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Fauna of Uttarakhand (Part-3)



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(PART-3)

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FAUNA OF UTTARAKHAND

STATE FAUNA SERIES

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PROTOZOA : COCCIDIA

R. NANDI

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INTRODUCTION

Although several species of coccidian parasites of vertebrates were reported from Uttarakhand State, investigation on the parasitic protozoa of this state, in general, is very scanty (Mandal, 1987). These coccidian parasites were recorded mainly from Mukteswar, Nainital district and Kashipur, Udham Singh Nagar district of the state. Ray and Das Gupta (1937) was probably the first to examine the coccidian parasites in *Hemidactylus* sp., from Mukteswar (earlier Uttar Pradesh, now Uttarakhand State). Subsequently, H. N. Ray and his co-workers (1942-1952), D. K. Ray (1952) D. K. Ray *et al.* (1952a, b), Gill (1954, 1961) and Gill and Ray (1960) contributed to the study of coccidian parasites from this state.

Out of 13 districts of the state, 10 districts were surveyed during 2003 and 2006, and 14 species of coccidian parasites from reptiles, birds and mammals have been recorded. A systematic list of coccidian species recorded earlier including 14 species reported herein from the state is presented here under in Table-1 along with their host and locality.

MATERIALS AND METHODS

The collection of coccidian parasites have been made during the years 2003 and 2006, collecting faecal samples from the field, while some lizards were dissected and examined during the course of survey work. Faecal samples were kept in 2.5% aqueous potassium dichromate solution for subsequent sporulation. The details of collection and preservation of these parasites were followed from Mandal and Nandi (1980) and Mandal *et al.* (1990).

SYSTEMATIC LIST

The systematic list of coccidian species along with their host and locality of occurrence hitherto known/ recorded from the state of Uttarakhand is presented Table-1 as follows :

SYSTEMATIC ACCOUNT

Phylum APICOMPLEXA
Class SPOROZOEAE
Subclass COCCIDIA
Order EUCCIDIA
Suborder EIMERINA
Family EIMERIIDAE

Diagnosis : Monoxenous; schizogony and gametogony within host cells, and sporogony ordinarily occurring outside the host's body; oocysts and schizonts lack attachment organ; oocysts containing 0, 1, 2, 4, or many sporocysts, each containing one or more sporozoites.

Key to the genera

- 1(2) Tetrasporoblastic, tetrazoic oocysts *Wenyonella*
- 2(1) Disporoblastic, dizoic or tetrazoic oocysts 3
- 3(4) Two sporocysts, each with two sporozoites *Eimeria*
- 4(3) Two sporocysts, each with four sporozoites *Isospora*

Genus *Isospora* Schneider, 1881

1881. *Isospora* Schneider, Arch. Zool. Exp. Gen., 9, p. 389.

Diagnosis : Oocysts with two sporocysts, each sporocyst with four sporozoites; usually parasitic in vertebrates.

Key to the species of *Isospora* of reptiles

- 1(2) Oocysts irregular, 15.2-16.8 μm x 9.6-11.2 μm , parasitic in *Natrix platyceps*
 *I. dirumpens*
- 2(1) Oocysts spherical, 17.5-23.14 μm in diameter, parasitic in *Hemidactylus* sp.
 *I. knowlesi*

Key to the species of *Isospora* of birds

- 1(2) Oocyst with residuum; sporocyst pyriform
- A. Oocyst spherical or subspherical
- (i) Oocyst 22-28 μm in length, micropyle present, parasitic in Tit *I. parusi*
- (ii) Oocyst 20-22 μm in length, micropyle absent, parasitic in Jay *I. garrulae*
- (iii) Oocyst 15-23 μm in length, micropyle absent, parasitic in Crow *I. corviae*
- B. Oocyst oval or ovoid
- (i) Oocyst 25-27 μm in length, parasitic in Himalayan Jay *I. garrulusae*
- (ii) Oocyst 22-30 μm in length, parasitic in Flycatcher *I. scicercusae*
- 2(1) . Oocyst spherical to sub-spherical, without residuum, micropyle absent, sporocyst ovoid to pyriform, parasitic in Sparrow
 *I. lacazei*

A. *Isospora* of reptiles**1. *Isospora dirumpens* Hoare, 1933**

1933. *Isospora dirumpens* Hoare, *Parasitology*, 25 : 359.

1987. *Isospora dirumpens*: Mandal: *Fauna of India: Protozoa: Sporozoa : Eucoccidiida : Eimeriidae*, Zoological Survey of India, Calcutta, p. 48.

Diagnosis : Oocyst ellipsoidal, 15.2-16.8 μm x 9.6-11.2 μm , thin walled, without any structure at the pole; sporocyst elongated, 10.4-11.2 μm x 8-9 μm ; sporozoite elongated, 7 μm in length, with one end tapering.

Host : Grass snake, *Natrix platyceps* (Blyth); site of infection : intestine.

Distribution : India : Uttarakhand (Mukteswar).

Elsewhere : Uganda, Africa.

Remarks : Ray and Singh (1948) reported this species from this state.

2. *Isospora knowlesi* Ray and Das Gupta, 1937

1937. *Isospora knowlesi* Ray and Das Gupta, *Arch. Protistenk.*, 88, p. 369.

1987. *Isospora knowlesi* : Mandal : *Fauna of India: Protozoa : Sporozoa : Eucoccidiida : Eimeriidae*, Zoological Survey of India, Calcutta, p. 49.

Material examined : Sev. exs., Haridwar, 16.ix.03, R. Nandi

Diagnosis : Oocyst spherical, 17-23 (21.7) μm in diameter, without residuum and micropyle, double layered; sporocyst ellipsoidal 12-15 (14.3) μm , shape index 1.7; sporozoites elongated, 10-13 μm , tapering at one end.

Host : House lizard *Hemidactylus* sp.; site of infection : intestine.

Distribution : India : Uttarakhand (Haridwar), West Bengal.

Remarks : This species is reported herein for the first time from House lizard, *Hemidactylus* sp. of this state.

B. *Isospora* of birds**3. *Isospora corviae* Ray, Shivani,**

Oommen and Bhaskaran, 1952

1952. *Isospora corviae* Ray, Shivani, Oommen and Bhaskaran, *Proc. Zool. Soc. Calcutta*, 5 : 141.

Material examined : Sev. exs., Dehradun, 04.ix.03, R. Nandi.

Diagnosis : Oocyst subspherical to spherical, 15-23 (20) μm x 14.0-21.5 (17.7) μm , shape index 1.1, micropyle absent, oocyst residuum present; sporocyst pyriform, 7.5-12.5 (10.8) μm x 6.2-8.7 (7.7) μm , shape index 1.3, sporocystic residuum present; sporozoite elongated, 7.9- 9.9 μm in length.

Host : Jungle Crow, *Corvus macrorhynchus*; site of infection : intestine.

Distribution : India : Uttarakhand (Dehradun) and Meghalaya.

Remarks : Ray *et al.* (1952) described this species from this state. The species is recorded herein from Jungle Crow, *Corvus macrorhynchus* at Dehradun, Uttarakhand.

**4. *Isospora garrulae* Ray, Shivani,
Oommen and Bhaskaran, 1952**

1952. *Isospora garrulae* Ray, Shivani, Oommen and Bhaskaran, *Proc. Zool. Soc. Calcutta*, 5 : 141.

Diagnosis : Oocyst spherical to subspherical, 20-22 (21) μm x 17.0-21.25 (19.75) μm , shape index 1.05, micropyle absent, oocystic residuum present; sporocyst pyriform, 10.0-15.5 (13.4) μm x 6.2-8.7 (7.7) μm , shape index 1.5, a knob present at the anterior end, sporocystic residuum present; sporozoite elongated, 9.3 μm in length.

Host : *Garrulax lineatus lineatus*; site of infection : intestine.

Distribution : India : Uttarakhand (Mukteswar) and Meghalaya.

Remarks : Ray *et al.* (1952) described this species from this state.

**5. *Isospora garrulusae* Ray, Shivani,
Oommen and Bhaskaran, 1952**

1952. *Isospora garrulusae* Ray, Shivani, Oommen and Bhaskaran, *Proc. Zool. Soc. Calcutta*, 5 : 141.

Diagnosis : Oocyst oval to subspherical, 25-27.5 (25.2) μm x 20.0-25.0 (21.0) μm , shape index 1.1, micropyle, oocystic residuum and polar granule present; sporocyst pear-shaped, 12.5-17.5 (16.0) μm x 7.5-10.0 (9.6) μm , shape index 1.6, sporocystic residuum present; sporozoite elongated, 8.3 μm in length.

Host : *Garrulus glandarieus bispecularis*; site of infection : intestine

Distribution : India : Uttarakhand (Mukteswar) and Meghalaya.

Remarks : Ray *et al.* (1952) described this species from this state.

6. *Isospora lacazei* (Labbe, 1893)

1893. *Diplospora lacazei* Labbe, *C. r. heb. Seanc. Acad. Sci.*, Paris, 117 : 407.

1893. *Isospora lacazei* Labbe, *C. r. heb. Seanc. Acad. Sci.*, Paris, 117 : 407.

1987. *Isospora lacazei* : Mandal: *Fauna of India: Protozoa: Sporozoa : Eucoccidiida : Eimeriidae*, Zoological Survey of India, Calcutta, p. 69.

Material examined : Sev. exs., Haridwar, 16.ix.03, and 4.vi.06, R. Nandi.

Diagnosis : Oocyst spherical or subspherical, 24-32 (26.8) μm x 20-30 (27.4) μm , double walled, micropyle and oocystic residuum absent; sporocyst ovoid to pyriform, 14-22 (17.2) μm x 10-11 (10.3) μm , with a button-shaped plug at the narrow anterior end, sporocystic residuum present; sporozoite bean-shaped, 8.5 μm x 2.3 μm in size.

Host : Sparrow, *Passer domesticus*; site of infection : intestine.

Distribution : India : Uttarakhand (Haridwar); Andhra Pradesh, West Bengal; cosmopolitan in distribution.

Remarks : This species is recorded herein for the first time from House sparrow, *Passer domesticus* of this state.

**7. *Isospora parusi* Ray, Shivani,
Oommen and Bhaskaran, 1952**

1952. *Isospora parusi* Ray, Shivani, Oommen and Bhaskaran, *Proc. zool. Soc. Calcutta*, 5 : 141.

1987. *Isospora parusi* : Mandal : *Fauna of India : Protozoa : Sporozoa : Eucoccidiida : Eimeriidae*, Zoological Survey of India, Calcutta, p. 78.

Diagnosis : Oocysts oval to subspherical, 22.5-27.5 (24.16) μm x 17.4-26.6 (21.84) μm , with both ends rounded; oocyst double-layered, micropyle present; oocystic residuum in two granules; sporocyst pyriform, 10.0-17.5 (15.0) μm x 10.0 μm , with a small plug-like stieda body, sporocystic residuum present; sporozoite elongated 9.5 μm in length.

Host : Brown crested Tit, *Parus dichrurus* (Hodgson.); site of infection : intestine.

Distribution : India : Uttarakhand (Mukteswar).

Remarks : Ray *et al.* (1952) described this species from this state.

**8. *Isospora scircusae* Ray, Shivani, Oommen
and Bhaskaran, 1952**

1952. *Isospora scircusae* Ray, Shivani, Oommen and Bhaskaran, *Proc. Zool. Soc. Calcutta*, 5 : 141.

1987. *Isospora scircusae* : Mandal : *Fauna of India* : Protozoa : Sporozoa : Eucoccidiida : Eimeriidae, Zoological Survey of India, Calcutta, p. 83.

Diagnosis : Oocysts spherical to subspherical, 22.5-30.0 (24.8) μm x 20.5-25.0 (23.2) μm , shape index 1.06, double-layered, micropyle and oocystic residuum present; sporocyst pear-shaped, 10.0-17.5 (14.2) μm x 8.7-11.2 (10.3) μm , shape index 1.3, sporocystic residuum present; sporozoite elongated 8.5-9.7 μm in length.

Host : *Scircus xanthoschistos* (Gray); site of infection : intestine.

Distribution : India : Uttarakhand (Mukteswar).

Remarks : Ray *et al.* (1952) described this species from this state.

C. *Isospora* of mammals

9. *Isospora felis* (Wasilewsky, 1904)

1904. *Diplospora bigemina* Wasielewsky (partim), *Stuien und Mikrophotogramme zur Kenntnis der pathogenen Protozoen*, Leipzig.

1923. *Isospora felis* Wenyon, *Ann. Trop. Med. Parasit.*, 17 : 231.

1987. *Isospora felis* : Mandal : *Fauna of India* : Protozoa : Sporozoa : Eucoccidiida : Eimeriidae, Zoological Survey of India, Calcutta, p. 82.

Material examined : Sev. exs., Uttar Kashi, 17.ix.03, R. Nandi

Diagnosis : Oocyst ovoid, measuring 32-53 (43) μm x 26-43 (33) μm in dimension, smooth walled, colourless, without a micropyle, polar granule and oocystic residuum; sporocyst ellipsoidal, 20-27 μm x 18-21 μm , sporocyst residuum present; sporozoite 10-15 μm long.

Host : Domestic cat; site of infection: intestine (faeces).

Distribution : India : Uttarakhand (Uttar Kashi), Andhra Pradesh, Tamil Nadu, Uttar Pradesh, West Bengal.

Remarks : This species is reported herein for the first time from Domestic cat, *Felis* sp., of this state.

Genus *Eimeria* Schneider, 1875

1875. *Eimeria* Schneider, *Arch. Zool. Exp. Gen.*, 4 : 473.

Diagnosis : Each oocyst with 4 sporocysts, each sporocyst with two sporozoites; merogony intracellular; parasitic in vertebrates and only in a few invertebrates.

Key to the species of *Eimeria* of reptiles

- 1(2) Oocyst spherical or oval, 16-20 μm in length, sporocyst ovoid, parasitic in House lizard ..
..... *E. knowlesi*
- 2(1) Oocyst oval, 17-21 μm in length, sporocyst spherical, parasitic in Skink *E. minetti*

Key to the species of *Eimeria* of birds

- 1(2) Oocyst wall striated, micropyle present
..... *E. tenella*
- 2(1) Oocyst wall smooth
- 3(4) Oocyst kidney-shaped
..... *E. sphenocercae*
- 4(3) Oocyst not kidney-shaped, but ellipsoidal, parasit in Turkey *E. meleagridis*
- 5(4) Oocyst not ellipsoidal
 - (i) Oocyst subspherical, 14-17 μm in length, parasit in Pigeon *E. columbae*
 - (ii) Oocyst broad-ovoid, 15-23 (20) μm in length, parasitic in Domestic fowl *E. necatrix*
 - (iii) Oocyst almost spherical, 12-20 (17) μm in length, parasitic in Domestic fowl
..... *E. mitis*
 - (iv) Oocyst spherical to elliptical, 17-24 (21) μm in length, parasitic in Domestic fowl
..... *E. praecox*
 - (v) Oocyst broadly ovoid, 15-20 (19) μm in length, parasitic in Domestic fowl
..... *E. hagini*

Key to the species of *Eimeria* of mammals

- 1(9) Oocystic wall double layered
- 2(8) Micropyle present
- 3(6) Micropyle with micropylar cap
- 4(5) Oocyst elongate ellipsoidal, micropyle with a crescent-shaped micropylar cap
..... *E. arloingi*

- 5(4) Oocyst flask-shaped, pseudo micropyle forming a transparent micropylar cap
..... *E. petauristae*
- 6(3) Micropyle without micropylar cap,
- 7(8) Oocystic residuum absent
- (i) Oocyst broadly ovoid, 25-33 (28) μm in length, parasitic in Cattle *E. bovis*
- (ii) Oocyst ovoid, 31-43 (38) μm in length, parasitic in hare and rabbit
..... *E. irresidua*
- (iii) Oocyst ovoid, 27-36 (31) μm in length, parasitic in hare and rabbit *E. media*
- (iv) Oocyst ovoid to ellipsoidal, 26-40 (35.7) μm in length, parasitic in hare and rabbit
..... *E. stiedai*
- 8(7) Oocystic residuum present
- (i) Oocyst ovoid to ellipsoidal, 33-44 (39) μm in length, parasitic in hare and rabbit
..... *E. robertsoni*
- (ii) Oocyst cylindrical, 28-35 μm in length, parasitic in hare *E. ruficaudati*
- (iii) Oocyst ovoid or elongated 21-39 (31) μm in length, parasitic in hare and rabbit
..... *E. sylvilagi*
- 8(2) Micropyle absent
- (i) Oocyst spherical to ovoidal, 14-22 (17) μm in length, parasitic in cattle *E. zuernii*
- (ii) Oocyst ellipsoidal to ovoid, 20-29 (24.2) μm in length, parasitic in Pig *E. deblickei*
- (iii) Oocyst Ovoid to ellipsoidal, 17-32 (20) μm in length, parasitic in hare and rabbit
..... *E. perforans*
- 9(1) Oocyst wall not double layered
- (i) Oocyst spherical to oval, 17-23 (20) μm in length, micropyle with a micropylar cap present, parasitic in sheep and goat
..... *E. crandallis*
- (ii) Oocyst egg-shaped, 23.8-38.4 (29.5) μm in length, micropyle at the narrower end without any cap, parasitic in sheep and goat
..... *E. faurei*

A. *Eimeria* in amphibians

10. *Eimeria himalayana* Ray and Misra, 1942

1942. *Eimeria himalayana* Ray and Misra, *Proc. Indian Sci. Congr.*, p. 143.

Diagnosis : Oocysts round-oval, 7.5-10.5 (9.2) μm , without micropyle and residuum; sporocysts naviculoid, 4.5 x 6.5 (5.5) μm , with globular residuum; sporozoites club-shaped, 3.8-4.5 μm in length.

Host : Himalayan Toad, *Bufo himalayanus*; site of infection : gut.

Distribution : India : Uttarakhand (Mukteswar).

Remarks : Ray and Misra (1943) described this species from this state.

B. *Eimeria* of reptiles

11. *Eimeria knowlesi* Bhatia, 1936

1936. *Eimeria knowlesi* Bhatia, *Curr. Sci.*, 5 : 177.

Material examined : Sev. exs., Dehradun, 06.vi.06, R. Nandi

Diagnosis : Oocysts spherical or oval, 16.5-20.5 (18.5) μm x 14.5-18.5 (16.5) μm , double-layered, without any micropyle and residuum; sporocysts ovoid, 9.00-11.00 (10.0) μm x 7.5-8.5 (7.9) μm ; sporocystic residuum present; sporozoite elongated, 7.2 μm in length.

Host : House Lizard *Hemidactylus* sp.; site of infection : intestine.

Distribution : India : Uttarakhand (Dehradun), Andhra Pradesh, West Bengal.

Remarks : This species is reported herein for the first time from this state.

12. *Eimeria minetti* Ray, Raghavachari and Sapre, 1942

1942. *Eimeria minetti* Ray, Raghavachari and Sapre, *Proc. Indian Sci. Congr.*, p.170.

1987. *Eimeria columbae* : Mandal : *Fauna of India* : Protozoa : Sporozoa : Eucoccidiida : Eimeriidae, *Zoological Survey of India, Calcutta*, p. 176.

Diagnosis : Oocysts oval, 17.5-21.5 (19.5) μm x 12.5-14.5 (15.5) μm , shape index 1.2, double-layered, without micropyle and residuum; sporocysts spherical, 7.5-9.5 (8.5) μm , sporocystic residuum granular; sporozoite circular in shape.

Host : Skink *Mabuya* sp.; site of infection : intestine.

Distribution : India : Uttarakhand (Mukteswar).

Remarks : Ray *et al.* (1942) reported this species from this state.

C. *Eimeria* of birds

13. *Eimeria columbae* Mitra and Das gupta, 1937

1937. *Eimeria columbae* Mitra and Das Gupta, *Proc. Indian Sci. Congr.*, p. 291.

1987. *Eimeria columbae* : Mandal : *Fauna of India : Protozoa : Sporozoa : Eucoccidiida : Eimeriidae*, Zoological Survey of India, Calcutta, p. 176.

Material examined : Sev. exs., Ranikhet, 25.v.06, R. Nandi.

Diagnosis : Oocyst subspherical, 14.5-17.5 (16.5) μm x 13.5-15.5 (14.5) μm , shape index 1.14, double walled, micropyle absent, oocystic residuum present; sporocyst ellipsoidal, 6.5-8.5 (7.3) μm x 3.5-5.8(4.6) μm , shape index 1.6, without any knob, sporocystic residuum present as scattered mass; sporozoites curved with one end pointed.

Host : Domestic Pigeon, *Columba livia*; site of infection : intestine.

Distribution : India : Uttarakhand (Ranikhet), Andhra Pradesh, Orissa, West Bengal.

Remarks : This species is reported herein for the first time from Domestic Pigeon, *Columba livia* of this state.

14. *Eimeria hagini* Levine, 1938

1938. *Eimeria hagini* Levine, *cornell Vet.*, **28** : 263

1987. *Eimeria hagini* : Mandal : *Fauna of India : Protozoa : Sporozoa : Eucoccidiida : Eimeriidae*, Zoological Survey of India, Calcutta, p. 188.

Diagnosis : Oocyst broadly ovoid with smooth double contoured wall, measuring 15.8-20.9 (19.1) μm x 14.3-19.5 (17.6) μm , micropyle absent, polar granule present.

Host : Domestic fowl, *Gallus domesticus*; site of infection : intestine.

Distribution : India : Uttarakhand (Mukteswar), Orissa, Madhya Pradesh and Maharashtra.

Remarks : Gill (1954) reported this species from this state.

15. *Eimeria meleagridis* Tyzzer, 1927

1927. *Eimeria meleagridis* Tyzzer, *J. Parasit.*, **13** : 215.

1987. *Eimeria meleagridis* : Mandal : *Fauna of India : Protozoa : Sporozoa : Eucoccidiida : Eimeriidae*, Zoological Survey of India, Calcutta, p. 197.

Diagnosis : Oocyst ellipsoidal, 19.0-29.7 (23.8) x 14.5-23.0 (17.3), smooth-walled, with one or two polar granules, oocystic residuum absent; sporocyst with a stieda body, sporocystic residuum present.

Host : Domestic turkey, *Meleagris gallopavo*; site of infection : intestine.

Distribution : India : Uttarakhand (Mukteswar), Uttar Pradesh, Delhi.

Remarks : Gill (1954) reported this species from this state.

16. *Eimeria mitis* Tyzzer, 1929

1929. *Eimeria mitis* Tyzzer, *Am. J. Hyg.*, **10**, p. 169.

Diagnosis : Oocyst almost spherical, 12.3-20.7 (17.0) μm x 10.7-19.2 (15.0) μm , shape index 1.1 smooth-walled, polar granules present, oocystic residuum and micropyle absent; sporocyst ovoid, 9-10 μm x 6.5 μm , with a prominent stieda body, sporocystic residuum granular present centrally.

Host : Domestic fowl, *Gallus domesticus*; site of infection : intestine.

Distribution : India : Uttarakhand (Mukteswar), Madhya Pradesh, Orissa, Tamil Nadu and Maharashtra.

Remarks : Gill (1954) reported this species from this state.

17. *Eimeria necatrix* Johnson, 1930

1930. *Eimeria necatrix* Johnson, *Ore. Agric. Expt. St.*, p. 119.

1987. *Eimeria necatrix* : Mandal : *Fauna of India : Protozoa : Sporozoa : Eucoccidiida : Eimeriidae*, Zoological Survey of India, Calcutta, p. 203.

Material examined : Sev. exs., Ranikhet district, 26.v.06, R. Nandi; sev. exs., Rudrapur, Udham Singh Nagar district, 21.v.06, R. Nandi.

Diagnosis : Oocyst broad ovoid, 15.3-23.3 (20.5) μm x 13.6-20.2 (16.8) μm ; shape index 1.0-

1.6 (1.26), one end less pointed, oocyst wall smooth and double contoured, micropyle and oocystic residuum absent; sporocysts elongated, 10 µm x 6 µm, a polar body present.

Host : Domestic Fowl, *Gallus domesticus*; site of infection : intestine.

Distribution : India : Uttarakhand (Ranikhet, Rudrapur, Mukteswar), Andhra Pradesh, Uttar Pradesh, Tamil Nadu.

Elsewhere : Bangladesh, cosmopolitan.

Remarks : This species is reported herein for the second time from Domestic Fowl of this state.

18. *Eimeria praecox* Johnson, 1930

1930. *Eimeria praecox* Johnson, *Ore. Agric. Expt. St.*, p. 119.

1987. *Eimeria praecox* : Mandal : *Fauna of India : Protozoa : Sporozoa : Eucoccidiida : Eimeriidae*, Zoological Survey of India, Calcutta, p. 208.

Material examined : Sev. exs., Ranikhet, 26.v.03, R. Nandi.

Diagnosis : Oocyst spherical to elliptical, 17.7-24.4 (21.2) µm x 13.8-19.2 (15.6) µm; shape index 1.1-1.6 (1.3), micropyle indistinct, polar granule present and oocystic residuum absent; sporocysts elongated to ovoid in shape.

Host : Domestic Fowl, *Gallus domesticus*; site of infection : intestine.

Distribution : India : Uttarakhand (Ranikhet) Madhya Pradesh, Uttar Pradesh and Maharashtra.

Remarks : This species is reported herein for the first time from this state.

19. *Eimeria sphenocercae* Ray, 1952

1952. *Eimeria sphenocercae* Ray, *J. Parasit.*, **38** : 546.

1987. *Eimeria necatrix* : Mandal : *Fauna of India : Protozoa : Sporozoa : Eucoccidiida : Eimeriidae*, Zoological Survey of India, Calcutta, p. 211.

Diagnosis : Oocystic kidney-shaped, 17.5-25.0 (19.1) µm x 12.5-15.0 (12.6) µm, micropyle present; sporocystic broadly oval, 17.5-18.5 µm x 12.5-13.5 µm, sporocystic residuum present.

Host : Kokla green pigeon, *Sphenocercus sphenurus*; site of infection : intestine.

Distribution : India : Uttarakhand (Mukteswar).

Remarks : Ray (1952) reported this species from this state.

20. *Eimeria tenella* (Railliet and Lucet, 1891)

1891. *Eimeria avium* auct., *Coccidium tenellum* Railliet and Lucet, *Bull. Soc. Zool. Fr.*, **16** : 246.

1987. *Eimeria tenella* : Mandal : *Fauna of India : Protozoa : Sporozoa : Eucoccidiida : Eimeriidae*, Zoological Survey of India, Calcutta, p. 213.

Diagnosis : Oocyst broad-ovoid, 19.2-26 µm x 16-22 µm, oocystic wall striated, micropyle present; sporocyst measuring 11 µm x 7 µm, stieda body present; sporozoites elongated banana-shaped, 5-8 µm.

Host : Domestic Fowl, *Gallus domesticus*; site of infection : intestine.

Distribution : India : Uttarakhand (Mukteswar), Andhra Pradesh, Uttar Pradesh, Madhya Pradesh, Tamil Nadu, West Bengal.

Elsewhere : cosmopolitan.

Remarks : Ray (1945) reported this species from this state.

D. *Eimeria* of mammals

21. *Eimeria arloingi* (Marotel, 1905)

1905. *Coccidium arloingi* Marotel, *Rec. Med. Vet.*, **33** : 243.

1987. *Eimeria arloingi* : Mandal : *Fauna of India : Protozoa : Sporozoa : Eucoccidiida : Eimeriidae*, Zoological Survey of India, Calcutta, p. 229.

Material examined : Sev. exs., Haridwar, 04.vi.06, R. Nandi.

Diagnosis : Oocyst elongate ellipsoidal, asymmetrical or slightly ovoid, 17-42 (27) µm x 13-27 (18) µm, oocyst double layered, micropyle with a crescent-shaped micropylar cap present, a polar granule present, oocystic residuum absent; sporocyst elongate ovoid, 11-17 µm x 6-10 µm, stieda body absent or vestigial, sporocystic residuum present; sporozoite elongated.

Host : Domestic goat, *Capra hircus*; site of infection : intestine.

Distribution : India : Uttarakhand (Haridwar), Andhra Pradesh, Madhya Pradesh, Punjab, Uttar Pradesh, Maharashtra, Bihar, West Bengal.

Elsewhere : cosmopolitan.

Remarks : This species is reported herein for the first time from Domestic goat, *Capra hircus* of this state.

22. *Eimeria bovis* (Zublin, 1908)

1908. *Coccidium bovis* Zublin (in partim), *Schweizer. Arch. Treiherlk.*, 50 : 123.

1987. *Eimeria bovis* : Mandal : *Fauna of India : Protozoa : Sporozoa : Eucoccidiida : Eimeriidae*, Zoological Survey of India, Calcutta, p. 239.

Material examined : Sev. exs., Haridwar, 16.ix.03, R. Nandi; sev. exs., Dehradun, 06.vi.06, R. Nandi.

Diagnosis : Oocyst broadly ovoid, 23-33 (28) μm x 15-26 (21) μm , smooth walled, double layered, micropylar cap, polar granule and oocystic residuum absent; sporocyst elongate ovoid, 15-17 μm x 6-7 μm , stieda body and sporocystic residuum present; sporozoite elongated, banana-shaped, 13 μm x 3 μm , with two refractile granules.

