TAXONOMY AND DISTRIBUTION OF ORIBATID MITES (ACARI) IN INDIA

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Abstract


This paper reports from India a total of 121 Oribatid mites over 64 genera under 40 families, a few of these species being determined only up to generic level. A discussion on the distribution of the determined species in India and also outside India has been provided.

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INTRODUCTION

The oribatid mites, which form a complex group under the subclass Acarina, show high degree of diversity in form, habitat and behaviour and represent one of the chief constituents of the soil fauna. According to Noordam and De Vlieger (1943) and Van der Drift (1951) Oribatei are a predominant group of inhabitants of soil litter. They are primarily fungivorous, algivorous and saprophagous and occur in soil litter, humus, compost heaps, moss, lichens growing over tree stumps, and similar habitats. The occurrence of these mites is also noticed in bird’s nests (Aoki, 1966), in caves (Moritz et al., 1971), in lava caves (Yamamoto and Aoki, 1971) and in pasture soil; they also occur in coniferous taiga forest, in arctic tundra (Bregetova, 1965) and even in subantarctic zones (Wallwork, 1973). A few species are slightly hydrophilic and still fewer are known to inhabit the sea (Willmann, 1931). In fact, they occur in all ecological niches, especially where vegetative materials decay in sufficient moisture and are penetrated by mycelia. Enormous diversity is found in their organisation because they live in different types of ecological conditions, and consequently we find a good number of genera and species. On the basis of variations in the range of forms, structure and behaviour, approximately more than 5,000 species of oribatid mites belonging to 750 genera have been described from the world till date.

Recently attention of the acarologists has been drawn to this group in view of its great economic importance. It is claimed by them that the Oribatei are instrumental in decomposing organic matter in or on the soil and help in the promotion of soil fertility. Sellnick (1928) believed that they play an important role in the economy of nature in that they contribute considerably to the fertility of forest soil. Many species of oribatid mites possess the role of acting as intermediate hosts of certain anoplocephaline cestodes. Sunkard (1937, 1940, 1941), Kates and Runkel (1948), Potamkina (1941, 1944), Soldatova (1945), Anantaraman (1951), Allred (1954), Wallwork and Rodriguez (1961), Usova and Yarosenko (1971) studied the role of Oribatei as the intermediate hosts of anoplocephaline cestodes and other tape worms belonging to the family Cyclophyllidae. Jacot (1930) pointed out that the orbatid mites carry fungal spores in their mouth-parts, bodies, bristles and legs and it appears possible that they may help directly in the spread of fungal infection to plants. Rockett and Woodring (1966) found a new species, Pergalumna omniphagus, to feed (in all stages except larval) on both saprophytic and plant parasitic nematodes. It is suggested that normally saprophytic oribatids may constitute an important regulator of soil nematode population. In view of importance of these mites in veterinary, soil zoology and agriculture the taxonomy of this group has gained considerable momentum.

Unfortunately, oribatid mites of India remained unattended till the beginning of the present century and the taxonomy of the oribatid fauna of India had long been neglected by the acarologists for the reasons best known to them. In comparison to the oribatid mites known from other parts of the world Indian mites of this group have little been explored and the literature relating to the taxonomy of Indian Oribatei are also very scanty.

Taxonomic studies of the oribatid mites of India came to the lime light of scientific investigation chiefly through the works of Pearce (1906), Ewing (1910), Jacot (1933b) and Baker (1945). Later Bhaduri and Raychaudhuri (1968), Chakrabarti and Bhaduri (1972), Chakrabarti, Bhaduri and Raychaudhuri (1972, 1973, 1977, 1978), Bhaduri, Chakrabarti and Raychaudhuri (1974), Bhattacharya, Bhaduri and Raychaudhuri (1974), Bhaduri, Bhattacharya and Chakrabarti (1975) and Hafeez Kardar (1972, 1974, 1976) worked on this group either by describing new species or by providing data on the distribution of the known species.

