

**STUDIES ON THE MOSS-INAHABITING
TERRESTRIAL INVERTEBRATE FAUNA OF
SCHIRMACHER OASIS, EAST ANTARCTICA
DURING THE XVII INDIAN SCIENTIFIC
EXPEDITION TO ANTARCTICA**

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Abstract

The studies on the exploration of the faunal diversity and ecology of the moss-inhabiting terrestrial invertebrate fauna of Schirmacher oasis, East Antarctica has been continued during the XVII Indian Scientific Expedition to Antarctica, 1997-98. All together 46 sites in and around 32 lakes or pools and 14 swampy areas scattered in the Schirmacher oasis were explored for the study of the invertebrate faunal diversity of the continental Antarctica particularly the Schirmacher Oasis.

Examination of the moss and soil samples collected during the present expedition so far reveals :

- (a) One species of Protozoa, viz., *Diffugia lucida* Penard recorded for the first time from the Antarctica,
- (b) Discovery of a new species of Nematodes which has been accommodated under a new subfamily including a new genus, viz. *Antarctilaiminae* and *Antarctilalmus* respectively and
- (c) Discovery of the three new species of mites, viz, *Haplochthonius antarcticus*, *H. maitri* and *H. longisetosus* under the family *Haplochthniidae*. This family of mites has also been recorded for the first time from Antarctica.

Introduction

Antarctica is the ice-buried continent that covers and surrounds the geographic south pole. It has an area of about 14 million Sq.Km. between the Antarctic circle (66.5° s) and the southpole. It contains approximately 90% of the world's ice and its ice sheet covers about 98% of the continent. The rest, almost 2% area of it, is ice free zone containing rocky surface of barren hills. There is a mountain range which is a continuous hilly range passing from the north to south direction dividing the continental Antarctica. There are a number of ice free hilly areas scattered in the continental Antarctica both dry and wet surrounded by land ice (polar ice) which are called "Oasis". Schirmacher Oasis (discovered in 1939) is one of the oasis located in between shelf and polar ice in the free zone of Queen Maud land in East Antarctica lying in latitude $70^{\circ}44'30''$ S to $70^{\circ}46'30''$ S and longitude $11^{\circ}20'40''$ E to $11^{\circ}54'00''$ E. It is almost 90 km. away from Prince Astrid coast. This Schirmacher Oasis has a length of about 20 km. and maximum width of 3.5 km. having an approximately 35 sq.km. of solid bedrock area. It contains a number of freshwater lakes or pools scattered throughout this oasis.

The elevation of this oasis ranges between 0 to 228 m with an average of about 100 m. The northern periphery of this hill range has an abrupt and steep fall towards the shelf ice. The southern periphery underlies the continental ice sheet which cascades down gently over the bedrock. A characteristic feature of the southern periphery is the presence of a number of glacier outlets, giving rise to about 12 predominant glacial lakes.

A review of the earlier literature reveals that the maritime zone (the northern part of the Antarctic Peninsula and associated islands, north to 60° S) and sub-Antarctic islands (45° S to 60° latitude) were more explored extensively than the continental Antarctica (from 60° latitude to southpole) particularly the Schirmacher Oasis. Somme (1985) has commented that the knowledge on Antarctic invertebrates is still fragmentary and more works on their taxonomy, Zoogeography, population and physiology are needed. The terrestrial invertebrate fauna of Schirmacher Oasis is known to be represented by Protozoa, Turbellaria, Nematoda,

Oligochaeta, Tardigrada, Rotifera, Acarina (Mites), Collembola (Springtail), Diptera and Lepidoptera following the works of Ingole and Parulekar (1987), Arif (1995) and Venkataraman (1998). The present study was undertaken to add to the so far known invertebrates and to discover their diversity of animal life of the Schirmacher Oasis.

Materials And Methods

(a) Study area : Samples were collected from the periphery of Epsilon Lake (this was the location of our field camp) about 8km. west of Maitri and Lake 55 (it is one of the glacial lakes of Schirmacher Oasis) about 2 km. west of Epsilon Lake and from the periphery of some other freshwater small lakes or pools nearby Epsilon and Lake 55 among the western side of Maitri. Samples were also collected from the periphery of Lake 27 (near the Russian station) about 4 km. east of Maitri and from the periphery of some small freshwater lakes or pools in between Maitri and the Lake 27 among the eastern side of Maitri. Besides eastern and western side of Maitri moss and soil samples were further collected from the periphery of the Zub Lake (Priyadarshini Lake, in front of Maitri)

(b) Collection and processing of moss and soil samples.