Host : Cow, *Bos indicus*; Buffalo, *Bubalus bubalis* Linn.; site of infection : intestine.

Distribution : India : Uttarakhand (Haridwar, Dehradun), Andhra Pradesh, Haryana, Uttar Pradesh, Maharashtra, Bihar.

Elsewhere : cosmopolitan.

Remarks : This species is reported herein for the first time from Domestic cow, *Bos indicus* of this state.

23. *Eimeria crandallis* Honess, 1942

1942. *Eimeria crandallis* Honess, *Univ. Wyo. Agric. Expt. Sta.*, 249 : 3.

1987. *Eimeria crandallis* : Mandal : *Fauna of India : Protozoa : Sporozoa : Eucoccidiida : Eimeriidae*, Zoological Survey of India, Calcutta, p. 258.

Material examined : Sev. exs., Dehradun, 04.ix.03, R. Nandi; sev. exs. Rudrapur, 22.v.06, R. Nandi.

Diagnosis : Oocyst spherical to broadly ellipsoidal to ovoid, 17-23 (21.9) μm x 17-22 (19.4) μm , a micropyle and micropylar cap present,

oocystic residuum absent; sporocyst ovoid, 8-11 μm x 5-8 μm , stieda body absent, sporocystic residuum usually present; sporozoite with one or two clear globules.

Host : Domestic sheep, *Ovis aries* site of infection: intestine.

Distribution : India : Uttarakhand (Dehradun, Rudrapur), Andhra Pradesh, Kashmir, Haryana, Uttar Pradesh, Madhya Pradesh, Maharashtra, Tamil Nadu, Bihar, Orissa, West Bengal.

Elsewhere : Syria, Turkey, Poland, U.K., U.S.A.

Remarks : This species is reported herein for the first time from Domestic sheep, *Ovis* sp., of this state.

24. *Eimeria deblickei* Douwes, 1921

1921. *Eimeria deblickei* Douwes, *Bijdrage tot de kennis van enkele darmprotozoen der huisdieren in het bijzonder bij schaap en varken*, Diss., Utrecht, p. 62.

1987. *Eimeria deblickei* : Mandal : *Fauna of India : Protozoa : Sporozoa : Eucoccidiida : Eimeriidae*, Zoological Survey of India, Calcutta, p. 264.

Material examined : Sev. exs., Dehradun, 06.vi.06, R. Nandi

Diagnosis : Oocyst ovoid to ellipsoidal or spherical, 13-29 μm x 13-19 μm , smooth walled, double layered, micropyle, polar granule and oocyst residuum absent; sporocyst ellipsoidal or ovoid, 14-18 μm x 6-8 μm , stieda body and sporocyst residuum present; sporozoite elongated with two clear globules.

Host : Domestic pig, *Sus scrofa*; site of infection: intestine.

Distribution : India : Uttarakhand (Dehradun), Andhra Pradesh, Haryana, Madhya Pradesh and Uttar Pradesh.

Elsewhere : Cosmopolitan.

Remarks : This species is reported herein for the first time from domestic pig, *Sus scrofa* of this state.

25. *Eimeria faurei* (Moussu and Marotel, 1902)

1902. *Coccidium faurei* Moussu and Marotel, *Arch. Parasit.*, 6 : 82.

1987. *Eimeria faurei* : Mandal : *Fauna of India : Protozoa : Sporozoa : Eucoccidiida : Eimeriidae*, Zoological Survey of India, Calcutta, p. 269.

Material examined : Sev. exs., Rudrapur, 22.v.06, R. Nandi.

Diagnosis : Oocyst ovoid, 25-35 (28.9) μm x 18-24 (21.0) μm , with a conspicuous micropyle, oocyst residuum absent, polar granule present; sporocyst ellipsoidal, 15-17 μm x 8-10 μm , sporocyst residuum scattered, stieda body absent; sporozoite elongated.

Host : Domestic sheep, *Ovis aries*; site of infection : intestine.

Distribution : India : Uttarakhand (Rudrapur), Andhra Pradesh, Punjab, Haryana, Maharashtra, Madhya Pradesh, Uttar Pradesh, Orissa, West Bengal.

Remarks : This species is reported herein for the first time from Domestic sheep, *Ovis* sp., this state.

26. *Eimeria irresidua* Kessel and Jankiewicz, 1931

1931. *Eimeria irresidua* Kessel and Jankiewicz, *Am. J.H yg.*, 14 : 304.

1987. *Eimeria irresidua*: Mandal: *Fauna of India: Protozoa: Sporozoa: Eucoccidiida: Eimeriidae*, Zoological Survey of India, Calcutta, p. 279.

Diagnosis : Oocyst ovoid, 31-43 (38.8) μm x 22-27 (25.6) μm , micropyle present, oocystic residuum absent; sporocyst 181 μm x 9 μm ; sporozoite with large refractile granule.

Host : Domestic rabbit, *Oryctolagus* sp.; site of infection: intestine.

Distribution : India : Uttarakhand (Mukteswar, Kashipur) and Punjab.

Remarks : Ray (1945) Gill and Ray (1960) reported species from this state.

27. *Eimeria media* Kessel, 1929

1929. *Eimeria media* Kessel, *J. Parasit.*, 16 : 100.

1987. *Eimeria media* : Mandal : *Fauna of India : Protozoa : Sporozoa : Eucoccidiida : Eimeriidae*, Zoological Survey of India, Calcutta, p. 289.

Diagnosis : Oocyst ovoid, 27-36 (31.2) μm x 15-22 (18.5) μm , oocyst wall pinkish, micropyle and oocyst residuum present; sporocyst ovoidal, with a small round or sporocystic residuum; sporozoite with a medium-sized refractile globule.

Host : Domestic rabbit, *Oryctolagus* sp.; site of infection : intestine.

Distribution : India : Uttarakhand (Mukeswar, Kashipur) and Punjab.

Remarks : Gill and Ray (1960) this species from this state.

28. *Eimeria perforans* (Leuckart, 1879)

1987. *Eimeria perforans* : Mandal : *Fauna of India : Protozoa : Sporozoa : Eucoccidiida : Eimeriidae*, Zoological Survey of India, Calcutta, p. 308.

Diagnosis : Oocyst ovoid to ellipsoidal, 17-32 (20.2) μm x 12.5-19.5 (15.) μm , oocyst residuum present; sporocyst ovoid 7.7 μm x 3.7 μm , sporocystic residuum indistinctly present; sporozoite with medium-sized refractile granule.

Host : Domestic rabbit, *Oryctolagus* sp.; site of infection : intestine.

Distribution : India : Uttarakhand (Mukteswar, Kashipur) and Punjab.

Remarks : Gill and Ray (1960) reported this species from this state.

29. *Eimeria petauristae* Ray and Singh, 1950

1950. *Eimeria petauristae* Ray and Singh, *Proc. Zool. Soc Calcutta*, 3 : 65.

1987. *Eimeria ninakholyakimovae* : Mandal : *Fauna of India : Protozoa : Sporozoa : Eucoccidiida : Eimeriidae*, Zoological Survey of India, Calcutta, p. 312.

Diagnosis : Oocyst flask-shaped, 46.5-52.5 (49.0) μm x 35-40 (37) μm , pseudo-micropyle present, small oocyst residuum present, polar granule absent; sporocyst naviculoid, 25.5-31.2 (28) μm x 8.7-10 (9) μm , sporocyst residuum present, stieda body absent; sporozoite club-shaped with a vacuole at either end.

Host : Common giant flying squirrel, *Petaurista inornatus*; site of infection: intestine.

Distribution : India : Uttarakhand (Mukteswar).

Remarks : Ray and Singh (1952) reported this species was reported from this state.

30. *Eimeria robertsoni* (Madsen, 1938)

1987. *Eimeria robertsoni* : Mandal : *Fauna of India : Protozoa : Sporozoa : Eucoccidiida : Eimeriidae*, Zoological Survey of India, Calcutta, p. 318.

Diagnosis : Oocyst ovoid to ellipsoidal, 33-44 (39.2) μm x 21-32.5 (25.5) μm , shape index 1.6 micropyle and oocystic residuum present; sporocyst ovoidal, 18.5 μm x 6.2 μm ; sporocystic residuum absent; sporozoite elongated with large and terminal refractile globule.

Host : Black-naped hare, *Lepus nigricollis ruficaudatus*; site of infection : intestine.

Distribution : India : Uttarakhand (Kashipur) and Punjab.

Remarks : Gill and Ray (1960) reported this species from this state.

31. *Eimeria ruficaudati* Gill and Ray, 1960

1960. *Eimeria ruficaudati* Gill and Ray, *Proc. Zool Soc. Calcutta*, 13 : 128.

1987. *Eimeria ruficaudati* : Mandal : *Fauna of India : Protozoa : Sporozoa : Eucoccidiida : Eimeriidae*, Zoological Survey of India, Calcutta, p. 320.

Diagnosis : Oocyst cylindrical, 28-35 (31.2) μm x 12-15 (13.5) μm , shape index 2.3, micropyle and oocystic residuum present; sporocystic ovoidal, sporocystic residuum present; sporozoite medium-sized with refractile globule.

Host : Black-napped hare, *Lepus ruficaudatus*; site of infection : intestine.

Distribution : India : Uttarakhand (Kashipur) and Punjab

Remarks : Gill and Ray (1960) reported this species from this state.

32. *Eimeria stiedai* (Lindermann, 1865)

1865. *Eimeria stiedai* Lindermann, *Bull. Soc. Imp. Nat. Moscow*, 38 : 381.

1987. *Eimeria stiedai* : Mandal : *Fauna of India : Protozoa : Sporozoa : Eucoccidiida : Eimeriidae*, Zoological Survey of India, Calcutta, p. 326.

Diagnosis : Oocyst ovoidal to ellipsoidal, 26-40 (35.7) μm x 16-24 (21) μm , shape index 1.85, micropyle present, oocystic residuum absent; sporocyst ovoid to ellipsoid, 17 μm x 9 μm , sporocyst residuum present.

Host : Rabbit, *Oryctolagus* sp.; site of infection: intestine.

Distribution : India : Uttarakhand (Mukteswar), Kashmir and Punjab.

Remarks : Gill and Ray (1960) reported this species from this state.

33. *Eimeria sylvilagi* Carini, 1940

1940. *Eimeria sylvilagi* Carini, *Arch. Biol.*, 24 : 218.

1987. *Eimeria sylvilagi* : Mandal : *Fauna of India : Protozoa : Sporozoa : Eucoccidiida : Eimeriidae*, Zoological Survey of India, Calcutta, p. 330.

Diagnosis : Oocyst ovoid or elongated, 21-39 (31) μm x 16-24 (19) μm , micropyle present, oocyst residuum absent; sporocyst ellipsoidal to oval, 16 μm x 7 μm ; sporocyst residuum and stieda body present; sporozoite with large refractile globule.

Host : Domestic rabbit, *Oryctolagus* sp.; site of infection : intestine.

Distribution : India : Uttarakhand (Kashipur) and Punjab.

Remarks : Gill and Ray (1960) reported this species from this state.

34. *Eimeria zuernii* (Rivolta, 1878)

1878. *Cryptosporidium zurnii* Rivolta, *Geor. Anat. Fisiol. Patol. Anim.*, Pisa, 4 : 220.

1987. *Eimeria zuernii* : Mandal : *Fauna of India : Protozoa : Sporozoa : Eucoccidiida : Eimeriidae*, Zoological Survey of India, Calcutta, p. 338.

Material examined : Sev. exs., Rudrapur, 21.v.06, R. Nandi.

Diagnosis : Oocyst spherical, subspherical, bluntly ellipsoidal or ovoidal, double layered, 14-22 (17) μm x 13-19 (16) μm ; micropyle, micropylar cap, polar granule and oocystic residuum absent; sporocyst elongate-ovoid, 8.0-10.5 μm x 5.0-7.0 μm , stieda body and sporocystic residuum present; sporozoite 9 μm x 3 μm , with a refractile granule.

Host : Cattle, *Bos indicus*; site of infection : intestine.

Distribution : India : Uttarakhand (Rudrapur), Andhra Pradesh, Orissa, Uttar Pradesh, Haryana.

Elsewhere : Cosmopolitan.

Remarks : This species is reported herein for the first time from domestic cow, *Bos indicus* of this state.

Genus *Wenyonella* oare, 1933

1933. *Wenyonella* Hoare, *Parasitol.*, **25** : 359.

Diagnosis : Oocyst with four sporocysts, each having four sporozoites.

35. *Wenyonella gallinae* Ray, 1945

1945. *Wenyonella gallinae* Ray, *Curr. Sci.*, **14** : 275.

1987. *Wenyonella gallinae* : Mandal : *Fauna of India : Protozoa : Sporozoa : Eucoccidiida : Eimeriidae*, Zoological Survey of India, Calcutta, p. 345.

Diagnosis : Oocyst oval or egg-shaped, 28.5-34.5 (31.5) μm x 19.5-21.5 (20.5) μm , shape index 1.5, micropyle present, oocystic residuum absent; sporocyst vial-shaped or pyriform, 17.5-19.5 μm x 7.5-9.2 μm ; sporocyst residuum present; sporozoite club-shaped.

Host : Domestic fowl, *Gallus* sp.; site of infection : intestine.

Distribution : India : Uttarakhand (Mukteswar).

Remarks : Ray (1945) reported this species from this state.

GENERAL REMARKS

During the course of survey of Uttarakhand State a total of 14 coccidian species have been recorded from 6 districts (viz., Almora, Dehradun, Haridwar, Nainital, Udham Singh Nagar and Uttarkashi) of the state of which 12 species (viz., *Isospora knowlesi*, *I. lacazei*, *I. felis*, *Eimeria knowlesi*, *E. columbae*, *E. praecox*, *E. arloingi*, *E. bovis*, *E. crandallis*, *E. deblickei*, *E. faurei*, and *E. zuernii*) are reported herein for the first time from the state of Uttarakhand.

SUMMARY

In all 35 species of coccidian parasites belonging to 3 genera (viz., *Isospora*, *Eimeria* and *Wenyonella*) under one family Eimeriidae are reported from Uttarakhand State including the present record of twelve species (viz., *Isospora knowlesi*, *I. lacazei*, *I. felis*, *Eimeria knowlesi*, *E. columbae*, *E. praecox*, *E. arloingi*, *E. bovis*, *E. crandallis*, *E. deblickei*, *E. faurei*, and *E. zuernii*) for the first time from the state.

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Table 1. Systematic list of coccidian parasites hitherto recorded from Uttarakhand State.

Parasite	Host	Locality (District)
Kingdom PROTISTA Subkingdom PROTOZOA Phylum APICOMPLEXA Class SPOROZOEAE Subclass COCCIDIA Order EUCOCCIDIIDA Suborder EIMERIINA Family EIMERIIDAE Genus <i>Isospora</i> Schneider, 1881		
A. <i>Isospora</i> of reptiles		
<i>I. dirumpens</i> Hoare, 1933	<i>Natrix platyceps</i>	Mukteswar
<i>I. knowlesi</i> Ray and Das Gupta, 1937	<i>Hemidactylus</i> sp.	Haridwar*
B. <i>Isospora</i> of birds		
<i>I. corviae</i> Ray, Shivnani, Oommen and Bhaskaran, 1952	<i>Corvus macrorhynchus intermedius</i>	Dehradun*
<i>I. garrulae</i> Ray, Shivnani, Oommen and Bhaskaran, 1952	<i>Garrulax lineatus lineatus</i>	Mukteswar
<i>I. garrulusae</i> Ray, Shivnani, Oommen and Bhaskaran, 1952	<i>Garrulus glandarius bispeculari</i>	Mukteswar
<i>I. lacazei</i> Labbe, 1893	<i>Passer domesticus</i>	Haridwar*
<i>I. parusi</i> Ray, Shivnani, Oommen and Bhaskaran, 1952	<i>Parus dichrurus</i>	Mukteswar
<i>I. scircusae</i> Ray, Shivnani, Oommen and Bhaskaran, 1952	<i>Scircus xanthoschistos</i>	Mukteswar
C. <i>Isospora</i> of mammals		
<i>I. felis</i> Wenyon, 1923	<i>Felis</i> sp.	Uttar Kashi*
Genus <i>Eimeria</i> Schneider		
A. <i>Eimeria</i> of amphibians		
<i>E. himalayana</i> Ray and Misra, 1942	<i>Bufo himalayanus</i>	Mukteswar
B. <i>Eimeria</i> of reptiles		
<i>E. knowlesi</i> Bhatia, 1936	<i>Hemidactylus</i> sp.	Dehradun *
<i>E. minetti</i> Ray, Raghavachari and Sapre, 1942	<i>Mabuya</i> sp.	Mukteswar
C. <i>Eimeria</i> of birds		
<i>E. columbae</i> Mitra and Das Gupta	<i>Columba livia</i>	Ranikhet*
<i>E. hagani</i> Levine, 1938	<i>Gallus</i> sp.	Mukteswar
<i>E. meleagridis</i> Tyzzer, 1927	<i>Meleagridis gallapavo</i>	Mukteswar
<i>E. mitis</i> Tyzzer, 1929	<i>Gallus domesticus</i>	Mukteswar
<i>E. necatrix</i> Johnson, 1930	<i>Gallus domesticus</i>	Mukteswar, Ranikhet*, Rudrapur*
<i>E. praecox</i> Johnson, 1930	<i>Gallus domesticus</i>	Ranikhet*
<i>E. sphenocercae</i> Ray, 1952	<i>Sphenocercus sphenurus</i>	Mukteswar
<i>E. tenella</i> (Railliet and Lucet, 1891)	<i>Gallus domesticus</i>	Mukteswar

Table 1..Contd.

D. Eimeria of mammals		
<i>E. arloingi</i> (Marotel, 1905)	<i>Capra hircus</i>	Haridwar*
<i>E. bovis</i> (Zublin, 1908)	<i>Bubalus bubalis</i>	Haridwar*, Dehradun*
<i>E. crandallis</i> Honess, 1942	<i>Ovis aires</i>	Dehradun*, Rudrapur*
<i>E. deblickei</i> Douwes, 1921	<i>Sus scrofa</i>	Dehradun*
<i>E. faurei</i> (Moussu and Marotel, 1902)	<i>Ovis aires</i>	Rudrapur*
<i>E. irresidua</i> Kessel and Jankiewicz, 1931	<i>Oryctolagus cuniculus</i>	Mukteswar, Kashipur
<i>E. media</i> Kessel, 1929	<i>Oryctolagus cuniculus</i>	Mukteswar, Kashipur
<i>E. perforans</i> (Leuckart, 1879)	<i>Oryctolagus cuniculus</i>	Mukteswar, Kashipur
<i>E. petauristae</i> Ray and Singh, 1950	<i>Petaurista inornatus</i>	Mukteswar
<i>E. robertsoni</i> (Madsen, 1938)	<i>Lepus nigricolis ruficaudatus</i>	Kashipur
<i>E. ruficaudati</i> Gill and Ray, 1960	<i>Lepus ruficaudatus</i>	Kashipur
<i>E. stiedai</i> (Linderman, 1865)	<i>Oryctolagus cuniculus</i>	Mukteswar
<i>E. sylvilagi</i> Carini, 1940	<i>Oryctolagus cuniculus</i>	Kashipur
<i>E. zuernii</i> (Rivolta, 1878)	<i>Bos indicus</i>	Rudrapur*
Genus <i>Wenyonella</i> Hoare, 1933		
<i>W. gallinae</i> Ray, 1945	<i>Gallus gallus domesticus</i>	Mukteswar

Note * = Present record.

TREMATODE PARASITES OF VERTEBRATES

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INTRODUCTION

Uttarakhand state is of an ecosystem in the Indian subcontinent comprises deeply forked hill ranges, criss-cross by a large number of major rivers of the sub-continent like Yamuna, Ganga, Ramganga, Kosi, Sharda, Saryu, etc. Climate ranges from hot dry sub-tropical in the river valleys to cool moist temperature in the higher hills, because of the varied physiographic and climatic condition of the hills possess a very rich flora and fauna including many commercially important timbers and a large variety of same animals. Though during the last two centuries or so, the fauna of Uttarakhand State i.e. Western Himalaya has been observed and reported by a number of Naturalists and Zoologists of our country and from abroad enriching our knowledge about the faunal composition of these hills to a considerable extent, large gaps still existing. For the reason to overcome the lacunae for bio-diversity the project has been undertaken, entitled "Fauna of Uttarakhand State : Part : Trematode Parasites of Vertebrate Hosts".

PHYSIOGRAPHY

Latitude 27° N and longitude 70° E, it is approximately 220 km long and its total width varies between 140-400 km.

Range : Uttarakhand State constitutes of two Himalayan Ranges, viz. the Cis- Himalayan and the Trans-Himalayan. The former group of ranges lie south of the Great Himalaya (the main range) and comprises the Siwalik and Lesser Himalayan Ranges. The Trans Himalaya Ranges lie north of the main ranges and include Zaskar, Ladak and Karakoram Ranges.

The Siwalik range separates the Himalaya proper from Indo-Gangetic plain and is in reality the Southern border range of the Himalayan System. It is of more recent origin than the great

mountains of the north. At some places the Shiwalik range is pressed by the outer Himalayan ranges and at other places it is separated from these ranges by a distance of 30-80 km to enclose the characteristically shaped longitudinal valleys called "dun" filled with deposits of rounded stones, gravel and sand brought down from the Himalaya. The Shiwalik range is strongly developed opposite to Dehradun, with steep, southern slope and gentle Northern slope.

The mountain region is about 150 km. wide between great Himalaya and Shiwalik, constitutes an intricate system of the lesser Himalayan Ranges. It comprises two distinct groups, viz. the ranges that branch off from the great Himalaya proper and ranges that the separate fold.

Geography : Geographically, the Himalaya is divided into, (1) The Eastern of Assam Himalaya, (2) The Central or Nepal Himalaya, (3) The Kumaon or Western Himalaya extends for about 320 km. between the river Kali and the great defile of the river Sutlej. Nainital, Almorah, Mussoorie and the Garhwal region of the Uttarakhand State are within the region; Nanda Devi, Trishul, Mana, Badrinath, Kedarnath, Gangotri and Banderpunch are some of the better known high peaks of the Western Himalaya. Among these mountains arise most of the head streams of river Ganga and Yamuna.

Climate : The Himalaya obstruct the moist laden wind from the South, causing them to send their moisture as copious rainfall along the sub-mountain areas, north or Indo-Gangetic plains and as snowfall on the mountains further north. This great mountain barrier is also equally effective in protecting India winds from the Central Asia (North Temperate of relief, the attitude of the mountains also is sufficient to cause great modifications in climate. The mean temperature at

2200 mt. in 44° F (7° C and the Summer mean about 65° F (18° C) but in the valley temperature is of 90° F – 100° F (32° C – 37° C) may be left during the day in May and June. Rainfall is related to south west monsoon from June to September and is on an average about 2000 mm/annum, 85 % of which falls during the month of July, August and September.

Flora : Predominantly forested with *Shorea robusta* dominates the Shiwalik and on the slopes of Lesser Himalaya upto an altitude of 1000 meters also occur in the sub-mountain region with *Biscofia javanica*, *Selix tetrasperma* and *Pyrus pashia* as the chief components. *Corallia branchiate* is an interesting member of such swamp forest in Dehradun. There are also present mixed deciduous forest with *Lagerstromia parviflora*, *Dalbargia sissoo*, *Annogessus latifolia* and *Terminalia sp.* from excellent forest cover between the altitude of 1200-2000 meters on south facing slopes in dry situation and well drained areas. Scattered bushes of *B. authopogon*, *Berberis sp* are found upto 4800 meters, the richness of the herbaceous alpine flora in some of the interior valleys of the region is amply demonstrated in famous valley of flowers in the North-Himalayan hills.

Faunal wealth : Factors like rainfall, climate etc. influences the faunal wealth element of Western Himalaya and as a cosequence of faunistic element. Mani (1974) while discussing on Bio-geography of Himalaya, demonstrated the presence of distinct zoo-geographical distributional pattern in the fauna of Himalaya. He has shown that the fauna of Western Himalaya is composed partly on oriental fauna, which has spread westwards from eastern Himalaya, largely of Palearctic forms and to some extent Mediterranean and Ethiopian element. He has further demonstrated that the Indo-Chinese and Malayan genera and species are concentrated largely in Eastern Himalaya, a number of them have thus spread with decreasing abundance upto Kumaon and sometimes, even as far west of Kashmir. The Palearctic-Ethiopian genera and species are similarly dominant in North-West Himalaya but have sparsely eastward to Nepal and rarely even around Assam and Burmese Mountains.

Fauna of Forest Zones : This zone is extended upto an elevation of 3000-4000 meters, difficult to define bio-geographically, as it changes from one type to another and not always sharp. Forest line to sometimes go up and at other places restricted to lower elevations.

Fauna above the forest line : Strikingly different from that of the forest zones; Mani (1962 & 1968) has made the exhaustive studies of the high altitude insect communities in North-West Himalaya and has reported that this fauna is relatively sparse, characteristically lacking in tropical ; India, South Chinese, Indo Chinese and Malayan derivatives and comprises almost exclusively of endemic cold adopted palaeartic elements. Among the vertebrates the fishes, amphibians and reptilians are present in poor numbers while birds and mammals are moderately abundant.

Among so many, following districts of Uttarakhand which have been very recently nomenclatured as Uttarakhand have been surveyed within the period from 2000-2006 by a number of Scientists of Zoological Survey of India; Uttarkashi, Dehradun, Haridwar, Tehri Garhwal, Pauri Garhwal, Bageswar, Almorah, Champawat. As a result of which 48 trematode, parasites of vertebrates have been reported which are accordingly recorded in the current communication. Still a vast lacunae may exist in our report wick are the stairs of the further course of scientific investigation.