Pearce (1906) for the first time reported and described 20 species from Sikkim Himalaya. Ewing (1910) wrongly identified 2 species from the Nilgiri Hills. After a long gap Jacot (1933b) found the syntypes of Ewing's species from the same locality and correctly identified them. Later Baker (1945) described a new species from Uttar Pradesh. Anantaraman (1951) described a new species and reported the genus *Galumna* from Madras. Prosad (1965) reported 3 mites belonging to the genera *Cosmochthonius*, *Oppia*, and *Tectocephus* from Sabur (Bihar). Bhaduri and Raychaudhuri (1967) for the first time reported 6 mites belonging to the genera *Hoplophorella*, *Oppia*, *Conopppia*, *Basilobelba*, *Xiphobelba* and *Lamellobates* from West Bengal. In subsequent year they (1968) added 7 more species to the list of Indian oribatid mites. Thus the total number of species reported and described from India till 1968 amounted to 40, then Chakrabarti and Bhaduri (1972), Chakrabarti, Bhaduri and Raychaudhuri (1972, 1973, 1977, 1978), Bhaduri, Chakrabarti and Raychaudhuri (1974), Bhattacharya, Bhaduri and Raychaudhuri (1974), Bhaduri, Bhattacharya and Chakrabarti (1975) reported and described 45 more species from West Bengal. Singh and Mukherjee (1971) and Singh and Pillai (1975) while working on the ecology of soil mesofauna of Varanasi (Uttar Pradesh) reported the occurrence of 15 species from there. Hafeez Kardar (1972, 1974, 1976) described 7 new species from Aligarh (Uttar Pradesh). Recently Misra (through personal communication) reported 16 species from Orissa. The total number of species reported and described from India till to-day stands at 121 distributed over 64 genera under 40 families.

**LIST OF SPECIES REPORTED AND DESCRIBED FROM INDIA**

**Family Parhypochthoniidae**

- *Gehypochthonius* Jacot, 1936a
  - *Gehypochthonius* sp.: Singh and Mukherjee, 1971

**Family Hypochthoniidae**

- *Eohypochthonius* Jacot, 1938
  - *Eohypochthonius gracilis* (Jacot, 1936): Chakrabarti and Bhaduri, 1972

- *Malacoangelia* Berlese, 1913
Malacoangelia remigera Berlese, 1913: Chakrabarti and Bhaduri, 1972
Malacoangelia remigera indica Chakrabarti, Bhaduri and Raychaudhuri, 1972

Family Haplochthoniidae
Genus Haplochthonius Willmann, 1930
Haplochthonius clavatus (Hammer, 1958): Chakrabarti and Bhaduri, 1972
Haplochthonius intermedius Chakrabarti, Bhaduri and Raychaudhuri, 1972

Family Cosmochthoniidae
Genus Cosmochthonius Berlese, 1910
Cosmochthonius sp.: Prosad, 1965
Cosmochthonius bengalensis Chakrabarti, Bhaduri and Raychaudhuri, 1972

Family Sphaerochthoniidae
Genus Sphaerochthonius Berlese, 1910

Family Phthiracaridae
Genus Hoplophorella Berlese, 1923
Hoplophorella africana Wallwork, 1967: Misra (op. cit.)
Hoplophorella scapellata Aoki, 1965a: Misra (op. cit.)
Hoplophorella sp.: Bhaduri and Raychaudhuri, 1967

Family Euphthiracaridae
Genus Rhysotritia Markel and Meyer, 1959
Rhysotritia ardua (C.L. Koch, 1841): Singh and Mukherjee, 1971
Rhysotritia peruensis (Hammer, 1961): Chakrabarti, Bhaduri and Raychaudhuri, 1973

Family Epilohmanniidae
Genus Epilohmannia Berlese, 1916a
Epilohmannia cylindrica (Berlese, 1904): Singh and Mukherjee, 1971
Epilohmannia pallida pacifica Aoki, 1965b: Singh and Mukherjee, 1971
Epilohmannia sp.: Singh and Pillai, 1975

