998; Sanyal, 2006a) only 16 species belonging to 15 genera under 14 families are known from Nagaland (Sanyal 2006a). But works are being taken up in the recent past by researchers like Tsurho and Ao (2014) who carried out the community analysis of Acari in a natural forest and jhumland ecosystem of Mokokchung in Nagaland from January 2009 to December 2011. The vertical distribution and abundance of total soil Acarina were found to be more in the natural forest ecosystem than jhum land ecosystem and showed a significant decrease from the upper layer to deeper layers (0 cm to 30 cm). A total of 15 soil Acarina species were identified from the two study sites i.e. forest and jhum land ecosystems. Following species of oribatid mites had been found in Nagaland from the records of the zoological survey of India namely *Haplacarus foliatus bengalensis*, *Allonothrus monensis*, *Eremulus avenifer*, *Eremobolba indica*, *Brachychthonius sp.*, *Rhysotritia sp.*, *Platythorus Peltifer*, *Dolicheremaeus bruciensis*, *Oppia sp.*, *Ramusella sp.*, *Suctobelba sp.*, *Neoribates sp.*, *Haplozetes sp.*, *Scheloribates sp.*, *Galumna* sp. (Sanyal and Bhaduri, 1986; Sanyal, 2006a).

**Arunachal Pradesh**

Sanyal *et al.* (2006b) gave an overall view of the Oribatid fauna of Arunachal Pradesh which included the work done by him and his associates in the collection of oribatids during the years 1997 and 1999. They reported the presence of a total of 35 species belonging to 30 genera under 21 families recorded till then from the state. All the taxa were reported for the first time from the state of Arunachal Pradesh, besides 3 species were likely to be new species. This account provided by Sanyal *et al.* (2006b) showed that 8.6% of Indian Oribatid fauna are known from the State of Arunachal Pradesh and 5 species under 5 genera reported from the state were not yet known from outside India. Afterwards, Ermilov in his venture of Indian Oribatid mites added several other species to the already existing database. For instance, Ermilov and Kaluz (2013) reported the presence of two new oribatids from Arunachal Pradesh, viz., *Epidamaeus parayammanensis* sp. nov. (Niphocepheidae) and *Taiwanoppia (Taiwanoppia) paraflagellifera* sp. nov. Also, it’s a very first record when the genera
Epidamaeus and Taiwanoppia had been reported in India. Similarly, Ermilov and Kaluz (2014) again reported three new species Allogalumna asetosa spec. nov., Galumna paraweni spec. nov. and Heterogalumna minima nov. of the family Galumna from the Huňli region of Arunachal Pradesh. In 2014 itself, Ermilov et al. (2014a) reported three new species of oribatid mites of the genus Pergalumna from the region of Tippi, Arunachal Pradesh viz., Pergalumna paracricicata sp., Pergalumna minitata sp. and Pergalumna paracartattienica sp. Lastly to conclude their venture Ermilov et al. (2014b) reported a new species of the genus Niphocephhus and gave an annotated checklist of three sites of India among which two sites were from Arunachal Pradesh which included 66 species out of the 71 species collected in total. Out of which 29 of the oribatid species were recorded for the first time in India. Five of the species/subspecies- Trhypochthonius tectorius stercus, Hermanniella alverdievae, Sphodrocephhus tridactylus, Caenosamerus spatialis, Dolicichermaeaus distinctus were recorded for the first time in the Oriental region. The holotype of all these collected species was deposited in the collection of the Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia.

Mizoram
Oribatid fauna of Mizoram has been little explored and only one major work has been found which was published by Sanyal (2009) in the state fauna series 14, the fauna of Mizoram, part-2. This study of Sanyal (2009) took into account the Mizoram surveys undertaken by B.K. Biswas and party in 1994 and A.K. Sanyal and party in 1995. Altogether 40 species were recorded belonging to 29 genera and 22 families. All the species incorporated were reported for the first time from the State of Mizoram. All the species studied in this work were deposited in the National Zoological Collection, Zoological Survey of India. Oppiidae, Scheloribitidae and Galumnidae were found to be the most dominant families of oribatid mites in the State of Mizoram. This account provided by Sanyal showed that 9.5% of Indian oribatid fauna are known from the State of Mizoram.