SYSTEMATIC LIST

Family LEUCOCHLORIIDAE

(Poche, 1907) Dollfus, 193

Subfamily LEUCOCHLORIDIINAE

Poche, 1907

Genus *Leucochloridium* Carus, 1835

1. *L. indicum* Singh, 1962

Family EUCOTYLIDAE Skrjabin, 1924

Subfamily TANAIISIINAE Teixeira de Freitas, 1951

Genus *Tanaisia* (*Tamerlania*) Skrjabin, 1924

2. *T. (Tamerlania) indica* Singh, 1962

Family LECITHODENDRIIDAE

(Luhe, 1901) Odhner, 1910

- Subfamily PHANEROPSOLINAE
Mehra, 1935
Genus *Pleuropsolus* Mehra, 1935
3. *P. microsoma* Singh, 1962
Subfamily GANEONINAE Yamaguti, 1958
Genus *Ganeo* Klein, 1905
- *4. *G. tigrinum* Mehra et Negi, 1928
5. *G. kumaonensis* Pande, 1937
Subfamily PLEUROGENINAE
Travassos, 1921
Genus *Pleurogenoides* Travassos, 1921
- *6. *P. gastroporus* (Luhe, 1901) Travassos, 1921
Subfamily PROSTHODENDRIINAE
Yamaguti, 1958
Genus *Prosthodendrium* Dollfus, 1931
7. *P. longiforme* (Bhalerao, 1926) Dubois, 1960
Family DICROCOELIIDAE
(Looss, 1899) Odhner, 1910
Subfamily BRACHYLECITHINAE
Yamaguti, 1958
Genus *Brachylecithum* Shtrom, 1940
- *8. *B. indicum* Singh, 1962
*9. *B. chapmani* Singh, 1962
Subfamily DICROCOELIIDAE
Looss, 1899
Genus *Dicrocoelium* Dujardin, 1845
10. *D. dendriticum* (Rud. 1819) Looss, 1899
Family FASCIOLIDAE Railliet, 1895
Subfamily FASCIOLINAE
Stiles et Hassal, 1898
Genus *Fasciola* Linnaeus, 1758.
11. *F. hepatica* Linnaeus, 1758.
Family PARAMPHISTOMIDAE
Fischoeder, 1901
Subfamily GASTROTHYLACINAE
Stiles et Goldberger 1910
Genus *Gastrothylax* Poirier, 1883
12. *G. cremenifer* (Crep. 1847) Poirier, 1883.
Genus *Fischoederius* Stiles et Goldberger, 1910
- *13. *F. cobboldi* (Poirier, 1883) Stiles et Goldberger 1910
- Subfamily DIPLODISCINAE Cohn, 1904
Genus *Diplodiscus* Diesing, 1960
14. *D. mehrai* Pande, 1937.
Subfamily PARAMPHISTOMINAE
Fischoeder, 1901.
Genus *Srivastavia* Singh 1970.
15. *S. indica* Singh, 1970
Genus *Stunkardia* Bhalerao, 1931.
16. *S. dilymphosa* Bhalerao 1931.
Genus *Paramphistomum* Fischoeder 1901.
17. *P. cervi* (Zeder, 1790) Fischoeder 1901.
Genus *Cotylophoron* Stiles et Goldberger 1910
18. *C. cotylophorum* (Fischoeder, 1901) Stiles et Goldberger, 1910.
Family ACANTHOSTOMIDAE
Poche, 1925
Subfamily ACANTHOSTOMINAE
Nicoll, 1914
Genus *Acanthostomum* Looss, 1899
- *19. *A. indicum* Sinha, 1942.
Family HETEROPHYIDAE
Odhner 1914
Subfamily HAPLORCHIINAE
Looss, 1899
Genus *Haplorchis* Looss, 1899.
20. *H. taichui* Nishigori, 1924.
Family OPISTHORCHIIDAE
Braun, 1901
Subfamily OPISTHORCHIINAE
Looss, 1899
Genus *Opisthorchis* Blanchard, 1895
- *21. *O. (O) noverca* Braun, 1903
22. *O. (nigerina) hardoiensis* (Baugh, 1958)
Family MONORCHIIDAE Odhner, 1911
Subfamily ASYMPHYLADORINAE
Szidat, 1943
Genus *Asymphylogora* Looss, 1890
23. *A. kedarai* Srivastava, 1951
Family NOTOCOTYLIDAE
Luhe, 1909
Subfamily NOTOCOTYLINAE
Kossak, 1911

- Genus *Notocotylus* Diesing, 1839
24. *N. (Notocotylus) parviovatus* Yamaguti, 1943
- Subfamily OGMOCOTYLINAE
Skrjabin et Shultz, 1933.
- Genus *Ogmocotyle* Skrjabin et Shultz, 1933
25. *O. indica* (Bhalerao, 1942) Ruiz, 1946
- Family CYCLOCOELIDAE
Kossak, 1911
- Subfamily CYCLOCOELINAE
Stossich, 1902
- Genus *Cyclocoelium* Brandes, 1892
26. *C. sharadi* Bhalerao, 1935
- *27. *C. (hyptiasmus) elongatum* Harrah, 1921
28. *C. (Cyclocoelium) mutabile* (Zeder, 1800)
- Family ECHINOSTOMATIDAE
Poche, 1926
- Subfamily ECHINOCHASMINAE
Odhner, 1911
- Genus *Echinochasmus* Deitz, 1909
29. *E. antigonus* Gupta, 1953
- Genus *Stephanoprora* Odhner, 1902
29. *E. antigonus* Gupta, 1953
30. *S. gigantea* Gupta, 1962
31. *S. nigerica* Gupta, 1963
- Subfamily IGNAVIINAE Yamaguti 1958
Genus *Ignavia* Freitas, 1948.
32. *I. breviovatica* Gupta, 1962
- Subfamily MEHRASTOMINAE
Saksena, 1959.
- Genus *Mehrastomum* Saksena, 1959
33. *M. minutum* Saksena, 1959
- Subfamily ECHINOSTOMATINAE
(Looss, 1899) Faust 1929
Genus *Echinostoma* Rud. 1809
- *34. *E. revolutum* (Froelich, 1802) Looss, 1899
- Family OPECOELIDAE Ozaki, 1925
Subfamily OPECOELINAE
Stunkard, 1931
- Genus *Dactylostomum* Woolock, 1935
35. *D. gayaprashadi* Tripathi et Jauhari, 1991
- Subfamily PLAGIOPORINAE
Manter, 1947
- Genus *Eucreadium* Dayal, 1942
36. *E. pandeyi* Srivastava *et.al* 1983
37. *E. kulpaharensis* Agarwal et Agarwal, 1987.
- Family CEPHALOGONIMIDAE
Nicoll, 1915
- Genus *Oudhia* Gupta, 1955
38. *O. hardayali* Kumar et Agarwal, 1980
- Family LATEROTREMATIDAE
(Yamaguti, 1958)
- Subfamily LATEROTREMATINAE
Yamaguti, 1958
- Genus *Pseudolaterotrema* (Yamaguti, 1939)
Singh, 1962
39. *P. indica* Singh, 1962
- Subfamily SRIVASTAVATREMATINAE
(Singh, 1962)
- Genus *Srivastavatrema* Singh, 1962
40. *S. mukteswarensis* Singh 1962
41. *S. indicum* Singh, 1962
- Family BRACHYLAIMIDAE (Joyeux et Folei, 1930) Miller, 1936.
- Subfamily BRACHYLAIMINAE
Miller, 1936
- Genus *Brachylaima* Dujardin, 1843
42. *B. indicum* Singh, 1962
- *43. *B. ratti* Baugh, 1962
- Family PARAGONIMIDAE
Dollfus, 1939
- Genus *Paragonimus* Braun, 1899
43. *P. edwardsi* Gulati, 1926
- Family PLAGIORCHIIDAE
(Luhe, 1901) Ward, 1917
- Subfamily ASTIOTREMATINAE
Baer, 1924
- Genus *Astiotrema* Looss, 1900
45. *A. reniferum* (Looss, 1898) Stossich, 1904
- Subfamily PLAGIORCHIINAE
Pratt, 1902
- Genus *Plagiorchis* Luhe, 1899
- *46. *P. koreanus* Ogata, 1938

Family BRACHYCOELIIDAE

Johnston 1912

Subfamily MESOCOELIINAE

Faust, 1924

Genus *Mesocoelium* Odhner, 1910

*47. *Mesocoelium monas* (Rud. 1819) Freitas, 1958

Family ANCHITREMATIDAE

(Mehra, 1935)

Genus *Anchitrema* Looss, 1899

*49. *A. sanguineum* (Sonsino, 1894) Looss, 1899

* Collected from Uttarakhand during the course of study and deposited to the National Zoological collection.

SYSTEMATIC ACCOUNT

Family LEUCOCHLORIDIIDAE

(Poche, 1907) Dollfus, 1934

Sub family LEUCOCHLORIDIINAE

Poche, 1907

1. Genus *Leucochloridium* Carus, 1835

1. *Leucochloridium indicum* Singh, 1962

Reg. No.W5704/ (Fig.1)

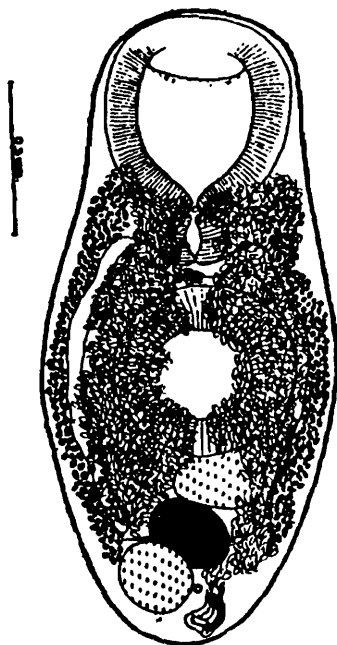


Fig. 1. *Leucochloridium indicum* Singh 1962 (After Singh 1962).

1962. *L. indicum* Singh Ind. J. Helm. XIV(1) : 57-61.

Material : 17 ex.; **Host** : *Garrulus bispecularis*, Vigors (Himalayan Red Crown Jay); **Location** : Intestine; **Locality** : Mukteswar –

Kumaon, Uttarakhand (Height : 7500 ft); Date of collection : 24th June, 1960; Collector : K.S. Singh.

Diagnostic characters : Fleshy, thick and small, length 1.157 – 1.442 (1.311), width maximum at almost middle of the body, 0.579 – 0.809 (0.666); both the ends broadly rounded; cuticles spined; oral sucker rounded to oval, subterminal, well developed and muscular, 0.356 – 0.401 (0.386); mouth opening directed anteriorly and situated ventrally; pharynx well developed, muscular, rounded, 0.16 – 0.176 (0.164); esophagus discernable; wide caeca run anteriorly forming the arch and then run along the lateral side reaching upto the posterior extremity; acetabulum well developed, muscular, almost of the size of oral sucker, 0.356 – 0.427 (0.36), situated equatorially or just posteriorly; testes round or oval, 0.12 – 0.17 (0.147), juxtaposed, slightly diagonal, situated terminally, anterior one just behind the acetabulum, posterior one at the posterior extremity; ovary round or oval, 0.1-0.16 (0.125), two testes separated by the ovary, exceptionally in some cases may be present at the posterior end, not very distinct, partly obscured by the eggs; cirrus everted, clumsy papilla like structure with broad free end, 0.056 x 0.04; genital pore dorsal, subterminal; uterus opens by the male genital pore, thick walled, surrounded by well developed sphincter muscles forming metraterm; eggs numerous, dark brown, operculated, 0.026 – 0.03 x 0.016 – 0.018 (0.0276 x 0.017); excretory pore on the dorsal side, 0.096 – 0.01 (0.102).

Remarks : The genus *Leucochloridium* Carus, 1835 having 39 species reported from birds though none has been described from India. Only *L. ceylonicum* described from *Gallus lafayetti* from Ceylon by Fernando, 1952. The present species separated from closely related species thus : *L. sime* Yamaguti 1935 in having equal suckers, absence of pre pharynx and esophagus; differs from *L. cardis* Yamaguti, 1939 in absence of prepharynx and oesophagus, extension of vitellaria and uterus, position of testes and ovary; from *L. hypotaenidiarum* Tubangui, 1932 in the size of the body, presence of spines, position and comparative size of acetabulum, position of ovary; from *L. perisorisae* Neiland, 1953 in having spines all over the body, in the position of ovary and testes, comparative size of two suckers and size of eggs;

from *L. baeuforti* Hunter et Vernverg, 1952 in the size of the body, equal size of the suckers, position of testes, ovary and uterus ; from *L. dryobatae* McIntosh, 1932 in the size of body, maximum width in equatorial region, absence of oesophagus, almost equal suckers, comparatively large gonads; form *L. mniotillae* (McIntosh, 1927) in extension of uterus in the area of oral sucker, in nature of fecundarium; from *L. cueseiuri* McIntosh, 1932 in Forward extension of uterus, shape and size of body, in relative size of two suckers and relative size of gonads.

Distribution : India : Uttarakhand.

Family EUCOTYLIDAE Skrjabin, 1924

Subfamily TANAISIINAE

Teixeira de Freitas 1951

2. Genus *Tanaisia* Skrjabin, 1924

2. *Tanaisia (Tamerlania) indica* Singh, 1962.

Reg. No.W 5712/1 (Fig.2)

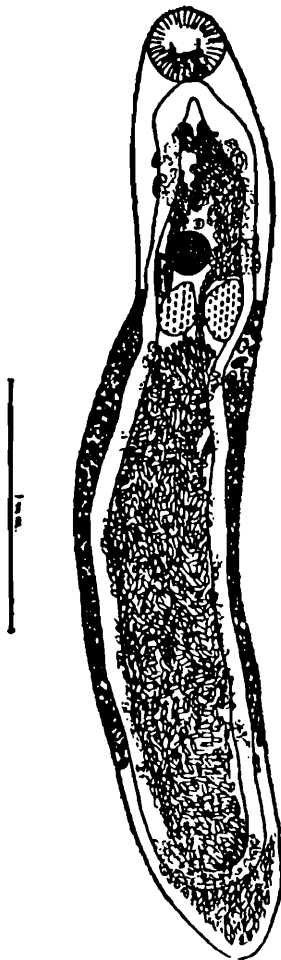


Fig. 2. *Tanaisia (Tamerlania) indica* Singh 1962 (After Singh 1962).

1962. *T. indica* Singh *Ind. J. Helm.*, XIV(2) : 112-115.

Material : 1 ex; Host : *Garrulus lancoelatus* (Black-throated jay); Location : Kidney; Locality : Mukteswar-Kumaon (Ht. 7500ft), Uttarakhand State; Date of collection : February, 1960, Collector : K.S. Singh.

Diagnostic characters : 3.756x 0.641, anterior end slightly tapering, both the ends rounded, body beset with small spines; oral sucker terminal, muscular, 0.30 in diameter; pharynx muscular, well developed, 0.139 in diameter; caeca run along the lateral sides as simple tube and joined to each other in posterior end of the body; acetabulum absent; testes on anterior half of body, intercaecal, somewhat oval, almost equal in size, left one 0.22x0.165, right one 0.238x0.154; vas deferens in median plane, opens to genital pore; cirrus pouch absent; ovary rounded at little anterior to right testis, 0.21 in diameter; receptaculum seminis large, at little posterior and lateral to the ovary; vitellaria extracoecal, extending from testicular region upto about 1/4th of body length; eggs numerous, small and brown, 0.0286-0.033x0.044-0.046; genital pore median, behind intestinal bifurcation, 0.872.

Remarks : Family Eucotylidae Skrjabin, 1924 contains two subfamilies, Eucotylinae and Tanaisiinae each with a single genus, *Eucotyle* Colin, 1904 and *Tanaisia*, 1924. Yamaguti, 1958 mentioned these two subfamilies as new but de Freitas, 1951 already had created these two subfamilies. The later genus has four Subgenera viz., *Tanaisia* Skrjabin, 1924; *Ohridia* Nezlobinski, 1926; *Lepidopoteria* Nezlobinski, 1924 and *Tamerlania* Skrjabin, 1924. De Freitas, 1951 in his revision of the family Eucotylidae did not recognized this subgenera, but Yamaguti, 1958 retained them and separated them according to the position and shape of the gonads. The subgenus *Tamerlania* includes 19 species (Yamaguti, 1958) described from birds which are cosmopolitan in distribution, but *Tanaisia* has been reported by the author for the first time from India. Present form unlikely to *T. byrdentoni* de Freitas, 1951 in size of the body, oral sucker, absence of esophagus, position and shape of testes, size of ovary, position of receptaculum seminis, extension of vitelline follicles and size of eggs; from *T. confusa* de

Freitas, 1951 in the size of the body, oral sucker, absence of ventral sucker, shape of testes, relative size of testes and ovary and extension of vitelline follicles; from *T. exigna* de Freitas, 1951 in size of oral sucker, absence of oesophagus, position and shape of testes, shape of ovary, extension of vitelline follicles and size of eggs; from *T. incerta* de Freitas, 1951 in the absence of scales, size of oral sucker, absence of esophagus, shape of testes and ovary and extension of vitelline follicles; from *T. japonica* Yamaguti, 1935 in the size of oral sucker, extension of intestinal caeca, position of genital pore, extension of vitelline follicles and size of eggs; from *T. magnicola* de Freitas, 1951 in the absence of scales, absence of ventral sucker and oesophagus, position of shape of gonads and extension of vitelline follicles; from *T. melospizae* Penner, 1939 in the size of pharynx, absence of esophagus, shape of gonads and extension of vitelline follicles; from *T. meruli* Nezhobinski, 1956 in the size of body and pharynx, position of testes and vitelline follicles and size of eggs; from *T. minax* de Freitas, 1951 in the absence of scales, size of oral sucker, absence of ventral sucker, position and shape of gonads and size of eggs; from *T. obiaspera* de Freitas, 1951 in absence of scales, size of oral sucker, absence of oesophagus, shape of gonads and extension of vitelline follicles from *T. parva* de Freitas, 1951 in absence of scales, size of oral sucker and pharynx, shape and position of gonads, extension of vitelline follicles; from *T. procaria* de Freitas, 1951 in the size of pharynx, absence of oesophagus, shape of gonads, extension of vitelline follicles and size of eggs; from *T. robusta* de Freitas, 1951 in absence of scales, ventral sucker and oesophagus, shape of gonads, in having ovary almost equal to testes, extension and vitelline follicles; from *T. similis* de Freitas, 1951 in the size of the body, absence of scales and oesophagus, shape of ovary, extension of uterus and vitelline follicles; from *T. valida* de Freitas, 1951 in the absence of scales, size of pharynx, absence of esophagus, shape and position of gonads; and from *T. zarudnyi* Skrjabin, 1924 in the size and shape of body, position of receptaculum seminis, shape and position of testes.

Distribution : India : Uttarakhand.

Family LECITHODENDRIIDAE (Luhe, 1901)
Odhner, 1910

Key to the subfamilies of Lecithodendriidae

Genital pore at pharyngeal or at post pharyngeal level; cirrus sac elongate, curved PHANEROPSOLINAE

Genital pore pre acetabular, cirrus sac elongate and straight GANEONINAE

Genital pore pre acetabular, cirrus sac round PROSTHODENDRIINAE

Genital pore & cirrus sac otherwise 2

Genital pore opens at the middle of the acetabular region, cirrus sac curved but elongate, cirrus pouch clavicorn PLEUROGENINAE

Subfamily PHANEROPSOLINAE Mehra, 1935

3. Genus *Pleuropsolus* Mehra, 1935

3. *Pleuropsolus microsoma* Singh, 1962

Reg. No. W5711/1 (Fig. 3)

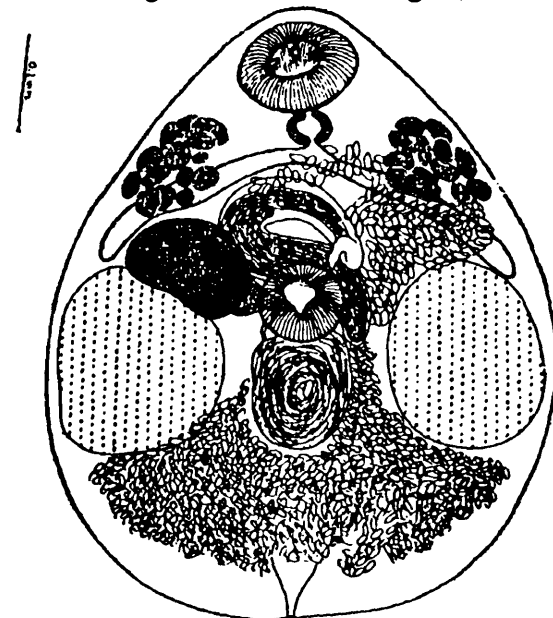


Fig. 3. *Pleuropsolus microsoma* Singh, 1962 (After Singh 1962).

1962 *P. microsoma* Singh *Ind. J. Helm.*, XIV(1) : 62-65.

Material : 20 exs. Host : *Leioptilla capistrata* Vigors (Black headed sibia); Location : Intestine; Locality : Amarabati (6500 ft.), near Mukteswar-Kumaon, Uttarakhand; Date of collection : July, 1960; Coll. K.S. Singh.

Diagnostic characters : 0.498-0.623 (0.553) in length, 0.356-0.49 (0.45) in maximum width at

posterior region; anterior end tapering, rounded, posterior end broadly rounded; spines present all through the body excepting posterior extremity; oral sucker muscular, rounded, subterminal, 0.1-0.116 (0.107); oral sucker followed by pharynx, 0.32-0.04 (0.046); intestinal caeca arise immediately after the pharynx; caeca run laterally, ended just anterior to testes at the border of ventral sucker; acetabulum 0.07-0.08 (0.076), almost at the middle of the body; testes rounded, symmetrically placed, oval, may also somewhat elongated, right one 0.154-0.19x0.1-0.16 (0.159x0.123), left one 0.106-0.2x0.1-0.15 (0.143x0.123); cirrus pouch well developed, partly overlapping acetabulum, strongly recurved, 0.22-0.33x0.036-0.064 (0.282x0.046) cirrus small, unarmed, opens at left side, anterolateral to ventral sucker; genital pore 0.2-0.26 (0.23) from the anterior end; ovary oval at the level of acetabulum, just anterior to posterior testes, 0.08-0.12x0.085-0.1 (0.094x0.093), oviduct wide, runs posteriorly, 0.1-0.14 (0.128); vitellaria with large follicles, close together, mostly extracaecal, extending from pharynx to just before the end of caeca; uterus from the left side of the body, runs posteriorly, occupying most of the posterior region of the body, crosses over the left side in the region of the intestinal bifurcation; uterus full of small, dark, brown distinctly operculated eggs, 0.018-0.02x0.01-0.012 (0.0193x0.0105); excretory pore terminal, excretory vesicle "V" shaped, strongly inflated arms reaching upto the testicular region.

Remarks : Bhalerao (1926) described a parasite *Phaneropsolus insolens* from the Burmese house crow, *Corvus insolens* from Rangoon. Mehra 1935 created a new genus *Pleuropsolus* mainly due to the difference in position of testes and genital pore in his species from the the members of *Phaneropsolus* and placed it under his new subfamily Phaneropsolinae. Since then, no other species has been described under this genus. The present form differs from *P. insolius* (Bhalerao, 1926) Mehra, 1935 in the following characters : the shape of the body (the present form being widest in the posterior region), in the ratio of the two suckers, size of testes, cirrus pouch and ovary. The size of eggs can not be compared for in the text Bhalerao, (1926) gave the size eggs of *P. insolius* as 0.018-0.022x0.097-0.0105 (the last figure should probably read 0.105)

and where the specific diagnosis is given, the eggs are said to measure 0.06-0.07x0.04-0.05. Unfortunately the diagramme of the entire parasite is too small to permit measuring the eggs in accuracy and the type slide is not available. Apparently and also judging by the size of the eggs in the present form, the figures given in the text by Bhalerao are correct.

Distribution : India : Uttarakhand.

Subfamily GANEONINAE Yamaguti, 1858

4. Genus *Ganeo* Klein, 1905

Key to the species of *Ganeo*

2.1 - 2.61 in length and 1.1-1.12 in width
..... *G. tigrinum*.

3.56-3.93 in length and 1.34 in width
..... *G. Kumaoensis*.

*4. *Ganeo tigrinum* Mehra et Negi, 1928
Reg. No. W8907/1 (Fig. 4)

1928. *G. tigrinum* Mehra et Negi *Allahabad Univ. Stud.*, 4 : 63-118,

Material : Host : 36 exs. *Rana cyanophlyctis*;
Locality : Terai, Uttarakhand; Coll. : J.C. Tripathi and P.T. Bhutia.



Fig. 4. *Ganeo tigrinum* mehra et. Negi, 1928 (After Chakraborti et. Chatterjee 2004).

Diagnostic characters : Body oval in shape, 2.35-2.85 long, 0.875-1.075 wide; posterior end rounded, cuticle spined; prepharynx present, pharynx 0.09-0.1x0.06-0.07; oesophagus 0.245-0.314x0.498-0.64 divides into two caeca at the

level of genital pore; caeca extend upto two third of body length; oral sucker sub terminal, $0.141-0.157 \times 0.075-0.099$, slightly smaller than the acetabulum; testes two, diagonally tandem around acetabular zone, anterior testis $0.248-0.306 \times 0.240-0.331$, posterior testis $0.27-0.33 \times 0.23-0.30$; seminal vesicle long, coiled, at base, anterolateral to ventral sucker; spines on terminal part of ejaculatory duct, genital atrium and metraterm; pars prostatica surrounded by prostate gland cells, ejaculatory well developed, broad and round duct along, opening into genital atrium; genital pore marginal, situated at level of esophageal bifurcation; ovary entire, $0.207-0.240 \times 0.215-0.233$, post lateral of overlapping the ventral sucker; seminal receptacle behind ovary; vitellaria follicular, bi lateral, distributed between posterior end of acetabulum to caeca end; uterus post ovarian, occupying most of hind body; metraterm well developed, opening into genital atrium separately; eggs 0.0249×0.0166 ; excretory vesicle "v" shaped.

Distribution : India : Meghalaya, Uttar Pradesh, Jammu and Kashmir, Bihar, Andhra Pradesh, Maharashtra, Tripura, Uttarakhand.

Elsewhere : Bangladesh.

5. *Ganeo kumaonensis* Pande, 1937

1937. *G. kumaonensis* Pande *Proc. Ind. Acad. Sci.*, 6(2) : 109-120.

Material : Host : *Rana cyanophlyctis*;
Locality: Kumaon, Uttarakhand.

Distribution : India : Uttarakhand.

Elsewhere : East Pakistan, Sri Lanka.

Subfamily PLEUROGENINAE Travassos, 1921

5. Genus *Plerogenoides* Luhe, 1901

*6. *P. gastroporus* (Luhe, 1901) Travassos, 1921
Reg. No. W8861/1 & W 8862/1 (Fig. 5)

1901. *Plerogenoides gastroporus* Luhe *Zentbl. Bakterial Parasitkde*, 30-40 : 166-177.

1921. *Pleurogenoides gastroporus* Travassos *Arch. Ds. Esc. Sup. de. Agric Med. Vet. Nichtheray*, 5(1-2) : 73-79.

Material : 15 exs. Host : *Rana cyanophlyctis*;
Location : Intestine; **Locality** : Dehradun, Uttarakhand; Date of collection : 18. 9. 2003; Coll. S. Chakrabarti.



Fig. 5. *Pleurogenoides gastroporus* (Lühe, 1901) Travassos, 1921 (After Chakraborti 1987)

Diagnostic characters : Oval shaped, with tapering anterior end, middle portion of the body broad, length 1.22-1.5; cuticle spined anteriorly, spines extended up to $\frac{2}{3}$ rd of the body length; width 0.7-0.85; oral sucker at the anterior conical portion of the body, sub-terminal, almost circular in shape, with the size varying from $0.174-0.125 \times 0.199-0.248$, oral sucker followed by oval muscular pharynx, $0.049-0.09 \times 0.074-0.1$; short esophagus, $0.07-0.9 \times 0.07-1$, caeca short, extend up to mid-level of ventral sucker; acetabulum almost spherical, $0.166-0.190 \times 0.182-0.190$; testes symmetrical or slightly oblique on either side of the acetabulum, right testis $0.215-0.273 \times 0.207-0.240$, left one $0.190-0.256 \times 0.157-0.215$; cirrus pouch anterior to the ventral sucker; genital pore lateral, opening at the right or left to the oral sucker; ovary slightly ovoid, pre-testicular, anterior to right of left testis, $0.124-0.190 \times 0.141-0.166$; vitellaria confined to fore body, continuous around pharynx and esophageal zone; eggs 0.024×0.016 .

Distribution : India : West Bengal, Uttar Pradesh, Andhra Pradesh, Meghalaya, Tripura, Maharashtra, Uttarakhand.

Elsewhere : Brazil, Bangladesh.

Subfamily PROSTHODENDRIINAE Yamaguti, 1958

6. Genus *Prosthodendrium* Dollfus, 1931

7. *P. longiforme* (Bhalerao, 1926) Dubois, 1960
Reg. No. w 8869/1 & w 8870/1 (Fig.6)

1926. *P. longiforme* Bhalerao *J. Verma. Res. Soc.*, 15(3) : 181-195.

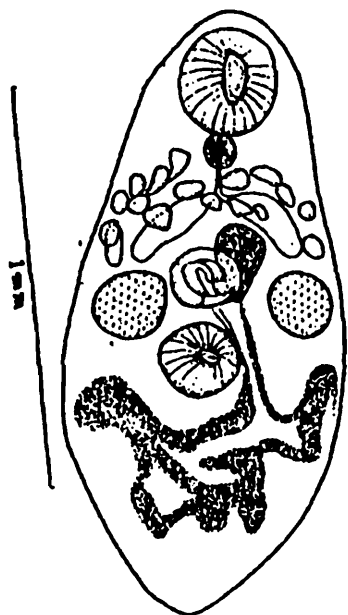


Fig. 6. *Prosthodendrium longiforme* (Bhalerao, 1926) Dubois 1960 (After Bhalerao 1926).

1960. *P. longiforme* Dubois *Rev. Suiss. Zool.*, 67(1) : 1-80

Material : 8 Exs. **Host** : Bat, *Tadarida aegyptica*; **Location** : Intestine; **Locality** : Dehradun (ZSI Complex), Uttarakhand; **Date of collection** : 18.10.2001; **Collector** : S. Chakrabarti.

Diagnostic characters : Body oval or pyriform, unspined, 1.43-3.64, maximum width at equatorial region, 0.68-1.28; oral sucker round or elliptical, 0.18-0.54 x 0.18-0.45; caeca short, widely divergent, not surpassing testes; acetabulum in middle third of body, 0.14-0.41 x 0.16-0.37; pharynx 0.06-0.13x0.09-0.16; esophagus 0.01-0.11; testes on each side of body, in preacetabular zone, almost equal in size, 0.13-0.4x0.14-0.3; cirrus pouch preacetabular; genital atrium unspined, opening just in front of acetabulum; pseudo cirrus sac 0.1-0.3x 0.13-0.386; ovary sub median, posterior to the testicular zone, 0.14-0.28x0.09-0.27; vitellaria forming symmetrical grape like branches in neck and shoulder region, anterior to caeca or testes; uterine coils occupying whole hind body; eggs 0.027-0.037x0.009-0.019; excretory vesicle "V" shaped.

Distribution : India : Andhra Pradesh, Uttarakhand

Elsewhere : Myanmar.

Family DICROCOELIIDAE (Looss, 1899)
Odhner, 1910

Key to the subfamilies of Dicrocoeliidae

Body slender BRACHYLECITHINAE

Body fusiform or more elongate, winded behind middle..... DICROCOELIINAE

Sub family BRACHYLECITHINAE
Yamaguti, 1958.

7. Genus *Brachylecithum* Shtrom, 1940

Key to the species of *Brachylecithum*

1.344-2.537 (2.075), maximum width at testicular region, 0.11-0.168
..... *B. indicum*

4.272, maximum width at anterior to acetabulum, 0.15-0.223(0.187)
..... *B. chapman*

*8. *Brachylecithum indicum* Singh, 1962

1962. *B.indicum* Singh. *Ind. J. Helm.*, 14(1) : 45-52. Reg. No. W5707/1 (Fig. 7).



Fig. 7. *Brachylecithum indicum* Singh 1962 (after Chakrabarti & Ghosh 2007).