Family Lohmanniidae
Genus Lohmannia Michael, 1898
Lohmannia sp.: Singh and Mukherjee, 1971; Singh and Pillai, 1975
Genus Annectacarus Grandjean, 1950
Annectacarus longisetosus Bhattacharya, Bhaduri and Raychaudhuri, 1974
Annectacarus sp.: Chakrabarti and Bhaduri, 1972
Genus Cryptacarus Grandjean, 1950
Cryptacarus hirsutus Aoki, 1961: Bhattacharya, Bhaduri and Raychaudhuri, 1974
Cryptacarus dendriscetosus Bhattacharya, Bhaduri and Raychaudhuri, 1974
Cryptacarus sp.: Singh and Mukherjee, 1971; Singh and Pillai, 1975
Genus Haplacarus Wallwork, 1962
Haplacarus foliatus bengalensis Bhattacharya, Bhaduri and Raychaudhuri, 1974
Genus *Javacarus* Balogh, 1961
*Javacarus kuehnetti* Balogh, 1961: Chakrabarti and Bhaduri, 1972; Bhattacharya, Bhaduri and Raychaudhuri, 1974

Genus *Papillacarus* Kunst, 1959
*Papillacarus indicus* Hafeez Kardar, 1972
*Papillacarus simplirostratus* Bhattacharya, Bhaduri and Raychaudhuri, 1974

Family Camisiidae
Genus *Platynothrus* Berlese, 1913
*Platynothrus peltifer* (C.L. Koch, 1839): Pearce, 1906

Family Trhypochthoniidae
Genus *Trhypochthonius* Berlese, 1905
*Trhypochthonius tectorum* (Berlese, 1896): Pearce, 1906
Genus *Allobothrus* Van der Hammen, 1953
*Allobothrus indicus* Bhaduri and Raychaudhuri, 1968
Genus *Archegozetes* Grandjean, 1931
*Archegozetes longisetosus* Aoki, 1965a (=*Archegozetes magna indicus* Bhaduri and Raychaudhuri, 1968)
*Archegozetes magna* (Sellnick, 1925a): Chakrabarti, Bhaduri and Raychaudhuri, 1977

Family Malaconothridae
Genus *Trimalaconothrus* Berlese, 1916b
*Trimalaconothrus cajamarcensis* Hammer, 1961: Chakrabarti, Bhaduri and Raychaudhuri, 1973
Genus *Cyrthermannia* Balogh, 1958
*Cyrthermannia vicinicornuta* Aoki, 1965a: Chakrabarti and Bhaduri, 1972
*Cyrthermannia quadricornuta* Chakrabarti, Bhaduri and Raychaudhuri, 1978
Genus *Masthermannia* Berlese, 1913
*Masthermannia mamillaris* (Berlese, 1904a): Chakrabarti and Bhaduri, 1972
Genus *Nanhermannia* Berlese, 1913
*Nanhermannia himalayensis* Chakrabarti, Bhaduri and Raychaudhuri, 1978

Family Hermanniidae
Genus *Hermannia* Nicolet, 1855
*Hermannia convexa* (C.L. Koch, 1842): Pearce, 1906

Family Plateremaecidae
Genus *Plateremaecus* Berlese, 1908
*Plateremaecus rotundus* Berlese, 1913: Chakrabarti, Bhaduri and Raychaudhuri, 1977
Family Liodidae
   Genus *Liodes* Von Heyden, 1826
   *Liodes (?) ocellatus* (Pearce, 1906)

Family Cepheidae
   Genus *Conoppia* Berlese, 1908
   *Conoppia* sp.: Bhaduri and Raychaudhuri, 1967
   Genus *Ommatocepehus* Berlese, 1913
   *Ommatocepehus ocellatus* (Michael, 1882): Pearce, 1906

Family Microzetidae
   Genus *Microzetes* Berlese, 1913
   *Microzetes auxiliaris* Grandjean, 1936: Chakrabarti and Bhaduri, 1972
   *Microzetes auxiliaris applachicola* Jacot, 1938: Chakrabarti, Bhaduri and Raychaudhuri, 1977

Family Gustaviidae
   Genus *Gustavia* Kramer, 1879
   *Gustavia palmicinctum* (Michael, 1880): Pearce, 1906

Family Amerobelbidae
   Genus *Amerus* Berlese, 1896
   *Amerus speciosus* Pearce, 1906