A total of 46 collection sites comprising 32 lakes and pools and 14 swampy areas distributed in the eastern and western side of Maitri of the above mentioned study area were explored during the Austral summer period of the XVII Indian Scientific Expedition of Antarctica. 83 packets of moss and soil samples were collected from the different localities of surrounding near by places of lakes, pools and adjoining areas and from the sides of the course of the flow of the melted water of the glaciers of the east, middle and west part of the Schirmacher Oasis.. The moss and soil samples were collected with the help of metal shovel and were kept in polythene packets. Soil samples were collected from inside the depth of approximately 5cm by the stainless steel corer. The packets containing moss or soil samples were properly closed with rubber bands and kept in a natural atmospheric temperature at Antarctica. During our return voyage to India these samples were kept in a refrigerator of our expedition ship to avoid desiccation. Some

freshly collected moss samples kept for 24 hrs. in half submerged condition in a beaker containing distilled water were examined under binocular microscope for observation of the living behaviour of different microscopic animals and for preparing slides of these animals. Some moss and soil samples were also extracted with the help of Tullgren soil extraction apparatus in the laboratory inside the summerhut on the Schirmacher Oasis. The remaining samples were processed for the isolation of the Mites, Springtail, Protozoa, Nematodes, Rotifers and Tardigrades in the laboratory of our institute. Separate standard method of preservation and isolation or extraction were followed for different groups of invertebrate fauna as given in the handbook of "Collection and Preservation of Animals" of the Zoological Survey of India.

Survey of the Invertebrate Animal Life In Schirmacher Oasis, East Antarctica

1. Protozoa : A large number of Protozoa are known to occur in most habitats on moss, peat, mineral soil and animal guano in Antarctica. 124 species of Protozoa has been recorded from the sub-Antarctic and Maritime Antarctic islands by Smith (1978). These are represented by 4 groups, viz, (i) Flagellates which have one or more filamentous structure, (ii) the naked Amoebae and (iii) the testate Amoebae that move about and capture food by pseudopodia and the mostly abundantly found (iv) the Ciliates which move by short hair-like structure called cilia covered all over their body.

But the fact is that the record of Protozoa from Schirmacher Oasis is almost scanty. Ingole and Parulekar (1987) were the first scientists who recorded Protozoa represented by one species of Ciliate, viz *Oxytricha fallax* Stein and that Protozoa is the dominating group of invertebrates consisting of 22.31% of the total lacustrine microfauna of Schirmacher Oasis Examination of moss sample collected by me has so far revealed the presence of 9 species of Protozoa consisting of 7 species of Rhizopods and 2 species of Ciliates. Among the Rhizopods *Diffugia lucida* Penard has been recorded for the first time from Antarctica. The rest of the species are common to the earlier collections from the Schirmacher Oasis. It has been found that the number of species decreases with

increasing latitude.

2. Nematodes : Nematodes are an extremely adapted and successful groups of microscopic animals, found almost everywhere in soil, plants, animals and dead organic matters in Antarctica. These are unsegmented roundworms with cylindrical bodies tapering towards both ends. Majority of the species are available in terrestrial and freshwater habitats. Antarctic nematodes were first discovered from Maritime zone by DeMan (1904) and from the sub-Antarctic zone by Jagerskiold (1905) It was Steinner (1961) who first discovered nematode from the continental Antarctica. Maslen (1979) is of opinion that approximately 70 species of nematodes are known from the continental, maritime and sub-Antarctic zones. Hazra (1994) has recorded 5 genera of Nematodes for the first time from the Schirmacher Oasis during the IX expedition.

Examination of soil and samples have revealed the presence of a species of Nematode new to Science under the family Leplonchidae which has been accommodated under a new genus, viz., *Antarctilaimus* and a new subfamily, viz., Antarctilaiminae. This new species will be described in detail with illustration separately. From a biogeographical point of view the Nematodes provide an interesting parallel to Antarctic terrestrial Arthropods, as the distribution of most of species is confined to certain zones.