Material : **Host** : *Myiophoneus caeruleus temminckii* Vigors, 1932, Himalayan whistling thrush; **Location** : Liver; **Locality** : Mukteswar-Kumaon, Uttarakhand; **Date of collection** : February, 1960; **Coll.** K.S. Singh. Re-described from *Kitia erythrorhynchus occipitalis*; **Location** - intestine, **Locality** : Mukteswar, Uttarkhand; **Coll.** S. Chakrabarti.

Diagnostic characters : Body elongated, translucent, devoid of spines, 1.344-2.537 (2.075), maximum width in testicular region, 0.11-0.168;

both ends rounded; oral sucker sub terminal, well-developed, rounded to oval, 0.086-0.114x0.066-0.086 (0.097x0.077), mouth opening sub terminal; pharynx rounded, muscular, small, 0.03-0.032 (0.031); oesophagus short, divides into intestinal caeca, runs laterally, ends beyond the vitellaria, could not determined due to number of eggs; acetabulum near the end of anterior fourth of the body, 0.09-0.15 (0.123), almost of equal size of oral sucker; testes one after another and little posterior to acetabulum, elongated, oval in some cases and in rare cases rounded; anterior one 0.09-0.24x0.09-0.122 (0.153x0.13) and posterior one 0.09-0.27x0.09-0.136 (0.168x0.104); testes separated just by loop like uterus with full of eggs; to vasa eferntia joined anterior to anterior testis to form vas deference, runs forward to enter the pear shaped cirrus pouch, partly overlapping acetabulum; cirrus pouch contains well developed vesicular seminalis; cirrus everted in some cases, 0.046x0.02 and 0.04x0.015; cirrus pouch 0.08-0.13x0.026-0.05 (0.092x0.34); ovary centrally located, posterior to testes, rounded to oval, 0.086-0.12 (0.102) along its long diameter; small receptaculum seminis, 0.031-0.038 (0.035) present on dorsal and posterior border of ovary; vitellaria consisting of small follicles wedged close together, present on the right side asymmetrically, but in few cases symmetrically, extend for a short distance, never more than twice the diameter of ovary. Uterus consisting of ascending and desending limbs forms number of loops specially posterior to vitellaria; female genital pore present just anterior to male genital pore; eggs numerous, large, brown, 0.03-0.034x0.012-0.016 (0.031x0.014); excretory bladder "Y" shaped with a long stem, excretory pore terminal.

Remarks : There are about fifty species under the genus *Brachylecithum* Shtrom, 1940 described from the various parts of the world but apparently only one species *B. stunkardi* (Pande, 1939) has been described from India. Pande 1939 described the parasite as *Lyperosomum stunkardi* from the black throated jay, *Garrulus lancoelatus*. Travassos, 1944 while revising the family Dicrocoeliidae, created the genus *Olssoniella*, (now regarded as the synonym of *Brachylecithum*, in part) and transferred this species from *Cyanocitta cristata* from U.S.A. and transferred it to the genus *Brachylecithum*, a position which

has been accepted by Yamaguti, 1958. Present form can be differentiated from the closely related species thus : *B. delicatum* Denton et Byrd, 1951 in the size of the body, in having the ventral sucker broader than the body, position of the genital pore in relation to the ventral sucker, distribution of the vitelline follicles and the position of the anterior testis with reference to the ventral sucker; from *B. exochocotyle* Denton et Byrd, 1951 in the relative size of the two suckers, shape and position of the two testes, size of ovary compared to the two testes and distribution of the vitelline follicles and from *B. stunkardi* (Pande, 1939) in the size of the body, size of the two suckers, position and shape of ventral sucker and size of cirrus pouch.

Distribution : India : Uttarakhand.

*9. *Brachylecithum chapmani* Singh, 1962
Reg. No. W5708/1 & W8865/1 (Fig. 8)

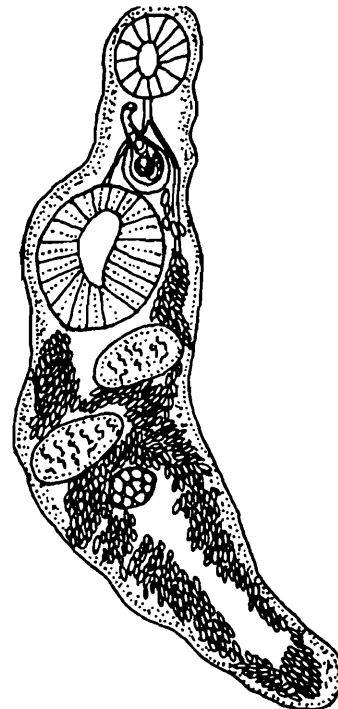


Fig. 8. *Brachylecithum chapmani* Singh 1962 (After Chakraborti and Ghosh 2007).

1962. *B. chapmani* Singh *Ind. J. Helm.*, 14(1) : 45-52.

Material : 6 exs.; Host : *Kitta erythrorhyncha occipitalis* (Blyth, 1846), Red-billed blue Magpie; Location : Liver; Locality : Kumaon Hills, Mukteswar (Ht. 7500 ft.), Uttarakhand; Date of collection : April, 1960; Collector : K.S. Singh. Re-described from Tree pie, Location-Gall bladder, Locality-Dinapani, Almorah, Uttarakhand; Date of collection 02.04.90; Coll. Dr. A.K. Mandol.

Diagnostic characters : Body delicate and elongate, 4.272 in length, width maximum at anterior to ventral sucker, 0.15-0.223 (0.187), cuticles smooth, both the ends rounded; oral sucker sub-terminal, rounded, 0.212; prepharynx absent, pharynx small, 0.08; oesophagus long and bifurcates into two long caeca just before the genital pore; intestinal caeca run along the lateral sides; acetabulum at the anterior one sixth of the body, 0.19-0.23 (0.21), muscular but shallow; testes rounded, situated posterior to the ventral sucker in the anterior one fourth of the body, anterior one 0.12, separated from the posterior one by the loop of uterus with full of eggs, posterior testes 0.12-0.14 (0.13); cirrus pouch just posterior to ventral sucker, 0.14-0.17x0.05-0.065 (0.165x0.057), cirrus unarmed, partly everted in few specimens, 0.062x0.05 and 0.066x0.52; genital opening at the intestinal bifurcation of oesophagus, median, 0.14-0.17 (0.155), in front of acetabulum; vesicular seminalis in side the cirrus pouch, bipartite; ovary rounded to slightly oval, present just behind the posterior testes and separated from it by a loop of the uterus, 0.16-0.2 (0.17), receptaculum seminis present just posterior to ovary, 0.086; vitellaria consisting of a few large asymmetrical follicles situated just posterior to ovary and separated from it by a loop of uterus with eggs, extension of the follicles more than the distance between ovary and acetabulum; entire space behind the genital region specially behind the vitellaria is filled up with numerous golden yellow eggs; eggs 0.04-0.046x0.02-0.024 (0.043x0.023), with ascending and descending limbs, ascending limbs passes in between various general organs, runs dorsal to acetabulum to open near main genital pore; excretory pore terminal, rest of the system not visible due to the presence of eggs.

Remarks : Present species can be distinguished from the closely related species of the genus *Brachylecithum* thus : from *B. gruis* Denton et Byrd, 1951 in having smooth and rounded testes, much smaller in size and separated from the ventral sucker by several folds of the uterus and position of vitelline follicles; from *B. moorii* Denton et Byrd, 1951 in the shape of the body, comparative size of the two suckers, shape and position of the two testes, in having the ovary larger than the testes and distribution of the vitelline follicles; from *B. rarum* Travassos, 1917

in the width of the body (though the length is nearly the same), absence of the tubercles from cuticle, absence of distended pouches from the ends of the caeca, position of the cirrus pouch in relation to the ventral sucker and the ovary being larger than the testes; from *B. strigis* (Yamaguti, 1939) in having the two suckers of almost the same size, number and position of the vitelline follicles, in having the ovary larger than the testes and the absence of metraterm; from *B. stunkardi* (Pande, 1939) in the ratio of the width of oral sucker to ventral sucker, position of the genital pore and cirrus pouch in relation to the acetabulum and in having the ovary larger than the testes; from *B. tuberculatum* Denton et Byrd 1951 in the absence of tubercles from the cuticle, position of anterior testes and cirrus pouch in relation to acetabulum.

Distribution : India : Uttarakhand.

Subfamily DICROCOELIINAE Looss, 1899.

8. Genus *Dicrocoelium* Dujardin, 1845

10. *D. dendriticum* (Rud. 1819) Looss, 1899
Reg. No. W3983/1 (Fig. 9)



Fig. 9. *Dicrocoelium dendriticum* (Rud. 1819) Looss, 1889
(After Skrjabin et al. Schulz).

1819. *Distomum dendriticum* Rudolphi Berol 811pp.

1899. *Dicrocoelium dendriticum* Looss. Zool. Jahrb. Syst.,
12 : 521-784.

Material : Host : Sheep, Locality : Tehri,
Uttarakhand.

Distribution : India Uttarakhand.

Elsewhere : Czechoslovakia, Kazakhstan.

Family FASCIOLIDAE Railliet, 1895.
 Subfamily FASCIOLINAE Stiles et Hassal, 1898
 9. Genus *Fasciola* Linnaeus, 1758
 11. *Fasciola hepatica* Linnaeus, 1758
 (Fig. 10)

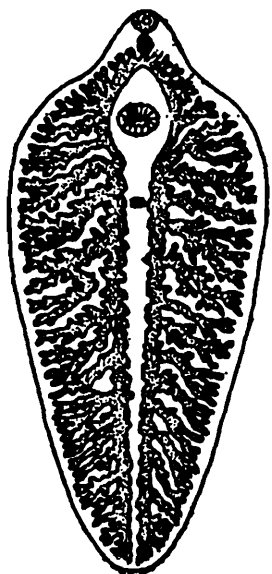


Fig. 10. *Fasciola hepatica* Linnaeus 1758 (After Linnaeus).

1758. *Distomum hepaticum* Linnaeus *Systema naturalis persegnatria* : 277.

Material : Host; Sheep, Goat, Camel, Horse, Rarely man.; Location : bile duct. Locality : Himalayas, Uttarakhand.

Diagnostic characters : Body oval or foliate, flattened with conical cephalic cone and distinct shoulders; length 18-40, width 4-13, cephalic cone 3-5 long, marked off from the body by prominent shoulders covered with scales; caeca profusely branched only on the outer side; acetabulum larger than the oral sucker, 1.6; oral sucker 1.0; genital pore median, midway between intestinal bifurcation and acetabulum; testes much branched; cirrus sac thin walled; ovary much branched to right side in front of testes; vitellaria filling up all available space between caecal ramifications laterally; uterus in ascending limb only forming rosette like cluster of coils between ovary and acetabulum; eggs 0.13-0.15x0.06-0.09.

Distribution : India : Cosmopolitan, Himalayas (Uttarakhand).

Elsewhere : Myanmar, Sri Lanka.

Family PARAMPHISTOMIDAE Fischöder, 1901

Key to the subfamilies of Paramphistomidae

1. Ventral pouch present
 GASTROTHYLACINAE

- Ventral pouch absent 2
2. Oral diverticula absent, testes two, no genital sucker PARAMPHISTOMINAE
- Genital sucker otherwise 3
3. Pharynx with paired diverticula; vitellaria encroaching intercaecal field; testis one
 DIPLODISCINAE

Subfamily GASTROTHYLACINAE Stiles et Goldberger, 1910

Key to the genus of Gastrothylacinae

Testes juxtaposed, symmetrical, uterus confined to dorsal median field
 *Gastrothylax*

Testes tandem, equatorial, either coinciding or overlapping *Fischöderius*

10. Genus *Gastrothylax* Poirier, 1883
12. *Gastrothylax crumenifer* (Crep 1847) Poirier, 1883 (Fig. 11)

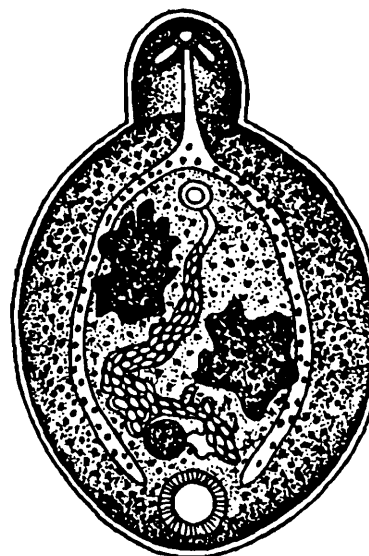


Fig. 11. *Gastrothylax crumenifer* (Crep. 1847) Poirier 1883 (After Poirier).

1847. *A. crumenifer* Creplin *R. Naturg.*, 13(1) : 30-35.

1883. *G. crumenifer* Poirier *Bull. Soc. Philom. Paris* s. 7, 10 : 20-40.

Material : Host : Sheep, Cattle, Buffalo; Location : Stomach, Locality : Uttarakhand.

Diagnostic characters : Body elongate, red when fresh, 9-18 long, 5.0 broad or thick, with large ventral sac, opening anteriorly and extending over the whole ventral surface upto acetabulum,

anterior end papillated; oral sucker and acetabulum 0.82×0.7 and 1.63×2.3 respectively; genital pore opens into ventral sac half way between pharynx and intestinal bifurcation; oesophagus 'S' shaped, 1.12 long; caeca terminate at about level anterior border of testes; testes symmetrical side by side, deeply lobed, between caeca and acetabulum with ovary median between them; cephalic half of uterus and vas deferens on opposite sides; Laurer's canal opening anterior to excretory pore; vitellaria of small follicles extend from intestinal fork to acetabulum along entire length and width of worm; eggs $0.115-0.145 \times 0.06-0.07$.

Distribution : India : West Bengal, Punjab, Andhra Pradesh, Uttarakhand, mostly cosmopolitan.

Elsewhere : Sri Lanka, Myanmar, China.

11. Genus *Fischoederius* Stiles et Goldberger, 1910

*13. *Fischoederius cobboldi* (Poirier, 1883)
Stiles et Goldberger, 1910
Ref. No. W8890/1 (Fig. 12)

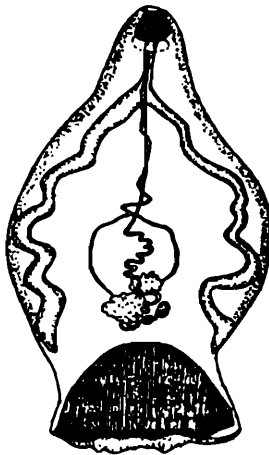


Fig. 12. *Fischoederius cobboldi* (Poirier, 1883) Stiles et Goldberger, 1910 (After Stiles et. Goldberger).

1910. *F. cobboldi* Stiles et Goldberger Hyg. Lab. Bull. No. 60 : 259pp.

Material : Host-cattle; location- stomach- Mukteswar, Uttarakhand, re-described as; 1 ex. Host - Pig; Location - intestine, locality, Deheradun, Uttarakhand; Date of collection 16.04.04; Collector S. Chakraborty.

Diagnostic characters : Body 2.7-15.5 long, 1-4.3 broad; caeca reaching anterior border of acetabulum; testes 0.8-1.0 in diameter; ovary 0.33×0.3 , poster lateral to dorsal testes; eggs $0.11-0.12 \times 0.06-0.065$.

Distribution : India : Uttarakhand.

Elsewhere : Sri Lanka, Java.

Subfamily Diplodiscinae Cohn, 1904

12. Genus *Diplodiscus* Diesing, 1836

14. *Diplodiscus mehrai* Pande, 1937
(Fig. 13)



Fig. 13. *Diplodiscus mehrai* Pande, 1937 (After Pande).

1937. *D. mehrai* Pande Proc. Ind. Acad Sci., 6(2) : 109-120.

Material : Host : *Rana cyanophlyctis*, *Bufo viridis* and *Rana* sp.; Location: Rectum and Intestine; Locality : Almorah (Kumaon Hills), Uttarakhand.

Diagnostic characters : Body conical, 2.1-3.2 long, 1-1.3 in maximum width a little in front of the acetabulum, translucent with excretory vessels as black wavy tube in living condition; oral sucker $0.36 \times 0.2-0.32$ broad in region of diverticula, the later 0.2×0.18 ; oesophagus 0.38-0.5 long, arises ventrally to evagination from bottom of oral sucker, esophageal bulb $0.11-0.14 \times 0.07-0.1$; caeca terminates a little in front of acetabulum; acetabulum $0.56-0.74 \times 0.9-1.1$ with accessory sucker dividing acetabulum into two halves; genital pore just behind the esophageal bulb, pre-bifurcal; excretory pore dorsal, midway between extreme posterior end and central sucker of acetabulum; excretory vesicle tubular, obliquely situated above acetabulum between it and shell gland; lymph vessels to outside and dorsally to caeca on each

side; testis single, almost globular, 0.23-0.4x0.134-0.45; cirrus sac 0.18x0.16, enclosing coiled vesicular seminalis interna and ejaculatory duct surrounded by prostate cells; ovary spherical, 0.16-0.18 in diameter; Laurer's canal opens dorsally immediately in front of shell gland; receptaculum seminis absent; uterus passes posteriorly on right side of ovary and reaching anterior border of acetabulum travels forward dorsally to testes, occupying intercaecal space; metraterm thick walled, convoluted, provided with gland cells; vitellaria extend from a little behind of oral evaginations to anterior border of acetabulum, meeting medially with acetabular part of body, follicles large, 35-40 in all, laterally and ventrally to caeca except in hinder region, where they pass medially forming a dorsally placed row; eggs 0.14x0.09. Kaw (1950) collected matured forms of smaller size and the young with testes separated from each other. His measurements : body 1.7-2.26x0.84-1.08; oral sucker 0.17-0.28; acetabulum 0.51-0.75x0.7-0.96; accessory sucker 0.15-0.22x0.18-0.29; oral evagination 0.12-0.17x0.1-0.15; oesophagus 0.2-0.35 long; esophageal bulb 0.1-0.16x0.13; testis 0.17-0.45x0.26-0.45, when testes are separate, anterior testis 0.18x0.15, posterior one 0.19x0.14; cirrus sac 0.12-0.16x0.09-0.14; ovary 0.13-0.24x0.1-0.17; eggs 0.112-0.135x0.054-0.086.

Distribution : India : Kashmir, Meghalaya, West Bengal, Andhra Pradesh, Punjab, Uttarakhand.

Elsewhere : Sri Lanka.

Subfamily PARAMPHISTOMINAE Fischöder,
1901

Key to the genus of the subfamily Paramphistominae

1. Mehli's gland at the postero dorsal to the ovary
..... *Srivastavia*
Mehli's gland at the antero lateral to the ovary
..... *Stunkardia*
2. Genital sucker strongly developed, pars muscosa present *Cotylophoron*

Genital calyx, genital sucker and pars muscosa poorly developed or absent

..... *Paramphistomum*

13. Genus *Srivastavia* Singh, 1970.

15. *Srivastavia indica* Singh, 1970.

(Fig. 14).

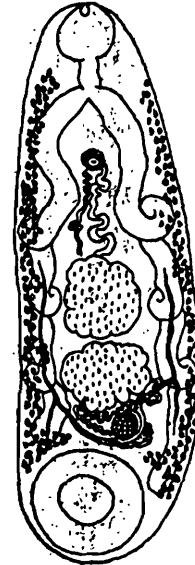


Fig. 14. *Srivastavia indica* Singh 1970 (After Mehra, 1982).

1970. *S. indica* Singh H. D. *Srivastava Comm.*, Vol. : 117-126.

Material : Host : Sheep; Locality : Bageswar Garur Valley, Kumaon, Uttarakhand.

Diagnostic characters : Body, smooth, elongate, mouth opening is surrounded by cuticular papillae, 5.61-7.743x2.253-0.284; mouth terminal; pharynx muscular, round, 0.445-0.765; esophagus 0.267-0.534, caeca sinuous, with 3-4 twists, wavy, end dorsally to anterior margin of acetabulum; acetabulum sub terminal, rounded, 1.335-1.513; testes two, tandem, in posterior half of middle third of body, rounded or oval, deeply lobed, 1.068-1.371x1.104-1.469 and 0.935-1.264x1.666-1.264 respectively; vas deferens runs along median line; ovary round, sinistral, behind posterior testis, 0.365-0.801; Mehli's gland postero dorsal to ovary; Laurer's canal opens dorsal to acetabulum; uterus forms a number of coils in ovarian region and runs forward dorsal to testes; ductus harmaphroditicus with genital papilla present; genital atrium shallow; vitellaria follicular, lateral, extend from base of esophageal region to anterior margin of acetabulum; eggs 0.13-0.16x0.07-0.086; excretory bladder antero -dorsal to ovary; excretory ducts reach posterior testis.

Remarks : This species was first described by K.S. Singh, 1970 as to the subfamily Orthocoelinae Price and McIntosh, 1953. C.B. Srivastava had follows H.R. Mehra's classification of the family Paramphistomidae, Fiscoeder, 1901 and redescribed it to the subfamily Paramphistomidae Fiscoeder, 1901 as in the specimen, pharynx is without paired diverticula, cirrus sac absent and it is parasitic to mammals.

Distribution : India : Uttarakhand.

14. Genus *Stunkardia* Bhalerao, 1931
16. *Stunkardia dilymphosa* Bhalerao, 1931
(Fig. 15)

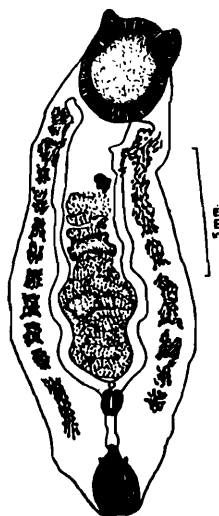


Fig. 15. *Stunkardia dilymphosa* Bhalerao, 1931 (After Chatterjee 1930).

1931. *S. dilymphosa* Bhalerao *Parasitology*, 23 : 99-108.

Material : Host : Fresh water turtle, *Batagur baska*, *Morenia ocellata*; Location : Rectum; Locality : Srinagar, Garhwal, Uttarakhand.

Diagnostic characters : Body elongate, 20-20.3x5-5.6 (Bhalerao), 13.5-20x3.8-7 maximum width (Chatterjee); cuticle thick, smooth; oral sucker 2.52-2.87x2.11-2.14 (Bhalerao), 1.8-2.7x1.4-1.8 (Chatterjee) with a pair of small diverticula, 0.7-0.8 long (Bhalerao); acetabulum 3.88-3.9x3.15-3.5 (Bhalerao), 2.5-4.1x1.7-3.3 (Chatterjee), its anterior half semicircular, posterior funnel like, two parts separated by a septa, its postero lateral border produced into two stout muscular processes; oesophagus zig zag, with posterior esophageal bulb of 0.75-0.89x0.585-0.685 (Bhalerao); caeca long, sinuous curved into four bracket like loops, terminating anterior to acetabulum with vesicula seminalis and metraterm

in the foremost bracket, anterior testis in second, posterior testis in third and ovary and shell gland in the last bracket of the loop; excretory pore anterior to acetabulum; excretory vesicle elongated, anteriorly; lymph system of two pairs of vessels, one dorsal and one ventral; testes 0.73-0.94x0.45-0.7 (Bhalerao), equal, deeply lobed, vesicula seminalis extends from behind intestinal bifurcation to posterior border of esophageal bulb; genital pore just pre bifurcal; cirrus sac absent; ovary 0.5-0.53x0.39-0.48 (Bhalerao), lobed, slightly sinistral, anterior to excretory vesicle; shell gland median; Laurer's canal opens dorsally; recepticulum seminalis near ovary; uterus much coiled, intercaecal, anterior to ovary; metraterm to left of vesicular seminalis; eggs 0.132x0.117 (Bhalerao); vitellaria lateral of small follicles from level of esophageal bulb almost to anterior border of acetabulum.

Distribution : India : Uttarakhand.

Elsewhere : Myanmar.

15. Genus *Paramphistomum* Fiscoeder, 1901
17. *Paramphistomum cervi* (Zeder, 1790)
Fiscoeder, 1901
Reg. No. w 3844/1 (Fig. 16)



Fig. 16. *Paramphistomum cervi* (Zeder, 1790) Fiscoeder, 1901 (After Fiscoeder, 1901).

1790. *Distomum cervi* Zeder *Schr. de. Geo. Sch. naturfch Freunde* : 1065-1072

1901. *P. cervi* Fiscoeder *Zool. Anz.*, 25(646) : 367-375

Material : Host : Sheep; Location : Rumen; Locality : Pashulok, Uttarakhand.

Diagnostic characters : Length 6.8-8.6, pharynx 0.7-1.5, esophagus 0.75-1.2, intestinal caeca reaching upto acetabulum, acetabulum 1-3.2. Testes lobed, oval, obliquely tandem, upto 1-2 in length; genital pore before caecal bifurcation, ovary post testicular, vitelline gland extending from intestinal bifurcation to posterior end of acetabulum. Eggs 0.145-0.156x0.075-0.082.

Distribution : (Widely distributed), Meghalaya, Uttarakhand.

Elsewhere : Myanmar, Italy, West Germany, England, Sweden.

16. Genus *Cotylophoron* Stiles et Goldberger, 1910.

18. *Cotylophoron cotylophorum* (Fischoeder, 1901) Stiles et Goldberger, 1910.
Reg. No. w 3849/1 (Fig. 17)



Fig. 17. *Cotylophoron cotylophorum* (Fischoeder, 1910) Stiles et Goldberger, 1910 (After Stiles et. Goldberger, 1910).

1901. *Paramphistomum cotylophorum* Fischoeder Zool. Anz., 25(646) : 367-375.

1910. *Cotylophoron cotylophorum* Stiles et Goldberger Hyg. Lab. Bull. No., 60 : 259 pp.

Material : Host : Sheep, Location : Lumen; Locality : Pashulok; Uttarakhand.

Diagnostic characters : Body conical or ovoidal, slightly curved ventrally or depressed, 4.3-6.12 in length, 1.5-3.6 in width. Acetabulum 1.53-2.61 in diameter, pharynx 0.6-1.0 in length, esophagus 0.42-0.62 provided with conspicuous esophageal bulb. Intestinal caeca coiled with 6-7 loops extending upto midlevel of acetabulum, testes

much lobed, diagonally placed, variable in size, 0.59-0.85x 0.73-0.85. Genital pore post-bifurcal, surrounded by genital sucker. Ovary 0.34-0.42x0.25 in level of posterior testis or post testicular. Eggs 0.125-0.140x0.055-0.068.

Distribution : India (Widely distributed), Meghalaya, Uttarakhand.

Elsewhere : Africa, Philippines, Indo-China.

Family ACANTHOSTOMIDAE Poche, 1925
Sub family ACANTHOSTOMINAE Nicoll, 1914

17. Genus *Acanthostomum* Looss, 1899

*19. *Acanthostomum indicum* Sinha, 1942
Reg. No. 8906/1 (Fig. 18)



Fig. 18. *Acanthostomum indicum* Sinha, 1942 (After Chakraborti & Ghosh 2007).

1942. *A. indicum* Sinha, *Pr. Ind. Acad. Sc.*, 16(3) : 86-90.

Material : Host : Crocodile; Location : Intestine; Locality : River Tehri at Gonda, Uttarakhand.

Diagnostic characters : Body spined, 6.2-7.33x0.36-0.45 in maximum width in acetabular region; oral sucker 0.35x0.32 with a single row of large spines of 0.051-0.0533x0.0132-0.0144 in size; acetabulum 0.2 in diameter, at the one fourth anterior body length, ratio of suckers 5:3; pre pharynx 0.86 long; pharynx 0.18 in diameter; oesophagus very short; caeca terminate blindly near posterior end; testes tandem at posterior end, oval, anterior slightly smaller, 0.28x0.25, posterior 0.85x0.25; vesicular seminalis extending to 0.95 behind acetabulum, consisting of basal sac like and

anterior narrow coiled parts, saccular basal part 0.3×0.13 ; ductus ejaculatory commences at middle of acetabulum; ovary ovoid, 0.22×0.17 , dextral, anterior to testes; receptaculum seminis large, oval, 0.127×0.062 ; vitellaria of small follicles, extending from 3.7 behind anterior end to anterior end of ovary, restricted to caeca; uterus transversely coiled between ovary and basal part of vesicula seminalis; eggs $0.032-0.034 \times 0.0145-0.016$.

Distribution : India : Uttarakhand.

Family HETEROPHYIDAE Odhner, 1914.
Sub family HAPLORCHIINAE Looss, 1899.

18. Genus *Haplorchis* Looss, 1899.

20. *Haplorchis taichui* Nishigori, 1924.

(Fig. 19)

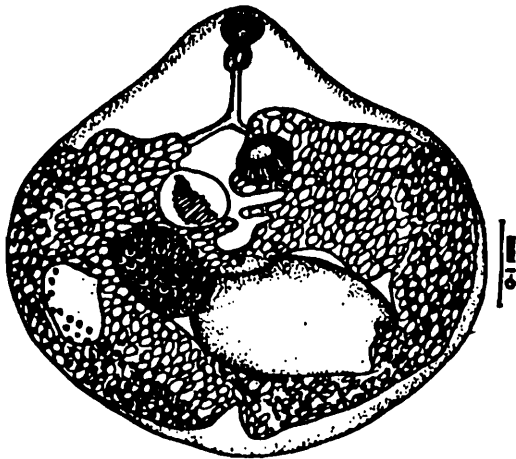


Fig. 19. *Haplorchis taichui* (Nishigori, 1924) Chen, 1936 (After Chen 1936).