Family Eremobelbidae
   Genus *Eremulus* Berlese, 1908
   *Eremulus flagellifer* Berlese, 1908: Chakrabarti, Bhaduri and Raychaudhuri, 1973
   *Eremulus avenifer* Berlese, 1913: Chakrabarti, Bhaduri and Raychaudhuri, 1973
   Genus *Fosseremus* Grandjean, 1954
   *Fosseremus quadriperitus* Grandjean, 1965: Singh and Mukherjee, 1971
   *Fosseremus* sp.: Singh and Mukherjee, 1971; Singh and Pillai, 1975

Family Carabodidae
   Genus *Carabodes* C.L. Koch, 1836
   *Carabodes peniculatus* Aoki, 1970: Chakrabarti, Bhaduri and Raychaudhuri, 1977

Family Basilo belbidae
   Genus *Basilo belba* Balogh, 1958
   *Basilo belba indica* Bhaduri, Chakrabarti and Raychaudhuri, 1974
   Genus *Xiphobelba* Csiszar, 1961
   *Xiphobelba* sp.: Bhaduri and Raychaudhuri, 1967

Family Liacaridae
   Genus *Liacarus* Michael, 1898
   *Liacarus nigrescens* Pearce, 1906

Family Tectocepheidae
   Genus *Tectocepheus* Berlese, 1913
**Tectocepheus velatus** (Michael, 1880): Pearce, 1906  
**Tectocepheus sp.:** Prosad, 1965  
**Tectocepheus latilamellaris** Hafeez Kardar, 1974  
**Tectocepheus translamellaris** Hafeez Kardar, 1974  
**Tectocepheus velatus var. sarekensis** Tragardh, 1910: Misra (Ph. D. thesis not yet submitted)

**Family Oppiidae**

Genus *Brachioppia* Hammer, 1961  
*Brachioppia cuscensis* Hammer, 1961: Chakrabarti, Bhaduri and Raychaudhuri, 1977

Genus *Multioppia* Hammer, 1961  

Genus *Oppia* C.L. Koch, 1836  
*Oppia yodai* Aoki, 1965a: Chakrabarti, Bhaduri and Raychaudhuri, 1977  

Genus *Striatoppia* Balogh, 1958  
*Striatoppia machadoi* Balogh, 1958: Chakrabarti, Bhaduri and Raychaudhuri, 1973


**Family Suctobelbidae**

Genus *Suctobelba* Paoli, 1908  

Genus *Suctobelbila* Jacot, 1937  
*Suctobelbila dentata* (Hammer, 1961): Chakrabarti and Raychaudhuri, 1973

**Family Cymbaeremaeidae**

Genus *Cymbaeremaeanus* Berlese, 1896  
*Cymbaeremaeanus cymba* (Nicolet, 1855): Pearce, 1906

Genus *Scapheremaeanus* Berlese, 1910  
*Scapheremaeanus fisheri* Aoki, 1966: Chakrabarti and Bhaduri, 1972

**Family Pelopidae**

Genus *Eupelops* Ewing, 1917  
*Eupelops acromios* (Hermann, 1804): Pearce, 1906  
*Eupelops acromios minor* Chakrabarti, Bhaduri and Raychaudhuri, 1973

**Family Oribatellidae**

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Genus *Lamellobates* Hammer, 1958

*Lamellobates* sp.: Bhaduri and Raychaudhuri, 1967

Genus *Paralamellobates* Bhaduri and Raychaudhuri, 1968

*Paralamellobates bengalensis* Bhaduri and Raychaudhuri, 1968

Family Ceratozetidae

Genus *Hypozetes* Balogh, 1959

*Hypozetes imitator* Balogh, 1959: Chakrabarti, Bhaduri and Raychaudhuri, 1973

Family Mochlozetidae

Genus *Unguizetes* Sellnick, 1925b

*Unguizetes clavatus* Aoki, 1967: Chakrabarti, Bhaduri and Raychaudhuri, 1977

Genus *Podoribates* Berleese, 1887

*Podoribates* sp.: Chakrabarti, Bhaduri and Raychaudhuri, 1973

Family Mycobatidae

Genus *Mycobates* Hull, 1916

*Mycobates* sp.: Singh and Pillai, 1975

Family Galumnidae

Genus *Galumna* Von Heyden, 1826

*Galumna tessellata* (Ewing, 1910): Jacot, 1933a
*Galumna nilgiria* (Ewing, 1910): Jacot, 1933a
*Galumna* sp.: Anantaraman, 1951; Singh and Mukherjee, 1971; Singh and Pillai, 1975