3. Mites : These are mostly very small animals, some barely visible to naked eye but some of which reach 10 millimeter or more in length. They belongs to the order Acarina of the class Arachnida under Arthropoda. Majority of them are almost round or oval without division into head, throat or abdomen, but some have a structure dividing the body into anterior and posterior part. Some of them are quite grotesque. 528 species of Acarina are known from the Antarctica, Sub-Antarctica and the Southern Ocean (Pugh, 1993). Commonly found species are feather mites that are parasites on birds, and the nasal mites living in the noses of seals. Free living Antarctic mites belongs to the soft-bodies Prostigmatid mites and the hard-shelled Cryptostigmatid beetle mites.

Prostigmatid mites include some of the toughest terrestrial animals of the world inhabiting nunataks of the continental

Antarctica. One of them is **Nanorchestes antarcticus** which is one third of a millimeter long, found as far south as 85°S. Cryptostigmatid mites usually form clusters, and the Maritime species, *Alaskoztes antarcticus* is often found in dense aggregations consisting of hundreds or thousands of immature and adult specimens. During the XV expedition Mitra (with A. K. Sanyal and A. K. Bhattacharya) has recorded one new species of Astigmatic mite, viz. ***Tyrophagus antarcticus*** and its genus *Tyrophagus* has been recorded for the first time from the continental Antarctica specially from Schirmacher Oasis. Along with this new species Mitra has also recorded 2 Prostigmatic mites which belongs to the family Scutacaridae forming the first record of this family from the continental Antarctica particularly from Schirmacher Oasis.

During the XVII expedition 3 new species of Cryptostigmatid mites under the genus ***Haplochthonins*** and the family Haplochthonide have been recorded from the Schirmacher Oasis. These Species have been named. ***H. antarcticus***, ***H. maitri*** and ***H. Longisetosus*** and their family Haplochthonide has also been recorded for the first time from Antarctica.

Conclusion

The on going study on the moss-inhabiting terrestrial invertebrate fauna of Schirmacher Oasis, East Antarctica has so far revealed the presence of 6 groups of invertebrate animals viz, Protozoa, Nematoda, Rotifera, Tardigrada, Collembola and Mites. It has been observed that the species of Protozoa and Nematoda are largely represented from the most of the samples examined during the present investigation. Among the Protozoa the abundance of Ciliates has been observed in a large scale. Our studies and findings are limited only to the moss and soil of the accessible areas of the coastal line of the continental Antarctica during the Austral summer period in particular, about 150 km inside. A vast portion of the continental Antarctica has yet to be surveyed. It is, therefore, a difficult task to assess the diversity of species of animal life of the continental Antarctica with the present state of knowledge. But from the result so far achieved, it can be concluded that the moss-inhabiting invertebrates of the Schirmacher Oasis is mostly represented by 2 groups, viz, Protozoa and Nematoda. From these

observation it can be said that these two groups of animals are the most successful having the highest range of adaptability living in the most remote and unfavourable harsh environmental condition.

Finally it may be mentioned that the discovery of the so far species of animal life of the Schirmacher Oasis may be treated as the base line data and information, demanding a long term study on the diversity and ecology of Antarctic animal life.

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Fig. 1 Aerial View of portion of Schirmacher Oasis



Fig. 2 Aerial View of Schirmacher Oasis Priyadarshini Lake & Maitri in first week of Jan.98

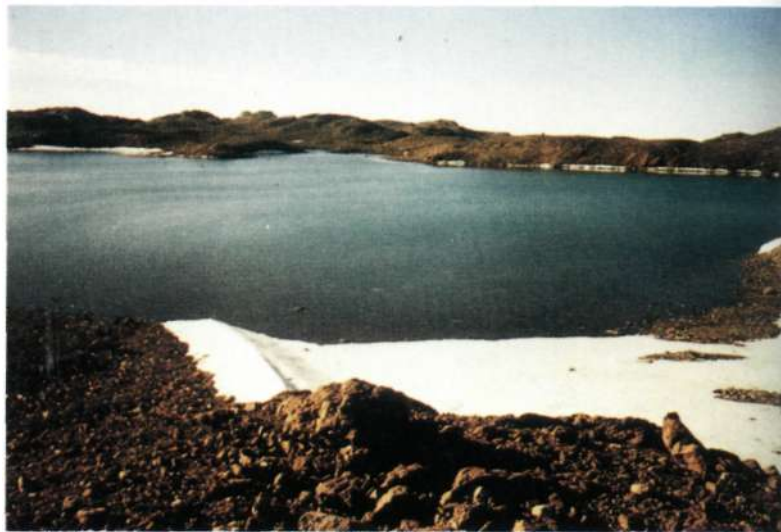


Fig. 3 A sample collection site - Priyadarshini Lake almost frozen in second week of Feb.98