1924. *H. taichui* Nishigori *Taiwan Igak. Zss.*, **237** : 569-570.

Material : Host : Kite, *Milvus migrans*, Domestic cat; Location : Small intestine; Locality : Mukteswar, Uttarakhand.

Diagnostic characters : (According to Pearson, 1964) Caeca thick walled, usually inflated, extend to between mid level of testes and just behind posterior border of testes, most commonly to level of posterior border of testes, typically with right caecum slightly longer than left (based on Taiwan specimens); vitelline follicles large, primarily dorsal, extend on dorsal face from between anterior to posterior border of ovary beyond testes almost to posterior end form roughly triangular, with apex over ovary, extend to lateral margin of body over testes and into lateral and venterolateral fields behind testes, occasionally in front of single rosette,

with center dorsal to testes; uterus apparently with three primary lobes, uterine eggs (20), 27 (24-28) micron $\times$ 13 (12-15) micron (based on Taiwan specimens); venterogenital sac median, post bifurcal, lined by a thick spineless cuticle, comprises large ventral chamber and dorsal pocket, with ventral chamber almost filled by apex of acetabulum, mouth of venterogenital sac median; genital pore enters ventral chamber dorsally on left; acetabulum highly modified with long axis so inclined that apex is directed anteroventrally towards the left side, comprises two parts, not separated by a constriction, a solid basal part embedded in the body and solidly muscular apical part projecting into ventrogenital sac; basal part sub spherical with distinct external muscular capsule enclosing parenchymatous medulla with few scattered nuclei and traversed radially by well separated muscular fibers running from apex to base; apical part anucleate, with cavity greatly reduced to a semi lunar pocket relatively unmodified ventrally and greatly enlarged dorsal lip with notch on medial (left) side between dorsal and ventral lips opposite (and ventral to) genital pore, ventral lip with fusiform group about 25 micron wide of anteriorly directed spines on external face; spines hollow shaped like canoes, with thick bottom and thin side, arranged bottom outwards on ventral face embedded for most of length in cuticle, with free end presumably flexible tips which can be recurved over edge of lip into cavity of sucker, fusible group of anteriorly directed spines with 12-16 spines of maximum length 25-30 micron, on medial (left) side, anteriorly directed hollow spines replaced by patch of small, solid, outwardly directed spines, the longest of which may reach 4 micron in length, born on a slight prominence, with a few spines on inner edge of ventral lip; dorsal lip unarmed, enlarged, swollen, hemispherical, typically subdivided by an internal longitudinal groove into a large lateral and a small medial lobe, at margin of medial notch; gland cells are not seen in acetabulum; dorsal pocket with thickened muscular wall lined by unarmed cuticle, opens into the ventral chamber dorsal to dorsal lip of acetabulum by transverse, elongate oval opening; gonotyle absent; genital sinuous opens into ventrogenital sac dorsomedially, opposite notch between ventral lip and medial lobe of dorsal lip of acetabulum, parts so arranged that sperms from

genital sinuous pass through notch into cavity of acetabulum and from thence along internal group in the dorsal lip to the ventrogenital sac.

Distribution : India : West Bengal, Uttarakhand.

Elsewhere : Faiyum Province, Egypt, Taiwan.

Family OPISTHORCHIIDAE Looss, 1899.

Sub family OPISTHORCHIINAE Looss, 1899.

19. Genus *Opisthorchis* Blanchard, 1895.

Key to the species of the genus *Opisthorchis*

Body spined, esophagus long, ovary irregularly lobed *O. noverca*

Body unspined, esophagus short, bulbous, ovary round or oval *O. hardoiensis*

21. *Opisthorchis (Opisthorchis) noverca

Braun, 1902.

Reg. No. W8866/1

(Fig. 20)

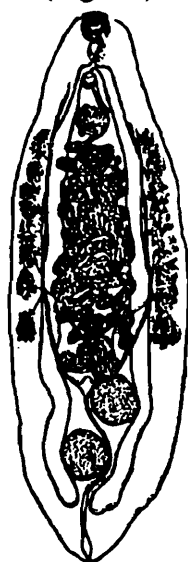


Fig. 20. *Opisthorchis noverca* Brawn, 1903 (After Brawn, 1903).

1902. *O. (O.) noverca* Braun Zool. Jahrb., 16 : 162.

Material : Host : Man, Dog, Swine; Location : Liver; Locality : Kasauli, Mukteswar, 2 exs. Re-described from Host : *Parus canthogenys*; Location : Khurpatal, Nainital, Uttarakhand, Collector : S. Chakrabarti.

Diagnostic characters : Body spined, 2.1-12.7x1.4-2.5; protrusible pedicel without spines bearing acetabulum and genital pore on the tip present; oral sucker 0.23-0.27 in diameter, larger than acetabulum; acetabulum 0.164-0.176 in

diameter; pharynx 0.184-0.26; esophagus 0.04 long; anterior testis round or egg shaped, 0.3-0.49; posterior testis partly rounded, partly lobed, 0.42-0.56; receptaculum seminis pear shaped, 0.28 long; ovary irregularly lobed or with three lobes, 0.32x0.24; vitellaria extending from ovarian region to vesicular seminalis, consisting of eight follicle group; uterus strongly coiled; genital pore median; eggs 0.02-0.027x0.011; excretory vesicle "Y" shaped.

Distribution : India : West Bengal, Meghalaya, Uttarakhand.

Elsewhere : Myanmar, Philippines.

22. *Opisthorchis (Nigerina) hardoiensis*

(Baugh, 1958)

(Fig. 21)



Fig. 21. *Opisthorchis (Nigerina) hardoiensis* Baugh, 1958 (After Mehra 1982).

1958. *O. (N.) hardoiensis* Baugh Proc. Natn. Acad. Sci. Ind., 26(3) Sect. B : 205-226.

Material : Host : Little cormorant, *Phalacrocorax niger* (Bieillot); Locaton: Gall Bladder, Liver; Locality : Vicinity of Hardoi, Uttarakhand.

Diagnostic characters : Body long, unspined, cricket bat shaped, 5.65-12.6x0.85-1.03; margins of post acetabular region ruffled forming conical lateral projections; acetabulum at end of anterior part, 0.328-0.459x0.41-0.459; oral sucker terminal, 0.196-0.246x0.41-0.574; pharynx 0.164-0.246x0.18-0.278; esophagus short, bulbous, 0.082-0.148 long; caeca extended to posterior extremity;

gonads in posterior end of body; testes globular, oblique, anterior testis 0.164-0.295x0.16-0.246, posterior one 0.164-0.278x0.164-0.245; vesicula seminalis convoluted, just posterior to acetabulum; genital pore pre acetabular; ovary round or oval, 0.082-0.18x0.115-0.180; receptaculum seminis and Laurer's canal present; shell gland mass compact, close to ovary; vitelline follicles extremely small in lateral region of posterior half of body upto level of posterior testis; vitelline reservoir is present immediately behind ovary; eggs 0.0247-0.060x0.0130-0.015; excretory pore terminal, excretory vesicle sigmoid, passing between testes to ovary.

Distribution : India : Uttarakhand.

Family MONORCHIIDAE Odhner, 1911.

Sub family ASYMPHYLORINAE
Szidat, 1943.

20. Genus *Asymphylogora* Looss, 1890.

23. *Asymphylogora kedarai* Srivastava, 1951.

1951. *A. kedarai* Srivastava *Ind. J. Helm.*, 3(1) : 7-12.

Material : 6 exs, Host : *Puntius sophore*;
Location : Intestine; Locality : Thamarwa, HarDOI,
Uttarakhand.

Diagnostic characters : Body oval, maximum width at acetabular region, 0.412, 0.715 long; anterior end thick, muscular; minute triangular spines on pre acetabular zone; unicellular gland present on the anterior muscular region, probably secretory, opens by minute pore in the oral sucker; well developed oral sucker sub terminal, 0.145x0.09; acetabulum well developed, more or less spherical, 0.14, lies at a distance of 0.18 from the anterior end overlapping the intestinal bifurcation; pharynx well developed, muscular, follows the oral sucker, 0.063x0.065, followed by a short, broad and straight esophagus, 0.032 in length; below the border of acetabulum, too simple, club shaped intestinal caeca, 0.17 long, reaching laterally upto the middle of ovary; single, triangular, massive testis with entire outline situated most posteriorly, 0.186x0.184, broad base of the testis directed anteriorly, overlapped by the posterior end of the ovary; seminal vesicle bipartite, simple, pars prostatica, ejaculatory duct somewhat convoluted, terminating into a well developed unarmed muscular cirrus, 0.06; cirrus sac enclosing seminal

vesicle, pars prostatica, prostate glands and ejaculatory duct, situated obliquely on the right side of the long body, cirrus sac 0.162 (length depends upon the quantity of sperms present in the seminal vesicle), the hind end of cirrus sac extends posteriorly beyond the acetabulum, opens at the level of the intestinal bifurcation on the right side, nearly midway between the esophagus and the right margin of the body; ovary round, situated just anterior to testis in third quarter of body, 0.108x0.115; ootype surrounded by shell glands and lies just anterior to ovary; the receptaculum seminis 0.06. lies on the left side of the ootype; vitelline glands lateral, extracaecal, occasionally overlapping the the intestinal caeca, extending from middle of the acetabulum to the the posterior end of caeca, composed of compact follicular acini; vitelline ducts arise from the opposite groups of vitellaria which join anteroventral to ovary to form a common yolk opens at the ootype; uterus originating from ootype filling up the space between acetabulum and gonads; metraterm muscular, unarmed, curved and runs somewhat parallel and ventral to the intestinal caecum on the right side, 0.085, opens independently by the side of the main pore; eggs small, smooth, oval, non operculate, 0.014-0.015x 0.009-0.01.

Remarks : The present form differs from all the species of the genus *Asymphylogora* Looss, 1890 except *A. exspinosa* Hausmann, 1896 in having unarmed cirrus and metraterm in the triangular testis which situated at the posterior end of the body, in the extent of the uterus, and in the non operculated and non filamentous condition of the egg; from *A. exspinosa* Hausmann 1896, it differs however in the smaller size of the body, in having spines on the anterior muscular region of the body (*A. exspinosa* is entirely without spines), in different ratio between oral sucker and acetabulum (1 : 1.37 in *A. exspinosa*), in the position and shape of the testis, in the extent of the uterus and in the smaller size and non operculated condition of eggs.

The above characters together with the absence of the spines from the cirrus and metraterm, bipartite seminal vesicle, separate genital pore, absence of prepharynx, presence of short, broad and straight esophagus and the overlapping of the

intestinal bifurcation by the acetabulum, distinguish the present form from all known species of the genus and therefore a new species *A. kedarai* is created for its reception.

Distribution : India : Uttarakhand.

Family NOTOCOTYLIDAE Luhe, 1909.

Key to the subfamilies of Notocotylidae

Genital pore sub median, far behind intestinal bifurcation, just pre equatorial; cirrus sac curved, 'C' shaped, vesicula seminalis present or absent OGMOCOTYLINAE

Genital pore median near anterior end, bifurcal or post-bifurcal; cirrus sac usually elongate not curved; vesicular seminalis externa present. NOTOCOTYLINAE

Subfamily NOTOCOTYLINAE Kossack, 1911

21. Genus *Notocotylus* Diesing, 1839

24. *Notocotylus (Notocotylus) parvivatus*
Yamaguti, 1934

1934. *N. (N.) Parvivatus* Yamaguti *Jap. J. Zool.*, 5 : 543-583

Material : *Anser anser* (Linn.); Location : Caeca; Locality : HarDOI, Uttarakhand; Collector : S.C. Baugh; Date of collection : 1958.

Diagnostic characters : Body elongated, spined, broadly elongate at the anterior end, 2.9-4.28 long, 0.879-1.06 broad, ventral gland 23-25 in each lateral lobes, 20 or 21 glands in median row; oral sucker 0.108-0.148x0.162-0.170, esophagus short, 0.067-0.089 long; caeca extend to posterior end of testes; testes elongated, lobed, equal or unequal, right testis 0.498-0.697x0.249-0.332, left testis 0.464-0.614x0.248-0.282; cirrus sac club shaped, 0.91-1.49 long; vesicular seminalis interna in the vessel part of cirrus sac, ductus ejaculatorius long; cirrus beset with minute spines; ovary irregularly lobed, 0.21-0.3x0.18-0.26; vitellaria extracaecal, extending from middle of body to anterior end of testes; shell gland immediately pre ovarian; uterine coils compact, 18-20, intercaecal; metraterm with glandular coat outside, half as long as cirrus sac, 0.41-0.66 long; eggs 0.013x0.0093, provided with long filament at each pole; excretory pore dorsal behind ovary; excretory vesicle with short stem divided into two cornua.

Distribution : India : Uttarakhand.

Elsewhere : Russia, Japan

Subfamily OGMOCOTYLINAE Skrjabin et Shultz, 1933

22. Genus *Ogmocotyle* Skrjabin et Shultz, 1933

25. *Ogmocotyle indica* (Bhalerao, 1942)
Ruiz, 1946, (Fig. 22)



Fig. 22. *Ogmocotyle indica* (Bhalerao, 1942) (After Ruiz, 1946)

1942. *Cymbiforma indica* Bhalerao *Parasite.*, 34(2) : 133-137.

1946. *O. indica* Ruiz *Mem. Inst. Butantan*, 19 : 249-372.

Material : Host : Goat, Sheep, Cattle; Location : whole of alimentary canal following esophagus and bile duct; Locality : Mukteswar, Kumaon, Uttarakhand.

Diagnostic characters : Body boat shaped, 0.8-2.715 long, 0.31-0.96 in maximum width in region of cirrus sac; cuticle smooth; oral sucker 0.067-0.14 in diameter; esophagus slender, 0.05-0.148 long; caeca slender, passing gradually towards periphery, parallel to each other for a short distance in front of vitellaria, gradually converging thereafter and terminating in intertesticular region opposite middle or posterior third of testes; excretory pore slightly dorsal, sub terminal; excretory vesicle 'Y' shaped with tubular stem, bifurcating into two arms at level of anterior third of testes, arms diverge laterally as far as anterior level of vitellaria; excretory duct arising from each arm bifurcates in two branches just in front of level of cirrus sac forming intricate network between oral sucker and anterior border

of cirrus sac; testes irregularly lobed, opposite near posterior end of body, $0.168-0.55 \times 0.068-0.26$, lobes sometimes well defined, giving cauli flower shape, occasionally ill defined, giving saucer shaped form; vas deferens almost median, zig-zag, enlarged into convoluted vesicular seminalis externa; cirrus sac $0.46-0.75 \times 0.125$, 'C' shaped; vesicula seminalis interna in basal part of cirrus sac, pars prostatica large, constricted of from vesicular seminalis by a small narrow duct; ductus ejaculatorius and cirrus convoluted; everted cirrus covered with large papillae, 0.12 long by 0.03 thick; genital pore sinistral, slightly in front of mid body; ovary at extreme posterior end, four lobed, lobes connected anteriorly, each lobe $0.077-0.145 \times 0.063-0.08$, lobes often entire, sometimes subdivided; Laurer's canal present, receptaculum seminis absent; vitellaria of large follicles arranged in form of horse shoe or semi circle, some follicles dorsal to testes, some lateral and some in front of them but large number are intercaecal; uterine coils extend from shell gland to middle of cirrus sac; metraterm on left side of cirrus sac, $0.14-0.37 \times 0.06-0.165$; eggs numerous, oval with filaments at ends, $0.008-0.0198$ long.

Distribution : India : Uttarakhand.

Elsewhere : China.

Family CYCLOCOELIDAE Kossak, 1911
Subfamily CYCLOCOELINAE Stossich, 1902

23. Genus *Cyclocoelium* Brandes, 1892

Key to the species of *Cyclocoelium*

1. Genital pore ventral to posterior end of pharynx 2

Genital pore in level with anterior border of pharynx or in front of it *C. mutabile*

2. Body 10.5-11 long, pharynx $0.25-0.40$ *C. sharadi*

Body $10.19-26.08$, pharynx 0.27 *C. elongatum*.

26. *Cyclocoelium sharadi* Bhalerao, 1935
Reg. No. W 3704/1 & W 3705/1.

1935. *C. sharadi* Bhalerao Ind. J. Vet. Sci. Anim. Hus., 5(1) : 49-63

Material : Host : *Uracissa fabiorostris*;
Location : Thoracic cavity; Locality : Mukteswar, Uttarakhand; Coll. G.D. Bhalerao.

Diagnostic characters : Body 10.5-11 long; pharynx 251-400 micron; eggs $100-140 \times 51-81$ micron; genital pore in level with posterior extremity of pharynx or a little behind; vitellaria marginal or sub marginal outside caeca, non confluent posteriorly; uterine coils clearly confined in intercaecal field; ovary deviated often from the line joining the centers of the testes; excretory vesicle bicornuate (form of two pouch joined together).

Remarks : Mehra, 1980 synonymies *C. sharadi* with *C. elongatum* Harrah, 1921 as *C. sharadi* closely resembles with that accepting considerable difference in length of the body also agreed with this synonymy.

Distribution : India : Uttarakhand.

27. *Cyclocoelium (Hyptiasmus) elongatum

Harrah, 1921

Reg. No. W8895/1 - W8901/1 (Fig. 23)

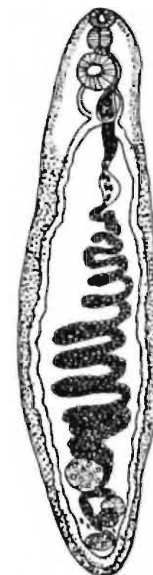


Fig. 23. *Cyclocoelium (Hyptiasmus) elongatum* Harrah, 1921
(After Chakraborti & Ghosh 2007).

1921. *C. (H.) elongatum* Harrah J. Par., 7(4) : 162-165.

Material : Host : *Uracissa fabiorostris*;
Location : Thoracic cavity; Locality : Mukteswar, Uttarakhand.

Diagnostic characters : Length $10.19-26.08$; with $1.68-5.6$; pharynx $0.27 \times 0.27-0.28$; genital pore ventral to posterior end of pharynx; anterior testis $0.41 \times 0.33-1.36 \times 1.71$ and posterior testis $0.38 \times 0.43-1.32 \times 1.92$; ovary $0.24 \times 0.25-0.54 \times 0.54$, often deviated from the lines joining the center of testes;

vitellaria marginal or sub marginal outside caeca, non confluent posteriorly; uterine coils clearly confined to intercaecal fields; eggs 11x78-140x94 micron; excretory vesicle bicornuate.

Distribution : India : Andhra Pradesh, Uttarakhand.

Elsewhere : China, South America.

28. *Cyclocoelium (Cyclocoelium) mutabile*
(Zeder, 1800)
(Fig. 24)

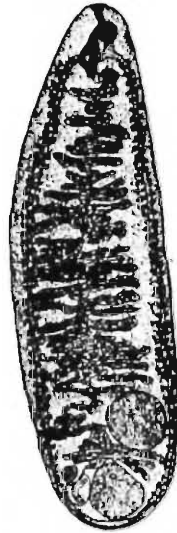


Fig. 24. *Cyclocoelium (C.) mutabile* Zeder, 1800 (After Mehra 1982)

Material : Host : *Fulica atria*, Location : Body cavity; Locality : Surha Tal, Balla.

Diagnostic characters : Length 27; pharynx large, 500-1270 micron; genital pore in level with anterior border of pharynx or in front of it; eggs 96-132x51-77 micron; vitellaria profusely developed, enveloping caeca ventrally and dorsally, not confluent posteriorly; parasitic in Ralloidea (*Fulica* and *Ganninula*).

Distribution : India : Uttar Pradesh, Uttarakhand.

Elsewhere : Germany, Europe, Asia, America.

Family ECHINOSTOMATIDAE Poche, 1926
Key to the subfamilies of Echinostomatidae

1. Body long slender, cylindrical collar spines interrupted dorsally, usually in a single row IGNAVIINAE

Collar spines not interrupted dorsally, usually in a double row

..... ECHINOSTOMATINAE

Body not much elongated, not attenuated posterior to acetabulum

2. Uterus short, eggs not numerous ECHINOCHASMINAE

Uterus long, eggs numerous MEHRASTOMINAE

Subfamily ECHINOCHASMINAE Odhner, 1910

Key to the genus of *Echinochasmus*

Uroproct present *Echinochasmus*

Uroproct absent *Stephanoprora*

24. Genus *Echinochasmus* Dietz, 1909

25. *Echinochasmus antigonus* Gupta, 1953

1953. *E. antigonus* Gupta *Ind. J. Helm.*, 5(2) : 81-86.

Material : Host : *Antigone antigone* (Linn.), Saurus crane; Location : Intestine; Locality : HarDOI, Uttarakhand.

Diagnostic characters : Body narrow, elongated, posterior end slightly tapering, 11.75-12.92x1.2-1.43; collar 1.425-1.55 broad with large ventral gap, collar spines 24 in single dorsally interrupted row, 0.065-0.08x0.03-0.041; acetabulum at middle or anterior third, 0.89-0.984 in diameter; pre pharynx 0.15-0.168, pharynx 0.26-0.302x0.225-0.24; esophagus 0.854-0.875 long; genital pore almost median between acetabulum and intestinal bifurcation; testes longitudinally elongated, 0.46-0.76 apart from each other, anterior testis 0.987-1.1x0.486-0.542, posterior one 0.928-1.1x0.486; cirrus sac pre acetabular and partly overlapping anterior border of acetabulum; ovary sub globular or globular, 0.263-0.284 in diameter, slightly dextral; recepticulum seminis uterinum large; uterus densely coiled; eggs numerous, 0.104-0.126x0.057-0.068; vitellaria commence from short distance behind acetabulum, tend to come closer in post testicular region, but are not confluent.

Distribution : India; Uttarakhand.

25. Genus *Stephanoprora* Odhner, 1902

Key to the species of *Stephanoprora*

- 22.5-26.764 long, 1.39-1.169 in maximum width at acetabular region, vitellaria follicular, from level of ovary to posterior end *S. gigantea*

2.683-4.01 long; 0.450-0.551 in maximum width at the level of testes; vitellaria follicular from level of anterior body of posterior testis to posterior extremity *S. nigerica*

30. *Stephanoprora gigantea* Gupta, 1962
(Fig. 25)

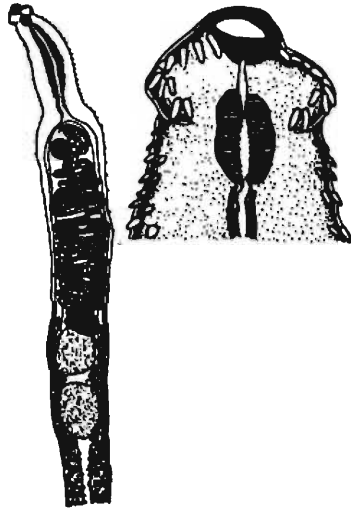


Fig. 25. *Stephanoprora gigantea* Gupta 1962 and its collar. (After Mehra 1982)

1962. *S. gigantea* Gupta *Proc. Nat. Acad. Sci. Ind.*, 32(3)
Section B : 381-386.

Material : Host : *Xenorhynchus asiatica* (Letham), Black necked stork, Location : Intestine; Locality : HarDOI, Uttarakhand.

Diagnostic characters : Body exceedingly long and slender, 22.5-26.764 long, 1.39-1.169 in maximum width in acetabular region behind which it is of uniform width, spinulate upto pre ovarian region; collar spines 22 in single dorsally broken row, 0.064-0.091x0.018-0.023; terminal oral sucker 0.154-0.21x0.21-0.238; acetabulum 0.476-0.532 at middle of anterior third of body; pre pharynx short, 0.056-0.098 long; pharynx elliptical, larger than oral sucker, 0.252-0.308x0.164-0.214; esophagus long, slender, 2.437-0.001 long, surrounded by a thick coat of small compact gland cells; caeca extending to hind end of body; testes tandem, closely placed in anterior region of middle third of body, quadrangular or oval, anterior one 1.01-1.54x0.81-0.99, posterior one 1.240-1.582x0.771-0.98; cirrus sac pear shaped, extending to middle of acetabulum, 0.602-0.84x0.258-0.406; vesicular seminalis bipartite; cirrus spiny; genital pore immediately behind intestinal bifurcation; ovary median, trilobed, 0.294-

0.42x0.532-0.616; vitellaria of small follicles from level of ovary to posterior end; Mehli's gland just behind ovary; recepticulum seminis absent, proximal part of the uterus forms recepticulum seminis uterinum; uterus of several transverse coil, pre testicular; eggs 0.0945-0.1002x0.0535-0.0628; excretory vesicle with four chambered stem, pore terminal.

Distribution : India : Uttarakhand.

31. *Stephanoprora nigerica* Gupta, 1963
(Fig. 26)

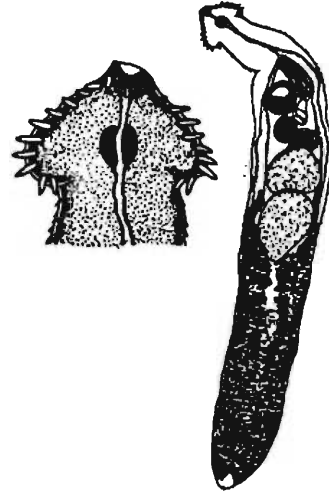


Fig. 26. *Stephanoprora nigerica* Gupta 1962 and its collar (After Mehra 1982).

1963. *S. nigerica* Gupta *Zool. Anz.*, 170(3/4) : 117-130.

Material : Host : *Phalacrocorax niger* (Viellot), Little cormorant; Location : Small intestine; Locality : Anupsahar, Uttarakhand.

Diagnostic characters : Body elongated, spinose in anterior half, 2.683-4.01 long, 0.450-0.551 broad at level of testes, collar with a large ventral gap, 0.28-0.295 broad with 22 spines in single dorsally broken rows, dorsal chasma slightly less than breadth of oral sucker, collar spines 0.041-0.049x0.005-0.007; suckers weakly developed, oral sucker 0.059-0.101x0.056-0.102; acetabulum 0.18-0.218x0.164-0.233, in posterior region of anterior body third; pre pharynx short, 0.045-0.064 long; pharynx 0.065-0.009x0.047-0.063; esophagus 0.341-0.591 long; caeca reaching almost to posterior end; testes tandem, contiguous, pear shaped, in middle region of body, anterior testis 0.255-0.368x0.306-0.454, posterior testis 0.419-0.551x0.282-0.436, always larger than anterior testis, cirrus sac elongated, saccular 0.198-

0.326X0.108-0.135, extending to middle of acetabulum; vesicula seminalis bipartite; pars prostatica weakly developed; ductus ejaculatorius short; ventral pore median, post bifurcal; ovary median or slightly dextral, 0.113—0.141; vitellaria lateral of median size follicles tend to merge together in post testicular region. Mehli's gland interrelated between ovary and anterior testis, recepticulum seminalis absent, recepticulum seminis uterinum present; uterus short, consisting of 2.4 transverse coils, pretesticular, eggs few, 2-8, 0.0679 - 0.0705 x 0.0501 - 0.0549.

Subfamily IGNAVIINAE Yamaguti, 1958

26. Genus *Ignavia* Freitas, 1948

32. *Ignavia brevibarica* Gupta, 1962

(Fig. 27)

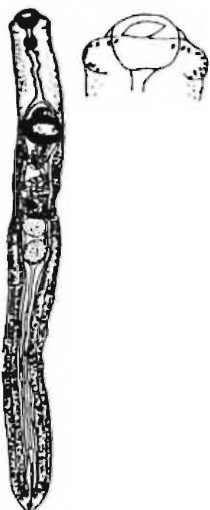


Fig. 27. *Ignavia brevibarica* Gupta, 1962 and its collar, (After Mehra, 1982)

1962. *I. brevibarica* Gupta Rev. Biol. Proc., 10(1) : 99-110.

Material : Host : *Ardea purpurea* (Linn), Purple heron; Location : Uterus and kidney; Locality; Hardoi, Uttarakhand.

Diagnostic characters : Body long, narrow with broad anterior and pointed posterior extremity, spine in anterior half, 4.57-6.951 long, 0.462-0.751 broad in testicular region; collar prominent at side of oral sucker, dorsally almost flushed with body surface, ventrally discontinuous; collar spines 21, stout, small, 3-5 spines at venterolateral angle on each side showing alternate arrangements, others in a single row, wide gap in the row of spines in with dorsal line, spines 0.021-0.029x0.011-0.012; oral sucker 0.219-0.241x0.245-0.297; acetabulum

0.329-0.39x0.36-0.495, in anterior third of body; pre pharynx short; pharynx 0.122-0.175x0.114-0.17; esophagus with lateral out growths, 0.47-0.621 long; testes oblong to round in posterior region of anterior half; anterior 0.028-0.255x0.195-0.305, posterior 0.301-0.311x0.279-0.286, cirrus sac pear shaped, 0.167-0.2x0.079-0.121, pre acetabular or partly overlapping anterior margin of acetabulum; vesicular seminalis large, bipartite; pars prostatica short; ejaculatory duct short; genital pore median or sub median, pre acetabular; ovary dextral, ovoid to sub globular, 0.056-0.109x0.118-0.12; vitellaria of small follicles, lateral, from posterior border of acetabulum to posterior extremity, follicles mostly extracaecal; Mehli's gland immediately post ovarian; recepticulum seminalis uterinum present; uterus with a few transverse coils, intercaecal, pre ovarian, eggs 0.1025-0.1148x0.0654-0.08; excretory vesicle stem six chambered.