Genus *Leptogalumna* Balogh, 1960

*Leptogalumna* sp.: Singh and Mukherjee, 1971

Family Oribatulidae

Genus *Oribatula* Berleese, 1896

*Oribatula tibialis* (Nicolet, 1855): Pearce, 1906
*Oribatula* sp.: Singh and Pillai, 1975

Genus *Liebstadia* Oudemans, 1906

*Liebstadia similis* (Michael, 1888): Pearce, 1906

Genus *Scheloribates* Berleese, 1908

*Scheloribates chauhani* Baker, 1945
*Scheloribates madrasensis* Anantarman, 1951
*Scheloribates huancayensis* Hammer, 1961: Misra (op. cit.)
*Scheloribates luminosus* Hammer, 1961: Misra (op. cit.)
*Scheloribates natalensis* Pletzen, 1963: Misra (op. cit.)
*Scheloribates parvus* Pletzen, 1963: Misra (op. cit.)
*Scheloribates rectus* Hammer, 1958: Misra (op. cit.)
*Scheloribates thermophilus* Hammer, 1961: Misra (op. cit.)
*Scheloribates baloghi* Hafeez Kardar, 1976
*Scheloribates rufafulvus* Hafeez Kardar, 1976
*Seheloribates bicuspidatus* Hafeez Kardar, 1976
*Seheloribates translamellaris* Hafeez Kardar, 1976
*Seheloribates* sp.: Singh and Mukherjee, 1971; Singh and Pillai, 1975

Family Chaunoproctidae

Genus *Chaunoproetus* Pearce, 1906
- *Chaunoproetus cancellatus* Pearce, 1906
- *Chaunoproetus asperulus* Pearce, 1906
- *Chaunoproetus abalai* Bhaduri, Bhattacharya and Chakrabarti, 1975
- *Chaunoproetus clavisetus* Bhaduri, Bhattacharya and Chakrabarti, 1975

Family Haplozetidae

Genus *Peloribates* Berlese, 1908
- *Peloribates* sp.: Singh and Mukherjee, 1971

Genus *Protoribates* Berlese, 1908
- *Protoribates* sp.: Singh and Pillai, 1975

Genus *Rostrozetes* Sellnick, 1925
- *Rostrozetes foveolatus* Sellnick, 1925: Chakrabarti and Bhaduri, 1972

Correct position of the following species could not be ascertained due to non-availability of the specimens. They are listed here according to Pearce (1906) who reported and described them from Sikkim Himalaya.

Family Phthiracaridae

Genus *Hoploderma* Michael, 1898
- *Hoploderma claviger* Pearce, 1906

Family Notaspidae

Genus *Notaspis* Herman, 1804
- *Notaspis hammatas* Pearce, 1906

Family Oribatidae

Genus *Oribata* Latereille, 1802
- *Oribata ovalis* Nicolet, 1855: Pearce, 1906
- *Oribata alata* var. *major* Pearce, 1906
- *Oribata fallax* Pearce, 1906

**DISTRIBUTION**

Oribatid mites are known only from six states of India, viz., West Bengal, Bihar, Orissa, Uttar Pradesh, Tamil Nadu and Sikkim. The other Indian states are completely unexplored in so far as the mites of this group are concerned.

In the table (p.33) all the species of oribatid mites found in the Indian territory till to-day are listed. Only the specimens determined upto the specific level have been considered in the table. The 5 left columns show the occurrence of species in different parts of India, while the other columns their possible occurrence in other parts of the globe. From the table it is found that 54 species have been reported and described from West Bengal, 20 from Sikkim, 12 from Uttar Pradesh, 17 from Orissa (Misra: Ph. D. thesis not yet submitted) and 3 from Tamil Nadu. The reason why there is richness of species in West Bengal is perhaps due to the fact that this state has been better explored in comparison to other states.
Distribution of species in India at present seems to be rather casual, which must be explained as a result of fewer collection and consequently imperfect knowledge of their distribution.