Fig. 4
A sample collection site-view of middle portion of Lake Epsilon



Fig. 5 Field Camp near Lake Epsilon



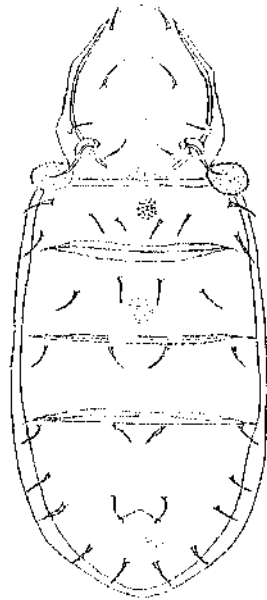
Fig. 6 A Sample collection site near Maitri



Fig. 7 A freshwater lake adjoining the Polar ice near Maitri

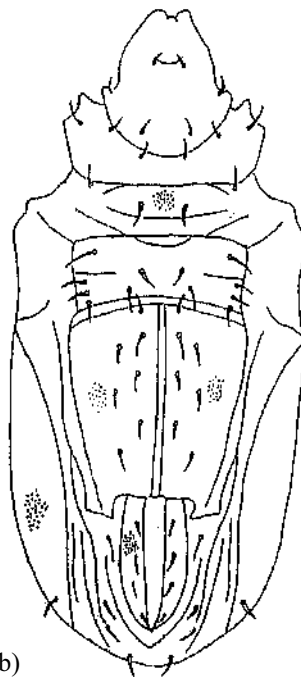


Fig. 8 A view of moss grown locality



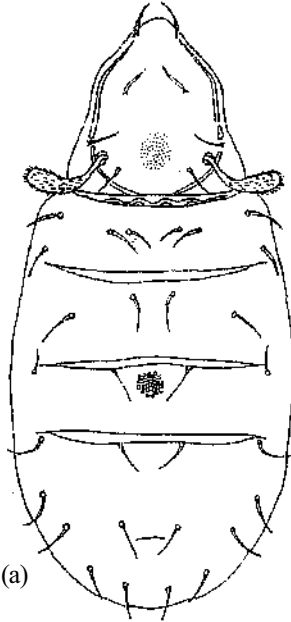
Haplochthomius antarcticus sp. nov.
an adult female-Dorsal view

Fig. 9 (a)



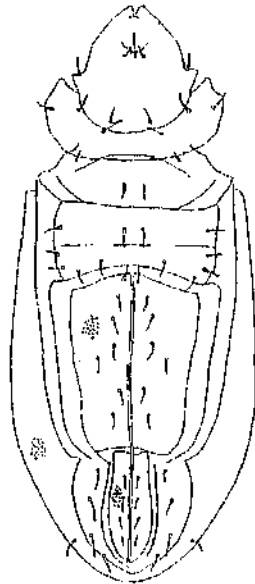
Ventral view of the
same Specimen

Fig. 9 (b)



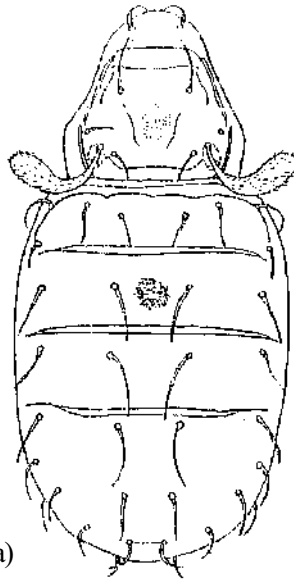
Haplochthonius maitri Sp. Nov.
an adult female - dorsal view

Fig. 10 (a)



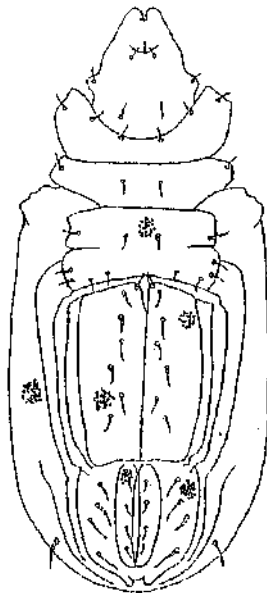
Ventral view of the
same Specimen

Fig. 10 (b)



Haplochthonius lowgiretosus
Sp. nov. an adult female
dorsal view

Fig. 11 (a)



Ventral view of
same specimen

Fig. 11 (b)