Distribution : India : Uttarakhand.

Subfamily MEHRASTOMINAE Saksena, 1959

27. Genus *Mehrastomum* Saksena, 1959

33. *Mehrastomum minutum* Saksena, 1959

(Fig. 28)

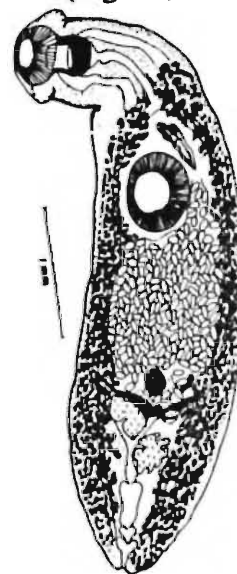


Fig. 28. *Mehrastomum minutum* Saksena, 1959 (After Baugh and Gupta 1961).

1959. *M. minutum* Saksena Proc. Natn. Acad. Sci. Ind. Sec., B.n., 29(5) : 240-244

Material : Host : *Dissura episcopa* (White necked stork), *Anastomus oscitans* (Boddaert) (Gape Bill Stork); Location : Intestine and cloaca; Locality: Uttarakhand; Coll. : J. N. Saxena.

Diagnostic characters : Body elongated, claviform, narrow anteriorly, broad posterior, spined with minute spines at pre acetabular region, 4.615-5.114 long, 0.95-0.18 broad at level of ovary; head collar well developed at the sides, appearing as latex in some specimens, run dorsally as a low ridge, ventrally incomplete; collar spines 28, small, 14 on each sides, dorsal region of collar devoid of spines, represented by a wide chasm or interaction, a few spines at ventral angle of collar show alternate arrangement while remaining spines are in a single row; collar spines 0.0235×0.0102 breadth at base; oral sucker terminal, $0.26-0.372 \times 0.393-0.51$; acetabulum pre equatorial, $0.612-0.71 \times 0.558-0.681$, equatorial position of acetabulum in specimens described by Saxena (1959) due to pre equatorial region of body not being fully developed (Baugh & Gupta, 1962); prepharynx 0.097×0.100 long; pharynx $0.186-0.265 \times 0.214$; esophagus moderately long, $0.465-0.673$ in length; caeca extend to posterior end of body; testes lobate, oblique, near posterior end, anterior $0.379-0.610 \times 0.176-0.254$, posterior $0.341-0.440 \times 0.110$, behind intestinal bifurcation, partly overlapping anterior border of acetabulum or its posterior part lies deflected to one side of the later in some specimens; genital pore slightly behind intestinal bifurcation; ovary globular, $0.179-0.210 \times 0.135-0.180$, pre testicular, median or slightly lateral; vitellaria lateral, mostly extracaecal from level of intestinal bifurcation to posterior extremity, anterior follicles of both sides come near towards median line, transverse vitelline ducts unite behind ovary to form large vitelline reservoir, shell gland complex, large behind ovary; Laurer's canal present; recepticulum seminis uterinum present; uterus large, coiled, full of eggs, intercaecal, occupying entire intercaecal space between anterior testis and acetabulum; metraterm may pass over acetabulum or to one side of the later; mature eggs partly embryonated, operculate, pale yellow, $0.112-0.132 \times 0.076-0.08$; excretory vesicle 'Y' shaped, stemmed with lateral branches or diverticula.

Discussion : The species was first described by Saxena (1959), who obtained it from the intestine of *Dissura episcopa* at Raipur, M.P. He created the genus and subfamily for it, and assigned it to the family Philophthalmidae. His specimens were not sexually mature and he

overlooked the collar spines and the minute cutaneous spines in the pre acetabular region of body. Baugh and R. Gupta (1962) described it from the fully mature specimens obtained by one of them from the cloaca of two Gape billed Stork, *Anastomus osciatus* (Boddaert) shot in the environs of Hardoi, U.P. They correctly allocated *Mehrastomum minutum* and the subfamily Mehrastominae to the family Echinostomatidae.

Distribution : India : Madhya Pradesh, Uttarakhand.

Subfamily ECHINOSTOMATINAE (Looss, 1899) Faust, 1929

28. Genus *Echinostoma* Rud. 1809

*34. *Echinostoma revolutum* (Froelich, 1802)
Looss, 1899

Reg. No. w 8902/1 (Fig. 29)

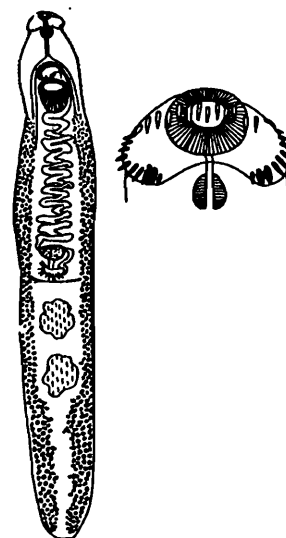


Fig. 29. *Echinostoma revolutum* (Froelich) and its collar (After Mehra 1982).

1802. *Fasciola revolutum* Froelich *Beitrag Natur. Einge.* 29 : 58-60.

1899. *E. revolutum* Looss *Zool. Jahrb. Syst.* 12 : 521-784.

Material : 1 ex.; Host : *Carpodacus erythrinus*; Location : Intestine; Locality : Ranikhet, Almorah (Dist.) Uttarakhand; Date of collection : 29th March, 2005; Collector : S. Chakrabarti.

Diagnostic characters : Body elongated, spined, 9.975 long, 1.475 broad, collar spines 37; oral sucker rounded, 0.175 in diameter, acetabulum 1.05×0.825 , prepharynx distinct, pharynx 0.1×0.075 , genital pore pre-acetabular, slightly to

left of median line; testes tandem, pre equatorial, lobed, anterior testis 0.55x0.325, posterior one 0.7x0.275, cirrus sac relatively small, encroaching anterior face of acetabulum; ovary almost equatorial, median, 0.4x0.35; vitellaria small, follicular, little behind acetabulum or about its middle to posterior extremity, including in middle line or not in post testicular region, uterus intercaecal, transversely coiled between anterior testis and acetabulum.

Distribution : India : Uttar Pradesh, West Bengal, Bihar, Assam, Tripura, Meghalaya, Uttarakhand.

Elsewhere : Australia, Philippines, Canada, Myanmar.

Family OPECOELIDAE Ozaki, 1925

Key to the subfamilies of Opecoelidae

Cirrus pouch weakly developed, rudimentary or lacking; anus often present
..... OPECOELIINAE

Cirrus pouch more or less well developed; anus absent PLAGIOPORINAE

Subfamily OPECOELINAE Stunkard, 1931

29. Genus *Dactylostomum* Woolcock, 1955

35. *Dactylostomum gayaprashadi* Tripathi et Jauhari, 1991

1991. *D. gayaprashadi* Tripathi et Jauhari *Uttar Pradesh. J. Zool.*, 11(1) : 70-72.

Material : 3 ex.; Host : *Xenentodon canicilla* (Ham.); Location : Small intestine; Locality : Lacchiwala, Dehradun, and Uttarakhand.

Diagnostic characters : Two dactyls on either side of the ventral sucker; testes oval and tandem; genital pore at the base of the peduncle; vitelline follicles extend from the level of the acetabulum up to the posterior end of the body.

Distribution : India : Uttarakhand.

Subfamily PLAGIOPORINAE Manter, 1947

30. Genus *Eucreadium* Dayal, 1942

36. *Eucreadium pandeyi* Srivastava et al. 1983

1983. *E. pandeyi* Srivastava et al. *Ind. J. Phys. Nat. Sci.*, (Sect. A) 3 : 33-37.

Material : Host : *Mastacembelus armatus*; Locality : Doon Valley, Uttarakhand.

Distribution : India : Uttarakhand.

37. *Eucreadium kulpaharensis* Agarwal et Agarwal, 1987

1987. *E. kulpaharensis* Agarwal et Agarwal *Rivis. de. Parasitologica* 1(45) (1) : 29-32.

Material : Host : *Channa punctatus*; Location : Intestine; Locality : Badatal, Kulpahar, Hamidpur, Uttarakhand.

Diagnostic Characters : Egg (1 or 2); 0.17-0.19x0.09-0.11 mm.

Distribution : India : Uttarakhand.

Family CEPHALOGONIMIDAE Nicoll, 1915

31. Genus *Oudhia* Gupta, 1955

38. *Oudhia hardayali* Kumar et Agarwal, 1980

1980. *O. hardayali* Kumar et Agarwal *Proc. Ind. Acad. Parasitol.* 1(2) : 41-42.

Material : Host : *Mystus vittatus*; Locality : Sorah Tal, Uttarakhand.

Family LATEROTREMATIDAE (Yamaguti, 1958)

Key to the Subfamilies of Laterotrematidae

1. Testes postacetabular, ovary pretesticular; vitellaria zone overlapping acetabular zone
..... LATEROTRSEMATINAE

Testes preacetabular; ovary posttesticular; vitellaria zone preacetabular
..... SRIVASTAVATREMATINAE

Subfamily LAEROTREMATINAE

Yamaguti, 1958

32. Genus *Pseudolaterotrema* (Yamaguti, 1939) Singh, 1962

39. *Pseudolaterotrema indica* Singh, 1962
Reg. No. W5703/1

1962. *P. indica* Singh. *J. Helm.*, 14(2) : 92-97.

Material : Host : *Epicurus maculatus guttatus*; Location : Intestine; Locality : Kumaon, Uttarakhand.

Distribution : India : Uttarakhand.

Subfamily SRIVASTAVATREMATINAE
(Singh, 1962)

33. Genus *Srivastavatrema* Singh, 1962

40. *Srivastavatrema mukteswarensis* Singh, 1962
Reg. No. W 5705/1

Material : Host : *Enicurus maculatus guttatus*;
Location : Intestine; Locality : Mukteswar,
Uttarakhand;

Distribution : India : Uttarakhand.

41. *Srivastavatrema indicum* Singh, 1962
Reg. No. W 5706/1

Material : *Enicurus maculatus guttatus*;
Location : Intestine; Locality : Kumaon,
Uttarakhand.

Family BRACHYLAIMIDAE (Joyeux et. Folei,
1930) Miller, 1936

Subfamily BRACHYLAIMINAE Miller, 1936

34. Genus *Brachylaima* Dujardin, 1843

42. *Brachylaima indicum* Singh, 1962
Reg. No. W5705/1.

1962. *B. indicum* Singh *Ind. J. Helm.*, 14(1) : 53-56.

Material : Host : *Kitta erythrorhynchus occipitalis*;
Location : Intestine; Locality : Mukteswar,
Uttarakhand;

Distribution : India : Uttarakhand.

*43. *Brachylaima ratti* Baugh, 1962
Reg. No. W 8860/1 (Fig. 30)

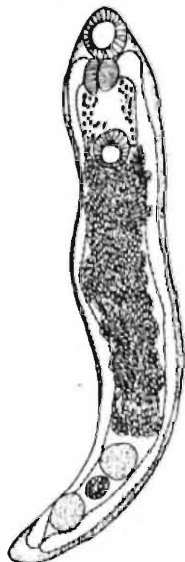


Fig. 30. *Brachylaima ratti* Baugh 1962 (After Chakraborti and Ghosh 2007)

1962. *B. ratti* Baugh *Ztschr. Par.*, 21 : 502-512.

Material : Host : Burrowing shrew; Location : Intestine; Locality : Nainital, Nainital (dist), Uttarakhand; Date : 24.3.2006; Collector : S. Chakrabarti;

Diagnostic characters : Body tongue shaped, 6.025x1.225; oral sucker 0.5x.525; pharynx 0.275 x.325; testes tandem in posterior third of body; anterior testis 0.4 x .375, posterior one 0.35 x .3; ovary inter testicular, 0.375 x .3; vitellaria commencing at varying levels near acetabulum.

Distribution : India : Uttarakhand. (Resdescribed).

Family PARAGONIMIDAE Dollfus, 1939

35. Genus *Paragonimus* Braun, 1899

44. *Paragonimus edwardsi* Gulati, 1926
Reg. No. W 1380/1

Material : *Paradoxurus grayi*; Locality : Kumaon Hills, Mukteswar, Uttarakhand.

Family PLAGIORCHIIDAE (Luhe, 1901)
Ward, 1917

Key to the subfamilies of Plagiorchiidae

Body spatulate, lanceolate for subcylindrical, spined or non-parasitic in reptiles, occasionally in fishes and amphibians
..... ASTIOTREMATINAE

Body oval or fusiform, elliptical or somewhat more elongate, spines, parasitic in all vertebrates PLAGIORCHIINAE

Subfamily ASTIOTREMATINAE Bear, 1924

36. Genus *Astiotrema* Looss, 1900

45. *Astiotrema reniferum* (Looss, 1898)
Stossich, 1904

Reg. No. W 8867/1 & W 8868/1. (Fig. 31)

1898. *Distoma unicum* Looss *Zool. Jahrb. Syst.*, 12 : 521-784.

1904. *Astiotrema reniferum* Stossich *Ann. Mus. Zool. d. R. Univ. d. Napoli n.s.n.*, 1(23) : 1-14.

Material : 5 exs., Host: *Bufo sp.*, *Rana sp.*, Location : Intestine, Locality : Muni ke Reti, Hardwar Dist., Uttarakhand; Coll. S. Chakrabarti; Date of collection : 23.9.2001.

Diagnostic characters : Body elongated with rounded extremities 5.7-6.55x1.025-1.2, cuticle covered with conspicuous spines which extend up

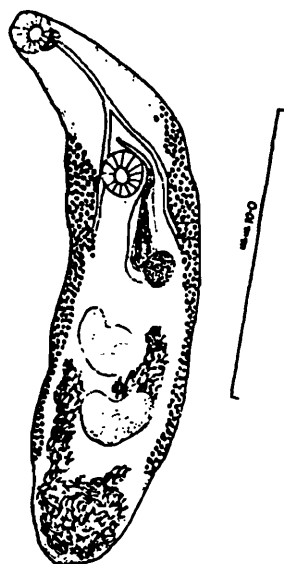


Fig. 31. *Astiotrema reniferum* (LooOss 1898) Stossich, 1904 (After Chakraborti 1994).

to the posterior level of posterior testis and thickly arranged up to the posterior level of the ventral sucker; oral sucker globular, sub terminal, $0.225 - 0.3 \times 0.225 - 0.325$; ventral sucker situated in posterior portion of anterior third of body length, almost of the size of the oral sucker, round; mouth sub terminal; prepharynx very small, leads to pharynx, pharynx $0.15 - 0.2 \times 0.175 - 0.2$; esophagus "S" shaped, small, bifurcates at anterior to ventral sucker; caeca extend up to middle or anterior level of posterior testis; testes triangular, diagonally tandem, posterior to ventral sucker, in equatorial zone, anterior testis $0.45 - 0.55 \times 0.4 - 0.45$; posterior testis $0.45 - 0.525 \times 0.5 - 0.525$; curved cirrus sac extends much posterior to ventral sucker, encloses seminal vesicle, short pars prostatica and protrusible cirrus; oblong ovary located in between anterior testis and ventral sucker, $0.275 - 0.325 \times 0.225 - 0.25$; recepticulum seminis well developed, transversely elongated, between anterior testis and ovary; uterus with numerous transverse coils, fills whole of posterior part of body, extend between testes, at places overlaps caeca; genital pore immediately in front of ventral sucker or vitellaria overlaps caeca, extends from bifurcal zone to almost caecal termination and sometimes asymmetrical; excretory bladder "Y" shaped with long stem, excretory pore subterminal, eggs yellowish.

Distribution : India : West Bengal, Meghalaya, Uttar Pradesh, Madhya Pradesh, Andhra Pradesh, Tripura, Uttarakhand.

Elsewhere : Egypt, Rhodesia.

Subfamily *PLAGIORCHIINAE* Pratt, 1902

37. Genus *Plagiorchis* Lühe, 1899.

46. *P. koreanus* Ogata, 1938.

Reg. No. W8872/1 & W8873/1 (Fig. 32)

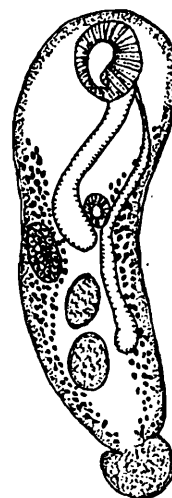


Fig. 32. *Plagiorchis koreanus* Ogata, 1938 (After Chakraborti & Ghosh 2007).

1938. *P. koreanus* Ogata *Ann. Zool. Jap.*, 17(2) : 581-586.

Material : 4 exs., Host : Bat, *Tadarida egyptica*; Location : Intestine. Locality : Dehradun (ZSI Complex), Uttarakhand; Date of collection : 18.09.01; Name of collector: S. Chakraborti.

Diagnostic character : Body elliptical covered with minute spines; Oral sucker well developed, $0.2 \times 0.175 - 0.2$; caeca terminating at posterior extremity; testes diagonal, in posterior half of body, anterior testis $0.125 - 0.175 \times 0.125 - 0.175$, posterior one $0.15 - 0.175 \times 0.1 - 0.2$; genital pore immediately pre-acetabular; ovary posterior to acetabulum, $0.125 - 0.15 \times 0.125 - 0.21$; vitelline follicles extending in lateral fields from posterior extremity to acetabular zone; uterus passing between ovary and anterior testis; eggs small, numerous; excretory vesicle 'Y' shaped, bifurcating between ovary and anterior testis.

Distribution : India : Uttarakhand.

Elsewhere : Korea.

Family BRACHYCOELIIDAE (Looss, 1899)

Johnston, 1912

Subfamily MESOCOELIINAE Faust, 1924

38. Genus *Mesocoelium* Odhner, 1910

*47. *Mesocoelium monas* (Rudolphi, 1819)

Freitas, 1958

Reg. No. W8891/1, W8892/1 & W8905/1

(Fig. 33)

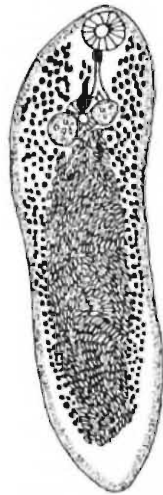


Fig. 33. *Mesocoelium monas* (Rud. 1819) Freitas, 1958 (After Chakraborti & Ghosh 2007).

1819. *Distoma monas* Rudolphi *ent. syst. cui acced. mant. duplex et. indices Locopletissime* Besol, 811.

Material : 34 exs. Host *Rana* sp., Frog, *Bufo* sp., Location - intestine; Locality - Haridwar, Dehradun, Uttarkhand. Date of collection - 27.09.03, 18.04.05, Collector S. Chakraborty.

Diagnostic characters : Body elongate with rounded extremities, 2.025 - 2.675 X 0.675 - 0.9, oral sucker subterminal 0.175-0.275 X 0.15 - 0.225; acetabulum at about 1/3 that of body length, smaller than oral sucker 0.15 - 0.2 X 0.125 - 0.2, pharynx not disceirnale, pharynx 0.075 - 0.1 X 0.075 - 0.125; oesophagus short; caeca upto equatorial region or slightly less. Testes round, oblique, anterodorsal or anterolateral to acetabulum, anterior one 0.0225 - 0.0325 X 0.175 - 0.225, postreior one 0.225-0.25 X 0.2 - 0.225; cirrus sac latercaecal, postbifurca adjacent to anterior testis. Genital pore on pretesticular zone below caecal bifurcation, ovary at acetabular opposite to posteriorly placed testes; vitelline follicles large from below to the oral sucker to caecal ends or

more, extracaecal, extensive coils massive in postacetabular region of body opening by the side of male genital pore, opposite to ovary, metraterm present; eggs operculated.

Distribution : India : Meghalaya, Uttar Pradesh, West Bengal, Tamil Nadu, Uttarakhand.

Elsewhere : North America, South America, Africa, Indonesia, Japan, Australia.

Family ANCHITREMATIDAE Mehra, 1935

39. Genus *Anchitrema* Looss, 1899

48. *Anchitrema sanguineum* (Sonsino, 1894)

Looss, 1899

Reg. No. W 8863/1 & W8864/1 (Fig. 34)

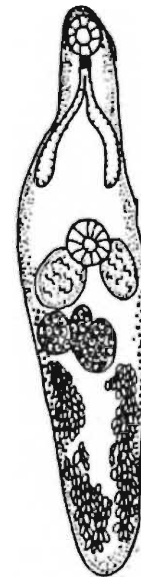


Fig. 34. *Anchitrema sanguineum* (Sonsino 1894) Looss, 1899 (After Chakraborti and Ghosh 2007).

1899. *A. sanguineum* Looss *Zool. Jahrb. Syst.*, 12 : 521-784.

Material : 8 exs. Host : *Scotophilus* sp. Location : Intestine; Locality : Dehradun (Z. S. I .complex.); Date of Collection : 19.9.2001; Collector. : S. Chakraborti;

Diagnostic characters : Body distome, tongue shaped, spinose anteriorly; 4.05- 4.3x 0.925-110; oral sucker terminal; 0.25-.275x0.25-. 03; Pharynx globular, 0.75-0.1 x 0.125, esophagus narrow and bifurcates above the acetabulum, into two narrow caeca which run almost upto the posterior end; acetabulum globular, smaller than oral sucker, 0.225-.275 x 0.2-.25, placed in anterior third of body; testes extracaecal, placed in distinctive

notch of ceacum of respective side, symmetrical, right testis 0.425-0.5, slightly bigger than the left one, 0.375- 0.475 x 0.3- 0.325; coiled seminal vesicle in globular sac, preacetabular; genital pore median, pre acetabular, ovary median, immediately post testicular, intercaecal, 0.225-0.25 x 0.2-0.25; vitelline glands consisting of small follicles, extracaecal, extend laterally in post testicular field; uterus filling up entire post testicular intercaecal field; excretory vesicle "Y" shaped; excretory pore terminal.

Distribution : India : Punjab, Rajasthan, Maharashtra, U.P., M.P., Andhra Pradesh, West Bengal. Meghalaya, Uttarakhand.

Elsewhere : Australia, Africa, Europe.

* Collected from Uttarakhand during the course of study and deposited to the National Zoological Collection.

SUMMARY

The present work is an account of all the species of Digenetic trematodes of vertebrate hosts recorded and studied so far from Uttarakhand. Diagnostic characters and keys for the families genera and species, dealt in the present

work have been provided mainly for the workers in this group. Geographical distribution of all the species recorded from Uttarakhand have been furnished to evaluate the bio-diversity of the species concerned. Diagrammes of most of the species have been provided for easy identification in future course of research.

In all 48 species under 39 genera and 21 families are recorded and examined so far from Uttarakhand.

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HOST-PARASITE RELATIONSHIP

Sl. No.	Parasite	Family	Host
01.	<i>Leucochloridium indicum</i> Singh, 1962	Leucochloridiidae	<i>Garulus bispecularis</i> Vigors (Himalayan Red Crown Jay)
02.	<i>Taniasia (Tamerlania) indica</i> Singh, 1962	Eucotyliidae	<i>Garrulus Lancoelatus</i> (Black throated Jay)
03.	<i>Pleuropsolus microsoma</i> Singh, 1962	Lecithode ndriidae	<i>Leioptilla capistrata</i> Vigors (Black headed Sibia)
04.	<i>Ganeo tigrinum</i> Mehra et Negi, 1928	-do-	<i>Rana cyanophlyctis</i>
05.	<i>Ganeo Kumao nensis</i> Pande, 1937	-do-	-do-
06.	<i>Pleurogenoides gastroporus</i> (Luhe, 1901) Travassos, 1921	-do-	Frog
07.	<i>Prosthodendrium longiforme</i> (Bhalerao, 1926) Dubois, 1960	-do-	<i>Tadarida aegyptica</i>
08.	<i>Brachylecithum indicum</i> Singh, 1962	Dicrocoeliidae	i) <i>Myiophoneus caeruleus temminckii</i> Vigors 1932 (Himalayan Whistling Thrush) ii) <i>Kitta erythrorhynchus occipitalis</i>
09.	<i>Brachylecithum chapmani</i> Singh, 1962	-do-	i) <i>Kitta erythrorhynchus occipitalis</i> (Bleek 1846) <i>Red-Billed Blue Mogpie</i> ii) Tree Pie.
10.	<i>Dicrocoelium dendriticum</i> Dujardin, 1845	-do-	Sheep
11.	<i>Fasciola hepatica</i> Linneaus, 1758	Fasciolidae	Sheep, Goat, Camel, Horse, Rarely Man.
12.	<i>Gastrothylax crumenifer</i> (Crep., 1847) Poirier, 1883	Paramphistomidae	Sheep, Cattle, Buffalo

Sl. No.	Parasitie	Family	Host
13.	<i>Fischoederius cobboldi</i> (Poirier, 1883) Stiles et Goldberger 1910	-do-	Sheep, cat, buffalo
14.	<i>Diplodiscus mehrai</i> Pande, 1937	-do-	<i>Rana cyanophlyctis</i> , <i>Bufo viridis</i> <i>Rana</i> sp.
15.	<i>Srivastavia indica</i> Singh, 1970	-do-	Sheep
16.	<i>Stunkardia dilymphosa</i> Bhalerao, 1931	-do-	Fresh water turtle, <i>Batagur baska</i> , <i>Morenea occilata</i>
17.	<i>Paramphistomum cervi</i> (Zeder, 1790) Fischoeder 1901	-do-	Sheep
18.	<i>Cotylophoron cotylophorum</i> (Fischoeder, 1901) Stiles et Goldberger, 1910	-do-	Sheep
19.	<i>Acanthostomum indicum</i> Sinha, 1942	Acanthostomidae	Crocodile
20.	<i>Haplorchis taichui</i> Nishigori, 1924	Heterophyidae	<i>Milvus migranus</i> Kite
21.	<i>Opisthorchis</i> (<i>Opisthorchis</i>) <i>noverca</i> Braun, 1902	Opisthorchiidae	Man, Dog, Swine
22.	<i>Opisthorchis</i> (<i>Nigerina</i>) <i>hardoiensis</i> (Baugh, 1958)	-do-	<i>Phalacrocorax niger</i> ; little cormorant.
23.	<i>Asymphyiodora kedarai</i> Srivastava, 1951	Monorchiidae	<i>Puntius sophore</i>
24.	<i>Notocotylus</i> (<i>Notocotylus</i>) <i>parviovatus</i> Yamaguti, 1934.	Notocotylidae	<i>Anser anser</i> (Linn.)
25.	<i>Ogmocotyle indica</i> (Bhalerao, 1942) Ruiz 1946	-do-	Goat, Sheep, Cattle.
26.	<i>Cyclocoelium sharadi</i> Bhalerao, 1935	Cyclocoelidae	<i>Uracissa fabiorostris</i>
27.	<i>Cyclocoelium</i> (<i>Hyptiasmus</i>) <i>elongatum</i> Harrah, 1921	-do-	<i>Uracissa fabiorostris</i>

Sl. No.	Parasitie	Family	Host
28.	<i>Cyclocoelium (Cyclocoelium) mutabile</i> (Zeder, 1800)	-do-	<i>Fulica atria</i>
29.	<i>Echinochasmus antigonus</i> Gupta, 1953	Echinostomatidae	<i>Antigone antigone</i>
30.	<i>Stephanoprora gigantea</i> Gupta, 1962	-do-	<i>Xenorhynchus asiatica</i> (Letham) Black necked stork.
31.	<i>Stephanoprora nigerica</i> Gupta, 1963	-do-	<i>Phalacrocorax niger</i> (Viellot), Little cormorant
32.	<i>Ignavia breviobarica</i> Gupta, 1962	-do-	<i>Ardea purpurea</i> (Linn.); Purple heron.
33.	<i>Mehrastomum minutum</i> Saksena, 1959	-do-	<i>Dissura episcopa</i> , white necked stork; <i>Anastomus oscitans</i> (Boddaert); Gape Bill Stork.
34.	<i>Echinostoma revolutum</i> (Froelich, 1802) Looss, 1899.	-do-	<i>Campodacus erythrynus</i>
35.	<i>Dactylostomum gayaprashadi</i> Tripathi et Janu hari	Opecoelidae	<i>Xenentodon cancella</i> (Ham).
36.	<i>Eucreadium pandeyi</i> Srivastava et. al., 1983	-do-	<i>Mastacembellus armatus</i>
37.	<i>Eucreadium kulpharensis</i> Agarwal et. Agarwal, 1987	-do-	<i>Channa punctatus</i>
38.	<i>Oudhia hardayali</i> Kumar et. Agarwal, 1980	Cephalogonimidae	<i>Mystus vittatus</i>
39.	<i>Pseudolaterotrema indica</i> , Singh, 1962	Laterotrematidae	<i>Epicurus maculatus guttatus</i>
40.	<i>Srivastavatrema mukteswarensis</i> Singh, 1962	-do-	-do-
41.	<i>Srivastovatrema indicum</i> Singh, 1962	-do-	-do-

Sl. No.	Parasitie	Family	Host
42.	<i>Brachylaima indicum</i> Singh, 1962	Brachylaimidae	<i>Kitta erythrorhynchus occipitalis</i>
43.	<i>Brachylaima ratti</i> Baugh, 1962	-do-	Burrowing Shrew
44.	<i>Pragonimus edwardsi</i> Gulati, 1926	Paragonimidae	<i>Paradoxurus grayi</i>
45.	<i>Astiotrema reniferum</i> (Looss, 1898) Stossich 1904	Plagiorchiidae	<i>Bufo</i> sp; <i>Rana</i> sp.
46.	<i>Plagiorchis koreanus</i> Ogata, 1938	-do-	<i>Tadarida aegyptica</i>
47.	<i>Mesocoelium monas</i> (Rud. 1819) Freitas, 1958	Brachycoeliidae	<i>Bufo</i> sp.; <i>Rana</i> sp.
48.	<i>Anchitrema sanguineum</i> (Sonsino, 1894) Looss 1899.	Anchitrema tidae	<i>Scotophilus</i> sp.