Of the total of 103 species listed in the table 35 species have previously been reported and described from various parts of the Southern Hemisphere. India has 19 species common to South America, 17 to Africa, 15 to Indonesia, 8 to New Zealand and 14 to other islands of the Pacific Ocean. Twenty species have a very wide range of distribution and are known from the different parts of Southern as well as Northern Hemisphere. These species include *Eohypochthonius gracilis*, *Malacoangelia remigera*, *Hoplophorella scapellata*, *Rhysotritia ardua*, *Jacarurus kuehnelti*, *Platynothrus peltifer*, *Trhypochthonius tectorum*, *Archiogozetes longisetosus*, *Masthermannia mamillaris*, *Microzetes auxiliaris*, *Eremulus flagellifer*, *Eremulus avenifer*, *Fosseremus quadriperlitus*, *Carabodes peniculatus*, *Tectocephus velatus*, *Striatoppia machadoi*, *Eupelops acromios*, *Lamellobates pallustris*, *Liebstadia similis*, and *Rostrozetes foveolatus*. The occurrence of these species in various regions of the Southern and Northern Hemispheres shows that our knowledge of the distribution of the oribatids is still very inadequate, but it is also seen that certain species have a far larger distribution and greater tolerance to diverse climatic conditions. It can be presumed that spreading must have taken place by gradually widening distribution through millions of years at a very early stage in the history of the earth before the continental drift when the whole continental surface was a single mass.

Fifteen of the species have previously been recorded only from the territories of the Northern Hemisphere like Europe, Canada, North America, Japan, Greenland and other areas. These species are *Epilohmannia cylindrica*, *Epilohmannia pallida pacifica*, *Cryptacarus hirsutus*, *Cythermannia vicinicornuta*, *Hermannia convexa*, *Ommatocephus ocellatus*, *Microzetes auxiliaris appalachicola*, *Gustavia palmicinctum*, *Oppia yodai*, *Striatoppia niliaca*, *Cymbaeremaeus cymba*, *Unguizetes clavatus*, *Oribatula tibialis*, *Oribata ovalis*, and *Oribata alata var. major*.

Thus it is found that India which belongs to the Oriental realm contains a mixture of Neotropical, Ethiopian and Palaearctic species. The species which have been reported from the tropical plain lands of India like West Bengal, Orissa, Uttar Pradesh and Tamil Nadu agree with the species from South America, Africa, Indonesia and, to some extent, New Zealand, while those recorded from the warm temperate high altitude regions of India like Sikkim and Darjeeling show similarities with the species from Europe, North America, Canada and Japan.

It is interesting to note that certain species are restricted to the warm temperate high altitude regions like Sikkim Himalaya and Darjeeling only and have not been recorded from the tropical plain lands. Thus the occurrence of the species *Platynothrus peltifer*, *Trhypochthonius tectorum*, *Hermannia convexa*, *Liodes ocellatus*, *Ommatocephus ocellatus*, *Gustavia palmicinctum*, *Amerus speciosus*, *Liacosus nigrescens*, *Cymbaeremaeus cymba*, *Eupelops acromios*, *Oribatula tibialis*, *Liebstadia similis*, *Chaunoproctus cancellatus*, *Chaunoproctus asperulus*, *Hoploderma claviger*, *Notaspis hammatus*, *Oribata ovalis*, *Oribata alata var. major* and *Oribata fallax* in the warm temperate high altitude regions of Sikkim and Darjeeling and their absence from the tropical plain lands of West Bengal, Orissa, Uttar Pradesh and Tamil Nadu suggest that these species are adapted to the biocological conditions prevailing there. Some of these species had previously been reported from
Europe and Japan, and some of them from North America, Canada and Greenland.

Relationship between the African and Indian species seems probable, because Africa is nearer to India and is connected with Asia through Middle East. Moreover, Africa has tropical climate in which it agrees with India in some respects.

The similarity and relationship between Indonesian, particularly Javanese, species and Indian species are expected because these regions and many other adjoining islands in the East Indies had a land connection with India through Malayan Archipelago. Indonesia, Thailand and Malaysia which belong to the Oriental realm have geographical and climatic conditions similar to those in India.