Assam
Though concrete evidence is not available regarding the time at which the study of soil mites began in Assam, but it can definitely be said that it is not a recently found area of research. According to Luxton (1966), some species of acari were highly selective in their choice of food and it mainly controls their zonal distribution. Since then different works have been done on the soil fauna especially in the early 2000s and at the beginning of this decade by researchers like Gope and Ray (2006), Bhattacharyya et al. (2013), Borah and Kakati (2014), Ermilov et al. (2014b). Gope and Ray (2006) reported the population dynamics at two sites of Dorgakona Village, Silchar, Assam in which Cryptostigmata constituted more than 50% of the total acari population. Bhattacharyya et al. (2013) worked on the quantitative distribution of soil microarthropods from three different ecosystems viz. agro-ecosystem, forest ecosystem, and fallow land of the district Jorhat of Assam. Maximum numbers of soil arthropods were collected from the forest ecosystem. The presence of higher numbers of soil arthropods in forest ecosystem may be due to the fact that the forest soils were healthy and virtually free from the risk of pesticides and other heavy metal deposits. Among all the soil arthropods, soil mites were found to be the most dominant in all the ecosystems. Population density of soil Acari in two sampling sites viz., natural and degraded forest sites were studied for one year at Dulung Reserve Forest of Lakhimpur district, Assam by Borah and Kakati (2014). Vertical and seasonal distribution of total soil Acari were more in natural forest and there was a significant decrease from the upper layer to deeper layers. Acarina was found to be a dominant group comprising 39.26% and 37.51% of the total soil microarthropods in natural and degraded sites respectively. Ermilov et al. (2014b) reported some oribatid species collected by L. Dembický and O. Šauša from the soil of Bhalukpong, Assam. Nothrus phylliphormis, Archegozetes longisetosus, Micacarus (Phyllophthorina) sp., Epidamaeus parayunnanensis, Sphodrocephhus tridactylus(*), Zetorchestes saltator, Eremobelba indica, Losiobellina remota(*), Constrictocephhus orientalis, Eurosteocephhus malhunkah, Labellolobates molecula, Rykeliaasiatica (*), Zetalrachelas aestuargarciai, Pereschelribites minutes(*), Scheloribites fimbriatus, Scheloribites latipes, Acrogalumna bipartite(*), Galumna levisensilla(*), Pergalumna paratursusakii were some of the species reported by him (* Indicates that the species is recorded for the first time in India). Most recently, Pator and Ray (2018) reported a significant size of both the Collembola and Oribatid mites population in the extracted soil samples of the Acacia plantation site within the Assam University Campus of Cachar District, Assam, India.

DISCUSSION
This current review provides a succinct glance on the study of soil mites (Oribatida) which has been done in NE India. Among them, Tripura has the highest grade of Oribatid abundance by contributing nearly 40% of the total Indian oribatid fauna, in contrast, Nagaland has the lowest abundance, contributing only 4%. Whereas the states of Arunachal Pradesh, Manipur, Meghalaya and Mizoram contribute 8.6%, 7%, 12.5% and 9.5% respectively. But no such records were available from Assam and Sikkim. A precise state wise graphical representation regarding the numerical abundance of Oribatid family, genus and species has been provided in Figure 1. In Assam due to lack of conspicuous evidence, it is very difficult to set forth the accurate year in which mite research actually begun in this state. However, extensive literature study indicates that mite research initiated in the late 1900s and picked up pace in the early 2000s. The Oribatid mites were the most prominent group of Acari documented from the soil of Assam. Few studies support the high abundance of soil mites in this state with a diverse pattern of distribution. However, some species were also reported as newer to India. Similarly, the state of Sikkim has also been scarcely explored and apart from the records of Zoological Survey of India and a couple of works dated way back in the 20th century no other works

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regarding the soil mite have been done in spite of having a good amount of soil oribatid richness as evident from the very few surveys in the state so far, thus this state needs special attention in terms of survey and exploration to evaluate the faunal richness. In Arunachal Pradesh major works were done by Sanyal et al. (2006) in their records of the Zoological Survey of India where number of new species were discovered and in few surveys of Ermilov with his associates. Besides, there were not many notable works found in the literature and thus there is a huge need for extensive exploration of soil mites in this state. Meghalaya holds second highest oribatid richness among the N-E states. A compiled account of the oribatid mites of Meghalaya was provided by Sanyal way back in the year 1995 in the state fauna series with records of genus Phyllocarabodes and five species endemic to the state, thus there is still room for further exploration and documentation. In Manipur, mite research was started by Mishra and his co-workers in 1982, since then only a few works has been found in the literature. Very recently, works done by Sithiou and Singh (2019) was in Kourbu Hills but most part of the state remains unexplored. Likewise, a very minimal number of works has been reported from Mizoram and it’s not sufficient to conclude the oribatid richness of the state although this state holds third most rank regarding oribatid richness among the N-E states. A compiled account of the oribatid mites of Meghalaya was provided by Sanyal way back in the year 1995 in the state fauna series with records of genus Phyllocarabodes and five species endemic to the state, thus there is still room for further exploration and documentation. In Manipur, mite research was started by Mishra and his co-workers in 1982, since then only a few works has been found in the literature. Very recently, works done by Sithiou and Singh (2019) was in Kourbu Hills but most part of the state remains unexplored. Likewise, a very minimal number of works has been reported from Mizoram and it’s not sufficient to conclude the oribatid richness of the state although this state holds third most rank regarding oribatid richness among the N-E states. According to the current records found in the state fauna series of Nagaland published by the Zoological Survey of India in 2006, it is found that Nagaland contributes the least to the Indian oribatid fauna and has the lowest oribatid faunal richness among the states of N-E. Although, several researchers are trying to explore the unexplained and unsurveyed areas of the state. In case of Tripura however, the scenario is quite different Subias and Sarkar (1982) took the initiative to explore the soil mite community of the state and since then many more works had been done by various authors and as a result, this state holds the highest rank in oribatid richness among all North-Eastern states. The western part of the state is very well surveyed and explored though major portion of the northern part still remains unexplored. Most recently, Ghosh’s (2018) attempt from the northern part of the state is a timely kick start in the path to explore more from this unsurveyed region of the state of Tripura and also focused extensive research is needed in this region.

CONCLUSION

The field of mite research has a great potential in ecological perspective. The pattern of mite distribution, species richness act as an indicator for determination of soil quality including toxicity status of a particular area. However, the work that had been done in the N-E India is not enough to completely understand the pattern of soil mite distribution and diversity as majority parts of the N-E India remain unexplored. Thus further multi-scale works are required to get an overall picture of every aspect of oribatid mite communities in this part of country. It may result in the discovery of newer and endemic mite species to N-E, India with their specific beneficial impact on edaphic ecology.

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