CESTODA

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INTRODUCTION

Cestodes or tapeworms are internal parasites, mostly found in vertebrate intestine, in adult stages: larval and cystic forms, of course are found in different body organs of almost all vertebrates and invertebrates. Among all the helminth parasites, they have perfectly adapted to the parasitic mode of life having completely dispensed with digestive, respiratory and circulatory systems and having chosen the habitat of vertebrate intestine in their adult stage, in most cases, where they get predigested food in abundance. They have unique and well-developed reproductive systems, in each gravid and growing proglottids. They were known to occur from time immemorial, in domestic and wild animals including man as the causative agent for disease and death. Some of these animals are found to have been recorded in Vedic literature also.

Cestodes are broadly divided into two distinct groups, one with only one segment (Cestodaria) and other with chain of segments or proglottids (Eucestoda). Size of cestodes are extremely variable. *Echinococcus granulosus* (Batsch, 1786) Rudolphi, 1801 with only three proglottids, measures only 1.7-2.5 mm., whereas *Taeniarrhynchus saginatus* (Goeze, 1782) Weinland, 1858 with more than two hundred proglottids, may attain the length of 25 meters and several of them often live in same individual. Both these species are parasites of man and have very wide geographical distribution including India.

There are more than 6000 species of cestodes described so far from all over the world and from India about 600 species have been recorded.

HISTORICAL BACKGROUND

For most people, the mention of Uttarakhand conjures images of snow-capped mountains, lush meadows, breathtaking glaciers, cascading rivers. Uttarakhand is among the youngest of India's states, having come into existence in November 2000. Spread over 53, 483 sq. ft. of land, which is 1.67 percent of the country's total area, Uttarakhand is home to about 85 lakh people. Any mention brings to mind the majestic Himalyas, the rich verdant forests and 'bugyals' of the pure and holy Ganga and Yamuna and myriad other rivers and streams, the Queen of hills Mussourie, the lake district of Nainital, the Char Dham: Badrinath, Kedarnath, Gangotri and Yamnotri.

No consolidated studies on helminth in general and cestodes in particular, have been undertaken so far in this hilly state. A perusal of the literature shows that a considerable number of cestodes have been reported from various vertebrate hosts particularly birds and hill-stream fishes. Kunwar Suresh Singh (1962) studied a number of Himalayan bird cestodes from Kumaun. Sandeep K. Malhotra (1988); S. Banerjee & A.K. Chaubey (1990); Singh, K.S. & Tandon, B.K. (1962); Malhotra, S.K. & Capoor, V.N. (1982) have studied and reported quite a few of these parasites from Garhwal and other districts of Uttarakhand.

In the present volume 36 species under 25 genera have been described. The report is based on the collections made from the Faunistic Surveys of the State between 2002-2005 and the sectional collections present in Zoological Survey of India.

Diagnostic characters of most of the species dealt with in the present work have been included. The present study may serve as a preliminary account of the Cestode Fauna of Uttarakhand.



Map : Distribution of species are shown in the map in accordance with the index number of species given in species list in present chapter.

MATERIAL AND METHOD

Cestodes are endoparasites mostly found in the intestine of all the groups of vertebrates in their adult stages. Larval stages are found generally in invertebrates such as mites, crustaceans, ants etc. Some stages of life history are also completed in fish, amphibia, mammals etc. before being consumed by final host, where cestode attains full maturity.

During the course of field survey of Uttarakhand, the host animals or the viscera were either purchased from market or collected in the fields by means of trapping and netting. In some cases like snakes, birds and small mammals, the hosts were chloroformed in closed jars or polythene bags. The animals were dissected and entire alimentary canals were removed and different organs such as liver, heart, lung, kidney, urinary bladder etc. were separately examined in normal saline in different petri dishes. In some cases cestodes were collected by opening the cyst attached mostly in liver or other body organs. Total length of the intestine was dissected by a fine scissor and its content was finely brushed by sable hair brush to detach the parasites from the intestinal wall. In many cases, from the dissected part of the intestine parasite come out in its own way keeping the scolex intact. Scolex or head in most cases remain embedded in the gut sub mucosa and special care was taken to collect complete specimens with scolex. Larger cestodes were picked up easily where as smaller ones were detected under binocular. To stretch the smaller parasites to the fullest extent they were shaken in a tube, using normal saline. The bigger specimens were flattened on slides, under cover glass. Slides or glass plate pressure were applied, depending upon their size and thickness. Cestodes of smaller size were found to get flattened without any distortion, when the living specimens were fixed in hot water or 4% hot formalin and then transferred to fixatives. 70% alcohol may be used as a preservative too. To avoid slipping of the worm from between slide and cover slip the slide is fastened by fine thread and kept in alcohol for fixation and after about an hour it is transferred to 70% alcohol.

Cestodes are best preserved in 4-5% formalin rather than alcohol. A few drops of glycerine in

the preservative gives good result. Best stains for preparing permanent slides are acetic acid, alum carmine and Delafield's haematoxylin. In some cases particularly in case of smaller specimens, borax carmine gives very good result.

All the measurements used in this volume are in millimetre unless otherwise stated. Figures of the species dealt with in the present chapter have been included as plates (Plate 1-14).

MORPHOLOGY AND TERMINOLOGY

Cestodes are dorsoventrally flat, rarely cylindrical, tape-like; length variable from a millimeter to several meters. At the anterior end, an organ of attachment that is head or Scolex armed with suckers, hooks or both are present. In monozoic cestodes the head is said to be absent, except in some where a sucking organ or pseudoscolex develops. Structure of head is very important taxonomically. Order and in most cases family are easily distinguishable by head characters. The main six orders of polyzoic cestode have following characters. Cyclophyllidea bears four suckers. In Pseudophyllidea two sucking grooves or bothria are present. In Trypanorhyncha head have four protrusible proboscides armed with spines. In Tetraphyllidea four ear like lappets are present. Diphyllidea have two spoon shaped bothridia and Spathebothridea have scolex with no suckers, bothridia, tentacles etc. Several other variations and intermediate forms of head structure are also found in cestodes, necessitating erection of several other order, superfamily etc., by different authors.

Neck is the unsegmented portion of cestode between head and beginning of segmentation. It is of various shape and size, present or may be absent; in some cases dilated to form accessory hold fast organ.

Strobila or the body part is made of proglottids or segments which is one in the Cestodaria or monozoic cestodes and many in the class Eucestoda or polyzoic cestodes. Outer segmentation usually correspond with that of internal segmentation. Segmentation may be parallel, convex or trapezoidal. The posterior border of proglottids normally covers the anterior border of posterior proglottids and they are called

craspedote, in the opposite case they are called acraspedote. The proglottid increase in length and breadth progressively towards gravid ones but only the terminal ones decrease in breadth.

Digestive, respiratory and circulatory systems are absent in cestodes.

Muscular system usually consists of longitudinal, circular and diagonal muscle fibres. In different orders of Cestodes, a great variety in the arrangement of these muscles have been observed. Longitudinal muscle fibres may be in two to four layers, having circular muscle fibre in between. Circular muscle fibre divides the connective tissues in body parenchyma in two zones, namely medullary and cortical. Genital organs remain normally confined in cortical layer and excretory vessels, nerves and longitudinal muscles are medullary in position. Diagonal fibres are not very conspicuous in most cases. Muscle fibre becomes weak gradually towards gravid proglottid, which makes it easy for their detachment from the body chain and ultimate rupture of body wall for liberating eggs. Arrangement of muscle fibres and zonal distribution of body organs in medullary and cortical layers are of taxonomic importance.

Excretory system consists of flame cells in parenchyma. They anastomise and form four longitudinal vessels in each proglottid, two running on each lateral side, one dorsal and one ventral. Dorsal almost as a rule smaller than ventral by which in most cases dorsal and ventral side could be determined. The longitudinal vessels run upto the scolex dorsally then turn backwards and descend as ventral vessels upto the last proglottid where they open to the exterior. The longitudinal vessels are connected by transverse vessels at the posterior end of each proglottid. Relative position of genital duct and excretory vessels is generally constant for a genus in cestodes and as such is very important taxonomically.

Nervous system consists of central ganglia in the scolex from which nerve trunks arise. Generally four nerve trunks are present in scolex and two longitudinal nerve trunks run along the border of proglottids. Nerve ganglia are also present scattered in each proglottid to monitor external stimuli.

Male reproductive system- Cestodes in general are proterandrous or androgyny, that is male

organs develop earlier though in some cases they are protogynous or gynandry in which female organs develop earlier. They are hermaphrodites in general except in few cases where male and female genitalia develop in different proglottids of the same or different individuals. Male genital organs consist of many testes though two or three testes are also present in some families and genera of cestodes. Normally they remain confined and scattered within the excretory vessels in medullary region, rarely extending to cortical region. Number of testes per segment and their arrangement is an important tool for differentiating genera and species in cestodes. Small duct known as vasa efferentia arises from each testis and all these ducts unite to form vas deferens which runs as sperm duct, from about the middle of each mature proglottid, towards genital pore. The terminal muscular protrusible portion of the sperm duct is known as cirrus which is male copulatory organ. The non-protrusible portion is termed as ejaculatory duct. The sperm duct before entering into cirrus pouch may have dilation which is called the external seminal vesicle. If the dilation is inside the cirrus pouch it is termed as internal seminal vesicle. Dilation of ejaculatory duct is termed as pars prostatica. Seminal vesicle if present along with ejaculatory duct and pars prostatica are very often enclosed within a sac called cirrus sac. This organ may be absent, but if present is variously shaped from a minute organ to a size extending across the breadth of the proglottids. Ductus hermaphroditicus is also present in certain cestodes. Cirrus is armed with spines in some cases. It opens to the genital sinus, genital cloaca or cirro-vaginal aperture as per the position of genital organs. The genital pore is usually on a small depression, on the various places on the lateral margin of one or both sides of every mature proglottid or on the ventral or dorsal superficial surface. It may open along with female genital pore. The relative position of genital openings along with shape and size of cirrus pouch is important from taxonomic point of view.

Female reproductive system- Ovary is single, two lobed, lies in the medullary region in most cases. Double ovary and partly or fully cortically placed position of ovaries are also reported in few cases. Ovary is H, X, fan shaped, lobed, branched or compact, normally lies ventrally and posterior

to testes. In some cases it is pre-testicular. The lobes of the ovary are joined by a hollow tube called isthmus, from which fine tubular oviduct arises. The eggs pass from ovary to this oviduct which soon divides in two long tubes, namely vagina and uterus. Vagina proceeds upto genital pore. Uterus of varied characteristic shape and size, in different genera remain loaded with eggs. Vitelline gland is single, compact or branched and remains close to ovary. It may be divided in many follicles which are confined laterally, in medullary or cortical region to encircle the proglottid. They are rarely absent in some cestodes where the germ cells in uterus is fertilized in situ. Vagina commonly opens to the exterior through genital atrium along with male aperture. It may open directly on the lateral side, on the ventral flat side or near posterior extremity. The uterus is a straight or coiled tube with or without outgrowths. The uterus in some cases is replaced by egg capsules containing one or more number of eggs. One or more paruterine organ may also develop on the uterus in some cases for storage of eggs. In the gravid proglottid uterus with eggs, occupies all the available space and practically rest of the organ degenerate except genital pore, cirrus pouch and genital atrium. Uterine pore is present or absent and open along with or separately from vaginal aperture on marginal or ventral surface. Eggs are discharged to the outside by disintegration or rupture of uterine wall where uterine pore is absent. The most gravid proglottid is detached from the body of cestode and passes out of the host to exterior. If it is one by one it is called euapolysis, when detached in groups of two or more proglottids they are called anapolysis. In some cases embryo matures only after detachment of the segment from the body, then it is termed as hyperapolysis. The eggs are globular or oval, in most cases the ovum is covered with two or three membranes. The embryo normally bears six hooklets, characteristic of polyzoic cestode eggs, though they are absent in some cases. Monozoic cestode eggs have 10 hooks. In some cases poles of the egg have two projection called pyriform apparatus which may cross each other when fully matured.

Life-history- Most of the tapeworms have indirect life cycle. Two or more hosts are required to complete the life history and one of which is usually an invertebrate. The most common

invertebrate hosts are insects, crustacea, ticks, mite, annelids, molluscs etc. Very few complete life history of cestode species are known. There are still several order of cestodes in which life history has not been studied even on single species.

The larval forms in cestoda are subdivided in various ways. Hexacanth or Onchosphere is the larval form of most Eucestoda and is characterized with six small hooks. In cestodaria larval forms when come out of egg normally bears hooks. Proceroid is an elongated larva with posterior bulb the cecomer bearing six hooks. Plerocercoid is next stage of proceroid and could develop into adult only in definitive host. The sparganum are plerocercoid larva whose indentity is unknown. In pleurocercus a bladder called blastocyst is present in the posterior end, whose upper portion or the body is protrusible within the bladder. Solid hexacanth larva or cyclophyllids is known as cysticercoid and they are of varying shape and size. If the body or cysticercoid is having segmentation it is called Strobilocercoid. Cysticercoid with a hollow bladder is designated as Cysticercus. They are of different characteristic shape and size. Simple one with a single protoscolex is known as coenurus. Single bladder with many protoscolices is strobilocercus. Unilocular hydatids are having many protoscolices formed by endogenous budding. Hydatid cysts having endogenous buddings are known as multilocular or alveolar hydatid, found in *Echinococcus multilocularis*. The genus *Echinococcus* has the largest cystic forms and have many protoscolices formed by exogenous budding which breaks free and settles within cyst as hydatid sand.

SYSTEMATIC LIST

Order CARYOPHYLLIDEA

van Beneden (in Carus, 1863)

Family CAPINGENTIDAE Hunter, 1930

Genus *Pseudocaryophyllaeus* Gupta, 1961.

1. *Pseudocaryophyllaeus indica* Gupta, 1961

Family LYTOCESTIDAE Hunter, 1927,

Wardle and Mcleod, 1952

Genus *Lytocestus* Cohn, 1908

2. *Lytocestus indicus* (Moghe, 1925) Moghe 1931

3. *Lytocestus filiformis* (Woodland, 1923)
Fuhrmann and Baer, 1925
4. *Lytocestus fossilisi* Gupta, 1961.
Genus *Lytocestoides* Baylis, 1928
5. *Lytocestoides paithanensis* Shinde and
Deshmukh, 1975
Order LECANICEPHALIDEA Wardle &
McLeod, 1952
Family LECANICEPHALIDAE Braun, 1990
Genus *Guptaia* Malhotra, 1985
6. *Guptaia garhwalensis* Malhotra, 1985
Order PSEUDOPHYLLIDEA Carus, 1863
Family BOTHRIOCEPHALIDAE
Blanchard, 1849
Genus *Senga* Dollfus, 1934
7. *Senga nayari* Malhotra, 1988
8. *Senga teleostei* Banerjee, 1990
Genus *Ptychobothrium* Lonnberg, 1889
9. *Ptychobothrium nayarensis* Malhotra,
1983
Genus *Bothriocephalus* Rudolphi, 1808
10. *Bothriocephalus teleostei* Malhotra, 1984
Family DIPHYLLOBOTHRIDAE Luhe, 1910
Genus *Capooria* Malhotra, 1985
11. *Capooria barilii* Malhotra, 1985
Order PROTEOCEPHALIDEA Mola, 1928
Family PROTEOCEPHALIDAE La Rue, 1911
Sub-family GANGESIINAE Mola, 1929
Genus *Gangesia* Woodland, 1924
12. *Gangesia macrones* Woodland, 1924
Order CYCLOPHYLLIDEA van Beneden
(in Braun, 1900)
Family ANOPLOCEPHALIDAE Cholodkovsky,
1902
Sub-family ANOPLOCEPHALINAE
Blanchard, 1891
Genus *Bertiella* Stiles & Hassall, 1902
13. *Bertiella indica* (Singh, 1962), Stiles &
Hassall, 1902
Genus *Mosgovoyia* Spasskii, 1951
14. *Mosgovoyia pauriensis* (Malhotra et al.,
1983) Spasskii, 1951
- Subfamily THYSANOSOMATINAE
Skryabin, 1933
Genus *Avitellina* Gough, 1911
15. *Avitellina (Avitellina) bangaonensis*
Malhotra, 1982
Genus *Stilesia* Railliet, 1893
16. *Stilesia garhwalensis* Malhotra, 1983
17. *Stilesia kotdwarensis* Malhotra, 1983
Sub-family LINSTOWIINAE Fuhrmann, 1907
Genus *Oochoristica* Luhe, 1898
18. *Oochoristica pauriensis* Malhotra, 1984
Family DAVAINAEIDAE Braun, 1900
Sub-family DAVAINAEINAE Braun, 1900
Genus *Cotugnia* Diamare, 1893
19. *Cotugnia digonophora* (Pasquale, 1890)
Blanchard, 1891
20. *Cotugnia fastigata* Meggitt, 1920
21. *Cotugnia satpuliensis* Malhotra, 1983
Genus *Raillietina* Fuhrmann, 1920
Subgenus (a) *Raillietina* Stiles & Orleman,
1926 (= *Ransomia* Fuhrmann, 1920)
22. *Raillietina (Raillietina) thapari* Singh,
1963
Subgenus (b) *Fuhrmannetta* Stiles & Orleman,
1926 (= *Johnstonia* Fuhrmann, 1920)
23. *Raillietina (Fuhrmannetta) echinobothrida*
(Megnin, 1880) Stiles and Orleman 1926
Subgenus (c) *Skrjabinia* Fuhrmann, 1920
24. *Raillietina (Skrjabinia) cesticillus* (Molin,
1858)
Genus *Ophryocotyloides* Fuhrmann, 1920
25. *Ophryocotyloides picusi* Singh, 1962
26. *Ophryocotyloides makundi* Singh, 1962
27. *Ophryocotyloides srinagarensis* Malhotra,
1979
- Family DILEPIDIDAE Railliet and Henry, 1909
Genus *Ivritaenia* Singh, 1962
28. *Ivritaenia mukteswarensis* Singh, 1962
Genus *Choanotaenia* Railliet, 1896
29. *Choanotaenia hypoleucia* Singh, 1952

- Genus *Dilepis* Weinland, 1858
30. *Dilepis kumaunensis* Singh, 1962
- Family PARUTERINIDAE Fuhrmann, 1907
Genus *Anonchotaenia* Cohn, 1900
31. *Anonchotaenia dendrocitta* Woodland, 1929
- Genus *Biuterina* Fuhrmann, 1902
32. *Biuterina meggitti* Singh, 1959
- Family HYMENOLEPIDIDAE Ariola, 1899
Subfamily (a) FIMBRIARIINAE
Wolffhugel, 1899
Genus *Profimbriaria* Wolffhugel, 1936
33. *Profimbriaria backynskae* Malhotra, 1984
Subfamily (b) HYMENOLEPIDINAE
Perrier, 1897
Genus *Hymenolepis* Weinland, 1858
34. *Hymenolepis phalacrocorax* (Woodland, 1929)
35. *Hymenolepis farcminosa* (Goeze, 1782)
Genus *Staphylocystis* Villot, 1877
36. *Staphylocystis* (*S*) *chattoraji* Malhotra, 1984

SYSTEMATIC ACCOUNT

Phylum PLATYHELMINTHES

Class CESTOIDAE Rudolphi, 1808

Subclass CESTODA Carus, 1863

Key to the Orders of the CESTODA

1. External segmentation absent, one set of reproductive organs, genital pores near posterior end of body, embryo with six hooks, uterus coiled in posterior region of body, scolex simple with shallow grooves, loculi or frills CARYOPHYLLIDEA
- External segmentation present or absent; more than one set of reproductive organs in each strobila 2
2. Scolex in two parts: anterior portion variable with muscular sucker, myzorhynchus or crown of unarmed tentacles; posterior portion has four suckers LECANICEPHALIDEA

Scolex not in two parts; with bothridia, bothria or suckers 3

3. Scolex with two bothria; occasionally replaced by pseudoscolex PSEUDOPHYLLIDEA

Scolex without bothria; with suckers, vitellarium compact 4

4. Scolex with four acetabulate suckers, vitellarium usually posterior to ovary CYCLOPHYLLIDEA

Vitellarium follicular; scolex with four (occasionally five) suckers; suckers rarely absent PROTOCEPHALIDEA

Order CARYOPHYLLIDEA

van Beneden (in Carus, 1863)

Key to the Families of CARYOPHYLLIDEA

1. Vitellarium completely in cortical parenchyma; inner longitudinal muscles separate testes from cortical vitellarium LYTOCESTIDAE

Vitellarium partially in medullary and cortical parenchyma; inner longitudinal muscles between adjacent vitelline follicles CAPINGENTIDAE

Family CAPINGENTIDAE Hunter, 1930

Genus *Pseudocaryophyllaeus* Gupta, 1961

1. *Pseudocaryophyllaeus indica* Gupta, 1961

1961. *Pseudocaryophyllaeus indica* Gupta, *Proc. Helminth. Soc. Wash.*, 28(1) : 43

1961. *Capingenioides batrachii* Gupta, *Proc. Helminth. Soc. Wash.*, 28(1) : 46

1984. *Pseudocaryophyllaeus mackiewiczzi* Gupta, V. and Parmar, *Indian J. Helminth.*, (1982), 34(2) : 136.

1984. *Pseudocaryophyllaeus ritai* Gupta, V. and Singh, *Indian J. Helminth.*, (1983), 35(1) : 11.

1984. *Pseudocaryophyllaeus lucknowensis* Gupta and Sinha, *Indian J. Helminth.*, 36(1) : 73.

Material : Host : *Clarias batrachus*. **Loc. :** Intestine. **Locality :** Chamba, Tehri Garhwal, Uttarakhand. **Collector :** A. Chatterjee & party. **Date :** 30.iv.02. **Reg. No :** W8845/1.

Diagnostic Characters : Body elongated, about 13.0-25.0 long, 0.65-1.35 in maximum width.

Scolex oval, truncated anteriorly, distinctly marked off from neck behind. Neck slender, 5.04-8.74 long, 0.175-0.365 wide. Trunk or main body cylindrical, 7.48-14.96 long, posterior end rounded. Testes numerous, spherical to oval, 0.14-0.28 x 0.06-0.11, medullary. Inner longitudinal muscle layer external to testes and vitellaria. Vas deferens loosely convoluted in front of cirrus sac. External seminal vesicle absent. Cirrus sac large, oval 0.43-0.61 x 0.26-0.41 enclosing bell shaped ejaculatory duct, situated at 1.75-2.98 from posterior end of body, opening mid ventrally by male gonopore. Ovary H-shaped; wings strongly follicular, lateral posterior ovarian follicles may not be extending upto posterior end of body, connected by medullary isthmus. Uterus in lateral coils in post and pre ovarian parts with uterine gland cells, not extending beyond cirrus sac. Vagina a slightly convoluted tube. Utero-vaginal canal opening miventrally as female gonopore on ventral side just behind male gonopore. No common genital atrium. No seminal receptacle. Vitellaria medullary, internal to inner longitudinal muscle layer. Eggs oval, 50-60 x 35-45µm. Excretory pore terminal.

Distribution : India : Uttarakhand, U.P (Lucknow), Assam (Guwahati).

Family LYTOCESTIDAE

Hunter, 1927, Wardle and McLeod, 1952

Key to the genera of Lytocestidae

1. Scolex tholate; neck absent; single gonopore with deep genital atrium *Lytocestoides*

Scolex digitiform, unspecialized or spatulate; ovary H-shaped, loosely follicular; gonopores separate, far apart; genital atrium inconspicuous *Lytocestus*

Genus *Lytocestus* Cohn, 1908

Key to the species of *Lytocestus*

1. Ovary follicular, lateral, on either side of body, neck short, body thick *L. indicus*
Ovary not lateral on either side 2
2. Ovary typically 'H' shaped, neck constricted wide at base *L. fossilisi*
Ovary not 'H'-shaped; Ovary bilobed; neck long *L. filiformis*

2. *Lytocestus indicus* (Moghe, 1925), Moghe 1931

1925. *Caryophyllaeus indicus* Moghe, *Parasitology*, **17** : 232-235.

1931. *Lytocestus indicus* Moghe, *Parasitology*, **23** : 84-87.

Material : Host : *Clarias batrachus*. **Loc. :** Intestine. **Locality :** Chamba, Tehri-Garhwal, Uttarakhand. **Collector :** A. Chatterjee & party. **Date :** 30.04.2002. **Reg. No. :** W8846/1.

Daignostic Characters : Monozoic cestode, mature parasite 10.56-28 in length, width 1.82-2.70. Scolex stumpy, bluntly rounded anteriorly, much narrower than rest of body; Neck short measure 0.45-1.33. Genital apertures in last seventh of the body length. Cirrus sac like a bell with handle. Female genital pores separate. Narrow tube like vagina in the middle line. Course of uterus does not extend beyond cirrus opening. Ovary follicular on either side, situated anterior to shell gland, joined by isthmus. Vitellaria follicular, lie between cortical and medullary layers of longitudinal muscle fibres and surround the testes, vitellaria absent behind ovary Vagino-uterine aperture 0.077-0.088 by 0.08-0.010. Testes about 200-600 in number, 0.01-0.096 in diameter; medullary; extending from anterior vitellaria to cirrus sac. Eggs measure approximately 0.08 x 0.04.

Distribution : India : Uttarakhand, Meghalaya, West Bengal, Madhya Pradesh.

Elsewhere : Cosmopolitan.

3. *Lytocestus filiformis* (Woodland, 1923), Fuhrmann and Baer, 1925

1923. *Caryophyllaeus filiformis* Woodland, *Quart J. microsc. Sci. (N.S.)*, **67** : 447.

1925. *Lytocestus filiformis* Fuhrmann and Baer, *Proc. Zool. Soc. London*, (1925) : 79-100.

1956. *Lytocestus alestesi* Lynsdale, *J. Helminth.*, **30**(2-3) : 92

1962. *Lytocestus filiformis* Mackiewicz, *Rev. Suisse Zool.*, **69** : 735.

Material : Host : *Clarias batrachus*. **Loc. :** Intestine. **Locality :** Chamba, Tehri Garhwal, Uttarakhand. **Collector :** A. Chatterjee & party. **Date :** 30.04.2002. **Reg. No :** W8847/1.

Diagnostic characters : Body flat, elongated, posterior end broader. Length 5.96-33.02. Scolex smooth, not distinctly marked off from neck behind, flat or pointed. Neck narrow. Testes 230-537, spherical or oval in shape, distributed from behind the neck to cirrus sac posteriorly. Opening of the cirrus and utero-vaginal opening separate. Cortical vitellaria smaller than testes, spherical or oval in shape, extend anterior to ovary. Ovary bilobed, follicular, joined by ovarian isthmus, below mehlis gland. Uterine coils glandular, extending from behind isthmus to cirrus sac. Excretory pore at the posterior end. Eggs operculate 0.04-0.05 x 0.01-0.031.

Distribution : India : Uttarakhand, Meghalaya.

Elsewhere : Egyptian Sudan.

4. *Lytocestus fossilisi* Gupta, 1961

1961. *Lucknowia fossilisi* Gupta, S.P., *Proc. Helminth. Soc. Washington*, 28(1) : 39.

1973. *Capingentoides moghei* Pande, *Indian J. Zool.*, 14(3) : 223.

1975. *Lytocestus fossilis* Singh, *Dr. B.S. Chauhan Comm. Vol.*, 79-82.

1984. *Lytocestoides fossilis* Kanth, Sinha and Srivastava, *Indian J. Helminth. (n.s.)* 1(1-2) : 26.

1985. *Capingentoides gorakhnathi* Agarwal and Singh, *Indian J. Helminth. (n.s.)*, 2(1-2) : 81.

Material : Host : *Clarias batrachus*. **Loc.** : Intestine. **Locality** : Chamba, Tehri-Garhwal, Uttarakhand. **Collector** : A. Chatterjee & party. **Date** : 30.04.2002. **Reg. No** : W8848/1.