Now the question naturally crops up about Neotropical influence in the Oriental Region like India and how the species from South America and New Zealand have gained footing in India. Despite topographical differences striking similarities are observed between the species from South America and India. Several continental masses like peninsular India, Africa, South America and Oceania were more closely aggregated in late Palaeozoic time forming Gondwana land. Therefore, perhaps similarities and relationship occur between India, South America, Africa and New Zealand.

Most of the species recorded from the high altitude regions of Sikkim and Darjeeling agree with European species, some with the species from Japan, North America and Canada. Sikkim stands on the border line of the Oriental and Palaearctic realms. The climate of Sikkim, particularly concerning the temperature and the degree of moisture, is somewhat similar to that of Europe, Japan and other temperate regions due to the presence of the Great Himalayan Range which rears its mighty summits far beyond the limits of perpetual snow. Therefore, Palaearctic influence dominates in Sikkim and Darjeeling which agree in oribatid fauna with Europe, Japan, North America, Canada and other warm temperate to temperate regions of the earth.

The far and wide distribution of oribatid mites suggests that they are a very ancient group of animals presumably spread over large areas of the world before land mass became divided to form the present continents.

With our present state of knowledge of the oribatids of the vast Indian territory it will be too early to suggest how the country have been populated with the mites of this group. At present it is difficult to make a detailed discussion on the zoogeography as our knowledge of oribatids of the Indian subcontinent is still rather poor. A thorough faunistic survey of the soil oribatid mites should be undertaken in order to throw more light on the distribution of this group of mites in India and on world basis.
Table I. Distribution of Indian oribatid mites

<p>| Species                        | West Bengal | Orissa | Uttar Pradesh | Tamil Nadu | Sikkim | South America | Africa | New Zealand | Europe | North America | Canada | Japan | Egypt | Indonesia | Malaysia | Thailand | Tahiti | Fiji |
|--------------------------------|-------------|--------|--------------|------------|--------|---------------|--------|-------------|--------|--------------|--------|-------|-------|-----------|----------|----------|--------|------|-----|
| Eohypochthonius gracilis       |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Eohypochthonius vilhenarum     |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Malacochelaeia remigera        |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Malacochelaeia remigera indica |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Haplochthonius clavatus        |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Haplochthonius intermedius     |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Cosmochthonius bengalensis     |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Sphaerrochthonius transversus  |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Hoplophorella africana         |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Hoplophorella scapellata       |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Rhysotritia ardua              |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Rhysotritia pernensis          |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Epilohmannia cylindrica        |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Epilohmannia pallida pacifica  |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Annectacarus longistosus       |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Cryptacarus hirsus             |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Cryptacarus tuberculatus       |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Cryptacarus denticristosus     |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Haplacarus foliatus            |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Haplacarus foliatus bengalensis|             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Jaucaracarus kuehnelti         |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Papillacarus indicus           |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Papillacarus simplexistratus   |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Platynothrus pelifer           |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Trhypochthonius tectorum       |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Allonothrus indicus            |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Allonothrus monodactylus       |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Allonothrus russeolus          |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Archegozetes longisetosus      |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Archegozetes magna             |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Trimalaconothrus cajamarcensis |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Trimalaconothrus longirostrum  |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Cyrthermannia victiornauta      |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Cyrthermannia quadricornuta    |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Nanhermannia himalayensis      |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Masthermannia mammilaris       |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Hermannia convexa              |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Liodes (?) ocellatus           |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Plateresceus rotundus          |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Ommatocephalus ocellatus       |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Microzetes auxiliaris          |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Microzetes auxiliaris appalachicola |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Microzetes peruensis           |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Gustavia palmitiscent       |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Anerus speciosus               |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Evermulsus flagellifer         |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Evermulsus avenifer            |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Fosseremus quadripertitus      |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Cavabodes periculatus          |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Basitolbelba indica            |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Liacarus nigrescens            |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |
| Tectocephhus velatus           |             |        |              |            |        |               |        |             |        |              |        |       |       |           |          |          |        |      |     |</p>
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ACKNOWLEDGEMENTS

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* Not consulted in original.