Diagnostic characters : Body elongated, flat, 5.6-6.75 long, 1.131-1.4 in maximum width, main body tapering into neck and scolex. Scolex stumpy or slightly differentiated into an oval structure, anterior end bluntly rounded, narrower than neck and much so than main body. Neck present, slightly constricted. Male and female gonopores separate. No common genital atrium. Testes rounded or oval, numerous, medullary. Vas deferens convoluted in front of cirrus sac. Cirrus sac ovoid, large, opening outside as male gonopore. Ovary 'H'-shaped in posterior region of body; arms follicular, lateral, cortical connected by bend shaped medullary isthmus or commisure; Vitellaria follicular, cortical, uterus laterally coiled; Vagina a

narrow tube, mid ventral to uterus, joining anteriorly to uterus to form a utero-vaginal canal opening as female gonopore ventrally, slightly behind male gonopore. Eggs oval.

Distribution : India : Uttarakhand, Uttar Pradesh (Lucknow), Bihar.

Elsewhere : Nepal (Kathmandu near river Bagmati).

Genus *Lytocestoides* Baylis, 1928

5. *Lytocestoides paithanensis*

Shinde and Deshmukh, 1975.

1975. *Lytocestoides paithanensis* Shinde and Deshmukh, *Maharashtra Univ. Nat. Sci. J.*, 14(7) : 233.

1981. *L. paithanensis*: Makiewicz, *Himalayan J. Sci.* 1(1) : 6.

1985. *L. paithanensis* : Agarwal, *Indian Rev. Life. Sci.*, 5 : 143.

Material : Host : Munia. **Loc.** : Intestine. **Locality** : Katgodam, Nainital Uttarakhand. **Collector** : I.B. Dutta & party. **Date** : 9.9.2003. **Reg. No.** : W8849/1 and W8879/1.

Diagnostic characters : Body elongated, conical anteriorly, broad in the middle, slightly tapering posteriorly to conical end. Scolex continuous with body. No neck. Male and Female gonopores separate opening on ventral surface. Testes follicular, medullary, about 300-410 in number, extending from base of scolex to cirrus sac. Testes measuring 0.024-0.06 in diameter. Vas deferens in middle of body. Cirrus sac situated in the middle of the opening by male pore ventrally. Ovary medullary in position, dumbell or butterfly shaped, bilobed; vitellarium follicular; Utero-vaginal opening as female pore closely behind male pore. Ovarian lobes connected by narrow isthmus, vagina thin, narrow.

Distribution : India : Uttarakhand, Maharashtra.

Order LECANICEPHALIDEA

Wardle and Mcleod, 1952

Family LECANICEPHALIDAE Braun, 1900

Genus *Guptaia* Malhotra, 1985

6. *Guptaia garhwalensis* Malhotra, 1985

1985. *Guptaia garhwalensis* Malhotra, *Khelminthologiya*, 20 : 45-49.

Host : *Schizothorax richardsonii* (Gray).

Loc. : Intestine and Stomach.

Diagnostic characters : (After Malhotra, S.K. 1985) Small scolex, lacking spines in the anterior part of the scolex, external seminal vesicle present; testes 3 in number, one poral and two aporal; large cirrus pouch; well-developed genital ducts in the mature proglottids. Vagina opening anterior to cirrus pouch, saccular uterus lying posterior to cirrus pouch. Eggs large.

Distribution : India : Uttarakhand (Pauri-Garhwal near East and West Nayar rivers).

Remarks : The type-species, placed in the Lecanicephalidae, is *G. garhwalensis* Malhotra, 1985. It was collected in fresh water in a cyprinid teleost, *Schizothorax richardsonii*. Khalil, L.F. et al have treated this genus as a *genus incertae sedis* and excluded the genus from the Lecanicephalidae (Keys to the Cestode Parasites of Vertebrates : pp.200). The chapter on Order Lecanicephalidea by L. Euzet has included no comments on the reasons behind the exclusion of genus *Guptaia* from this Order.

Order PSEUDOPHYLLIDEA Carus, 1863

Key to the Families of Order PSEUDOPHYLLIDEA

1. Genital pore and uterine pore both on ventral surface DIPHYLLOBOTHRIIDE

Genital pore dorsal, median
..... BOTHRIOCEPHALIDAE

Family BOTHRIOCEPHALIDAE Blanchard, 1849

Key to the genera of Bothriocephalidae

1. Scolex with hooks arranged in two semicircles *Senga*
Scolex unarmed 2
2. Uterine pore distinctly submedian
..... *Ptychobothrium*
Uterine pore ventral, median or slightly submedian *Bothriocephalus*

Key to the species of *Senga*

1. Scolex pear-shaped, large worms, body 58-134 (89.4) x 1.78 *S. nayari*

Scolex almost round; smaller worms; body measuring 38.4-44.0 (41.0±2.12) in length and 0.85-0.94 (0.88±0.021) in maximum width *S. teleostei*

Genus *Senga* Dollfus, 1934

7. *Senga nayari* Sandeep K. Malhotra, 1988 (Fig. 1 - Plate-1)

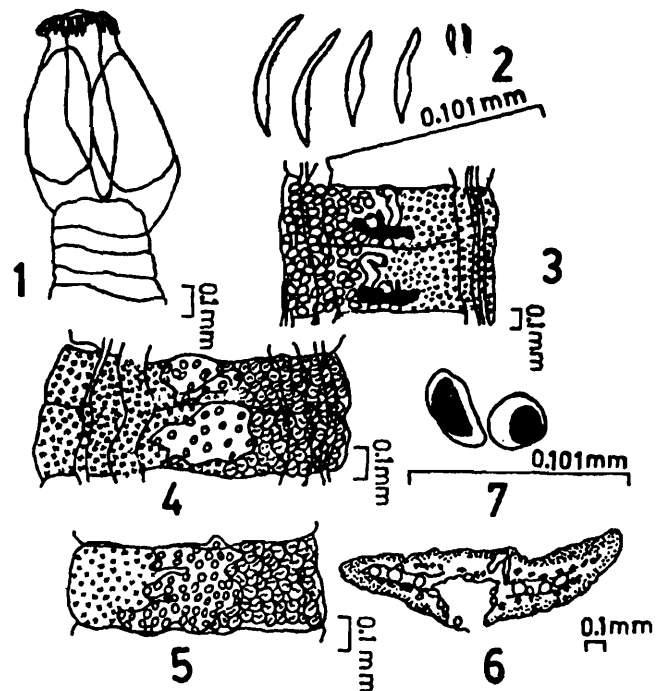


Fig. 1. *Senga nayari* 1. Scolex (x 100); 2. Rostellar hooks (x 600); 3. Mature proglottides (x 50); 4. Early gravid proglottides (x 100); 5. Late gravid proglottides (x 100); 6. T. S. through late mature proglottid (x 50); 7. Eggs with oncosphere.

1988. *Senga nayari* Malhotra, *Indian J. Helminth*, 40(1) : 53-57.

Host : *Mastacembelus armatus*.

Loc. : Small Intestine.

Diagnostic characters : (After Malhotra, S.K. 1988) Body 58-134 (89.4) x 1.78. Scolex pear shaped, broad at middle and tapering at ends, 0.91-0.962 (0.936) x 0.403-0.494 (0.449). Bothria 2, shallow, elongated, extend to posterior end of scolex, 0.572-0.59 (0.585) x 0.351-0.377 (0.364). A mid ventral groove present. Rostellum armed, 0.029-0.064 (0.049) x 0.186-0.229 (0.211). Rostellar hooks, 38-40 (39) in 2 semi circles, each separated by smaller hooks. Rostellar hooks of 2 sizes viz., large hooks 36-38 (38), 0.026-0.058 (0.03) in length and small hooks 2, 0.009-0.015 (0.01) long. Larger hooks gradually increase in

size away from notches. Neck absent. Proglottides acraspedote, broader than long. Immature, mature and gravid proglottides 0.028-0.156 (0.108) x 0.325-0.975 (0.553); 0.091-0.251 (0.154) x 0.58-1.43 (1.044); and 0.103-0.299 (0.197) x 0.614-1.781 (1.373), respectively. Testes, 64-132 (112) spherical to oval, medullary, in single field measure, 0.007-0.069 (0.027) x 0.005-0.082 (0.0209). Cirrovaginal aperture mid dorsal. Cirrus pouch oval, 0.039-0.028 (0.145) x 0.026-0.091 (0.077). Internal seminal vesicle small, 0.009-0.05 (0.074) x 0.021-0.09 (0.084). Ovary bilobed with acini, postequatorial measure 0.013-0.039 (0.03) x 0.104 (0.078) x 0.078-0.429 (0.315). Vagina, 0.010-0.02 (0.017) in diameter, opens anterior to cirrus pouch. Ootype postovarian, 0.013 - 0.039 (0.03) x 0.039-0.091 (0.072). Vitellaria follicular in a single row, cortical, 0.009-0.048 (0.011) in diameter. Receptaculum seminis, 0.01-0.169 (0.137) x 0.039-0.065 (0.052). Uterus with a coiled uterine tube. Uterine tube, 0.008-0.052 (0.026) in diameter; Uterine sac, 0.065-0.295 (0.125) x 0.053-0.475 (0.087) open anteriorly and occupy greater part of proglottid in gravid segments. Eggs round to oval, operculate 0.013-0.034 (0.026) x 0.024-0.058 (0.049).

Distribution : India : Uttarakhand (Pauri-Garhwal near river Nayar, Satpuli : Pauri Garhwal), U.P. (Lucknow), Andhra Pradesh, Maharashtra.

Remarks : The commonly known Indian species under the genus *Senga* are -

1. *S. godavarii* Shinde and Jadhav (1980).
2. *S. indicum* (Nama, 1979).
3. *S. vishakhapatnamensis* Ramadevi and Rao (1973).
4. *S. lucknowensis* Gupta, S.P. and Sinha, N. (1973).

8. *Senga teleostei* Banerjee, 1990
(Fig. 2 Plate 2)

1990. *Senga teleostei* Banerjee S., Chaubey A.K., Malhotra, S.K., *Ind. J. Parasit.* 14(2) : 153-156.

Host : *Channa punctatus*.

Loc. : Intestine.

Diagnostic characters : (After Banerjee, S. et al.1990). Worms measure (38.4-44.0) in length

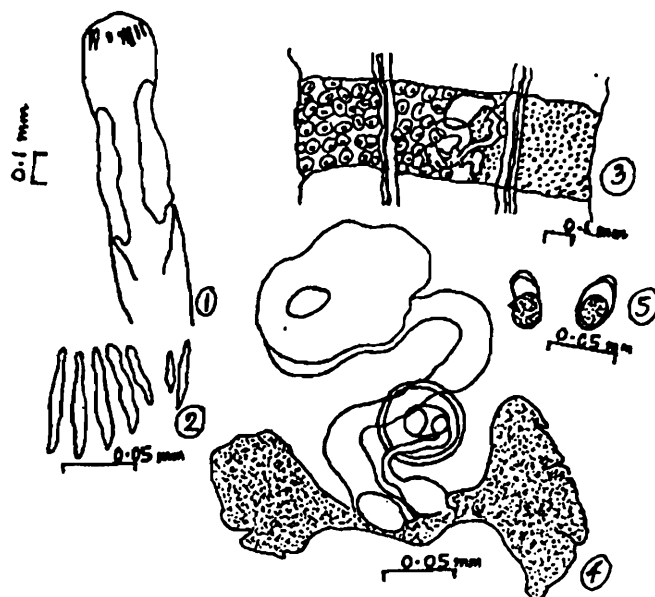


Fig. 2. *Senga teleostei* 1. Scolex (x 140), 2. Rostellar Hooks (x 330). 3. Mature Proglottid (x 140), 4. Gravid Segment (x 330), 5. Eggs with oncosphere.

and (0.85-0.94) in maximum width. Scolex measure, (0.323-0.697) in length x (0.11-0.23) in width. Bothria two, measure (0.27-0.46) x (0.025-0.043). Rostellar hooks 40-44 in two semicircles including 4 smaller hooks. Neck absent. Testes, 40-45 in number, spherical, measure, (0.025-0.051) x (0.051-0.061). Cirrus pouch measure (0.110-0.136) x (0.009-0.129). Ovary bilobed compact. Vitellaria follicular, as a tube form a continuous band occupying entire proglottid field. Receptaculum seminis measure (0.026-0.076) x (0.048-0.119). Uterine sac (0.01-0.17) x (0.016-0.23). Eggs oval, operculate, (0.019-0.051) x (0.042-0.085). Dorsal and ventral excretory vessels one pair each.

Distribution : India : Uttarakhand (River Song, Pauri-Garhwal Himalayas), Andhra Pradesh, Maharashtra, U.P.

Remarks : Measurements have also been given as range (Mean±SE).

Genus *Ptychobothrium* Lonnberg, 1889

9. *Ptychobothrium nayarensis* Malhotra, 1983
(Fig. 3 Plate 3)

1983. *Ptychobothrium nayarensis* Malhotra, *The Korean Journal of Parasitology*, 21(2) : 205-208.

Host : *Barilius bola* (Ham.) and *Schizothorax richardsonii* (Gray).

Loc. : Intestine.

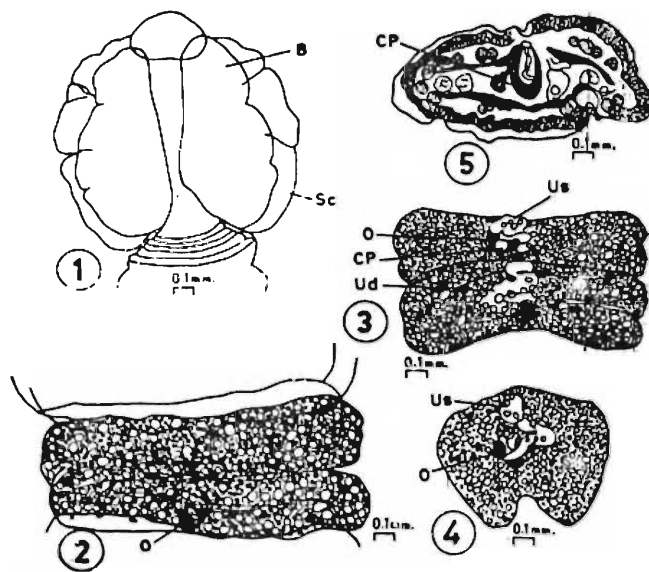


Fig. 3. *Ptychobothrium nayarensis* 1. scolex x10 2. mature proglottids x10 3. gravid proglottids x10 4. last gravid proglottid x10 5. T. S. through a mature proglottid showing location of cirrovaginal pore and uterine aperture x10.

Diagnostic characters : (After Malhotra, S.K. 1983) Cestodes small, 12-27 (17.667) x 1.131 in size. Scolex 0.652-1.25 (1.223) x 0.434- 1.241 (1.156), unarmed, distinctly heart-shaped with an apical disc. Apical disc, 0.156-0.234 (0.198) x 0.221-0.377 (0.306). Bothria well-developed, distinctly 3-4 lobed. Neck absent. External segmentation present but may be obliterated by secondary segmentation. Testes 52-78 (66) in number and measure 0.026-0.79 (0.033) x 0.019-0.109 (0.05). Cirrus pouch somewhat pyriform 0.05-0.343 (0.273) x 0.04-0.165 (0.054), thick walled. Cirrovaginal pore in mid-dorsal line anterior to ovary. Ovary 'V' shaped, 0.012-0.156 (0.104) x 0.105-0.273 (0.234) located posteriorly. Vagina a straight tube 0.007-0.023 in diameter. Receptaculum seminis present. Uterine duct S-shaped. Uterine sac 0.038-0.154 (0.081) x 0.042-0.231 (0.106). Eggs operculate, elliptical 0.01-0.046 (0.018) x 0.01-0.049 (0.029). Excretory vessels 6 pairs in number.

Distribution : India : Uttarakhand (River East and West Nayar, District Pauri-Garhwal), Maharashtra.

Genus *Bothriocephalus* Rudolphi, 1808

10. *Bothriocephalus teleostei* Malhotra, 1984

1984. *Bothriocephalus teleostei* Malhotra, *Boletín Chileno de Parasitología*, 39(1/2) : 6-9.

Host : *Barilius bola* and *Schizothorax richardsonii*;

Loc. : Intestine.

Distribution : India : Uttarakhand (River Nayar in Pauri-Garhwal Dist.).

Remarks : No description is provided due to non-availability of literature.

Family DIPHYLLOBOTHRIIDAE Luhe, 1910

Genus *Capooria* Malhotra, 1985

11. *Capooria barilii* Malhotra, 1985

1985. *Capooria barilii*, Malhotra, *Acta Parasitologica Lituanica*, 21 : 94-99.

Host : *Barilius bola*.

Loc. : Intestine.

Distribution : India : Uttarakhand (River Ganges in Pauri-Garhwal district).

Remarks : According to Khalil, L.F. in Keys to the Cestode Parasites of Vertebrates the genus *Capooria* erected by Malhotra in 1985, superficially resembles members of the family Bothriocephalidae. The characters employed to allocate it to the Diphylobothriidae require confirmation. Pending a redescription it is treated here as a *genus inquirendum*. No description is provided in the present chapter due to non-availability of literature.

Order PROTEOCEPHALIDEA Mola, 1928

Family PROTEOCEPHALIDAE La rue, 1911

Sub-family GANGESIINAE Mola, 1929

Genus *Gangesia* Woodland, 1924

12. *Gangesia macrones* Woodland, 1924

1924. *Gangesia macrones* Woodland, *Parasit.*, 16 : 441-451.

Material : Host : *Heteropneustes fossilis*. **Loc. :** Intestine. **Locality :** Dehradun, Uttarakhand. **Collector :** S. Chatterjee & party. **Date :** 16.02.2003. **Reg. No. :** W8850/1.

Diagnostic characters : Worms measure about 2.7 to 5.5 cm in length and have a maximum breadth of about 1. Genital pores are irregularly alternate and are situated anteriorly to the middle of the lateral margin of the segment. Scolex with rostellum. Rostellum is muscular, conspicuous and spherical. Rostellum with a single circle of 32-33 hooks. Hooks are of 2 kinds – large and small.

The four suckers bear minute spines. Neck absent. Testes about 100-110 in number, arranged in one continuous field anteriorly to the ovary between the vitelline glands. Cirrus sac extends from 1/6th to 1/4th the breadth of the proglottids and it contains a few coils of the vas deferens. Ovary is bilobed, lobes being connected by a narrow isthmus. Uterus consists of a central stem with 20 to 32 lateral diverticula on each side.

Distribution : India : Uttarakhand, U.P. (Allahabad from River Ganges and Jamuna).

Remarks : The commonly known Indian species under the genus *Gangesia* are :

1. *G. bengalensis* (Southwell, 1913) emend. Verma, 1928.
2. *G. lucknowia* Singh, 1948
3. *G. macrones* (Woodland, 1924)
4. *G. parasiluri* Yamaguti, 1934
5. *G. pseudotropii* Verma, 1928
6. *G. haryanae* Gupta and Arora, 1979
7. *G. aurangabadensis* Shinde and Wankhede, 1990

Order CYCLOPHYLLIDEA
van Beneden (in Braun, 1900)

Key to the Families of Order CYCLOPHYLLIDEA

1. Rostellum usually present, rarely absent, typically armed with very numerous minute hammer-shaped hooks. Hooks rarely otherwise; rostellar spines present or absent; suckers often spinose; uterus persistent or replaced by capsular or paruterine organs. DAVAINEIDAE
Rostellum absent; suckers unarmed 2
2. Proglottids wider than long, including gravid proglottids; uterus persistent or replaced by uterine capsules or paruterine organs; eggs often with pyriform apparatus ANOPLOCEPHALIDAE
Pyriform apparatus absent 3
3. Typical vagina present, uterus replaced by single paruterine organ; rostellum without saccular sheath PARUTERINIDAE

Uterus persistent or replaced by uterine capsules 4

4. Rostellar pouch present; rostellar hooks in one row, exceptionally two; genitalia single, rarely double; genital pores usually unilateral, rarely alternating; testes usually three; uterus persistent, sacciform, occasionally reticular HYMENOLEPIDIDAE

Rostellar hooks in one or more rows; genital pores unilateral, alternating or double (rarely); testes numerous; uterus persistent or replaced by egg capsules

..... DILEPIDIDAE

Family ANOPLOCEPHALIDAE Cholodkovsky, 1902

Key to the Subfamilies of ANOPLOCEPHALIDAE

1. Uterus tubular, reticular or saccate in mature proglottids, persistent in gravid proglottids ... ANOPLOCEPHALINE

Uterus ephemeral, breaking down into capsules; eggs scattered through parenchyma singly 2

2. Eggs covered with a thin outer membrane termed the uterine capsule; Paruterine organ absent LINSTOWIINAE.

Uterus developing paruterine organs into which eggs pass; distinct ovary and vitellarium often absent, replaced by germovitelarium THYSANOSOMATINE

Subfamily ANOPLOCEPHALINAE
Blanchard, 1891

Key to the genera of Anoplocephalinae

1. Genitalia single; testes originate anterior to uterus *Bertiella*
Genitalia paired; testes posterior to uterus. *Mosgovoyia*

Genus *Bertiella* Stiles & Hassall, 1902

13. *Bertiella indica* (Singh, 1962)

Khalil, 1994

(Fig. 4 - Plate 4)

1902. *Bertiella studeri* Stiles and Hassall, *Science* 16 : 434.

1962. *Indotaenia indica* Singh, *Ind. J. Helm.*, 14(2) : 86-91.

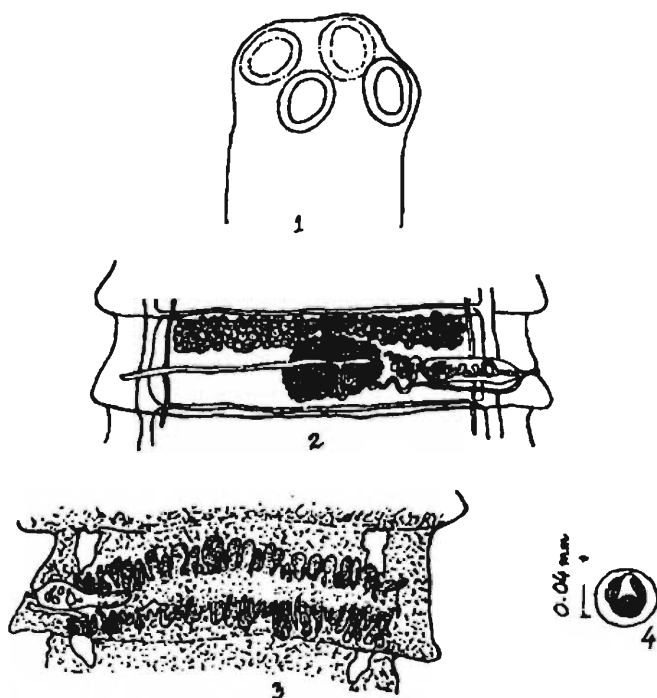


Fig. 4. *Bertiella indica* (Singh, 1962) Khalil, 1994 (After Singh, 1962), 1. Scolex, 2. Mature proglottid, whole mount, dorsal view, 3. Gravid proglottid, longitudinal horizontal section, 4. Egg recovered from uterus.

1994. *Bertiella indica* Khalil, Keys to the Cestode Parasites of Vertebrates : xiii + 751pp.

Host : *Petaurista inornatus* (Geoffroy, 1844).

Loc. : Intestine.

Diagnostic characters : (After Singh, K.S. 1962) Two cestodes are being described. Larger cestode measures 232.4 in length and 4.74 in maximum breadth and the smaller specimen 65.5 in length and 2.154 in breadth. Scolex in both measures 0.908 in breadth in region of suckers. Scolex unarmed; bears four weakly developed oval to rounded suckers, 0.303-0.329 (0.316) in diameter. Short neck present. Testes 103-121 (117) in number. Present in one group in anterior region of the proglottid, anterior to other genital organs. Testes rounded to oval, measure 0.068-0.096 (0.084) in diameter. Cirrus pouch well developed and measures 0.623-0.712 x 0.178-0.249 (0.646 x 0.208). Cirrus is muscular, cylindrical in shape, unarmed and measures 0.463 x 0.08. Ovary is fan-shaped, present in the middle of the proglottid. It measures 0.623-0.89 (0.756) across. Vitelline gland compact, partially overlapping the ovary. Vagina arises as a sinuous thick walled tube, opens posterior to male genital pore. Uterus arises as a

narrow stem giving off two diverticula. The one on the antiporal side extends dorsal and beyond the lateral excretory ducts while the one on the poral side extends upto the limit of the ovary. Eggs measure 0.038-0.046 (0.041) in diameter.

Distribution : India : Uttarakhand (Mukteswar-Kumaun, Nainital dist.), West Bengal.

Elsewhere : Cosmopolitan.

Genus *Mosgovoyia* Spasskii, 1951

14. *Mosgovoyia pauriensis* (Malhotra, 1983)
Khalil, 1994

1951. *Mosgovoyia pectinata* Spasskii, *Essentials of Cestodology*, Anoplocephalata, 1 : 783 pages.

1983. *Himalaya pauriensis* Malhotra, *Japanese Journal of Parasitology*, 32(3) : 211-217.

1994. *Mosgovoyia pauriensis* Khalil, *Keys to the Cestoda Parasites of Vertebrates* : xiii + 751pp.

Host : *Oryctolagus cuniculus*.

Loc : Intestine.

Distribution : India : Uttarakhand (Pauri-Garhwal Himalayas).

Remarks : Description cannot be provided due to non-availability of literature.

Subfamily THYSANOSOMATINAE
Skryabin, 1933

Key to the genera of Thysanosomatinae

1. Single paruterine organ per proglottid
..... *Avitellina*

Two paruterine organs per proglottid
..... *Stilesia*

Genus *Avitellina* Gough, 1911

15. *Avitellina (Avitellina) bangaonensis*
Malhotra, 1982

1982. *Avitellina (Avitellina) bangaonensis* Malhotra, *Proceedings of the Indian Academy of Parasitology*, 3(1/2) : 12-16.

Host : Cattle and goats.

Loc. : Intestine.

Distribution : India : Uttarakhand (Pauri-Garhwal district,) West Bengal, North India, Cosmopolitan.

Elsewhere : Myanmar, South Africa.

Remarks : Description cannot be provided due to non-availability of literature.

Genus *Stilesia* Railliet, 1893

Key to the species of *Stilesia*

1. Vas deferens forms a dense skein of convolutions before entering the cirrus pouch *S. garhwalensis*

Vas deferens does not form dense skein of convolutions before entering into the cirrus-pouch *S. kotdwarensis*

Genus *Stilesia* Railliet, 1893

16. *Stilesia garhwalensis* Malhotra, 1983
(Fig. 5 - Plate 5)

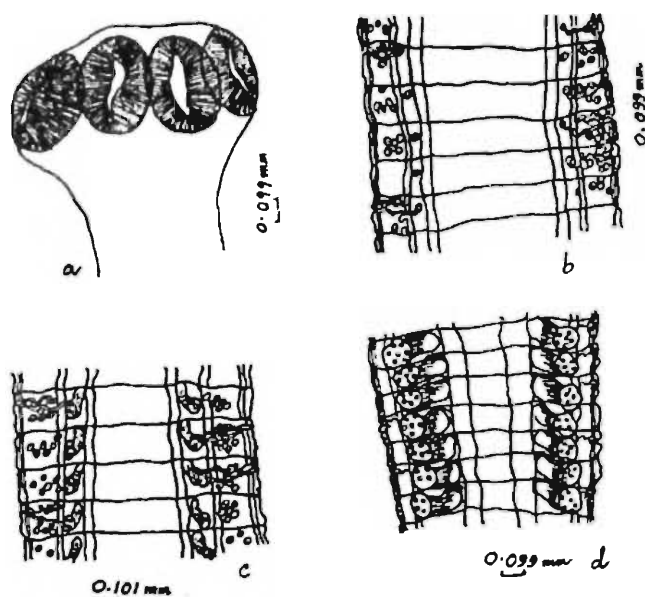


Fig. 5. *Stilesia garhwalensis* a. scolex with neck; b. mature proglottides; c. early gravid proglottides; d. late gravid proglottides

1983. *Stilesia garhwalensis* Malhotra, *Acta Parasitologica Polonica*, 28(38/42) : 399-406.

Host : Goats.

Loc. : Intestine.

Diagnostic characters : (After Malhotra, S.K. 1983) Cestodes small to medium sized, measuring 29-211 (62.36) in length and 1.9 in maximum breadth. Strobila consists of 358-913 (577) proglottides, all broader than long. Scolex large, bearing four large unarmed suckers. Testes oval to spherical, located laterally and dorsally to ventral longitudinal excretory vessels. Testes number 0-9 in each lateral side of the proglottides. Cirrus

pouch oval, unarmed. Vas deferens forms a dense skein of convolutions before entering the cirrus pouch. Ovary small, spherical situated laterally to ventral longitudinal excretory vessel. Vagina divided into two parts-a small copulatory region and a conducting region. Genital pores irregularly alternate. Uterus small, eggs round to oval, paruterine organs small, two in number-one on each lateral side of the proglottid.

Measurements : Size of the cestode : 29-211 (62.36) x 1.90; Scolex : 510-840 x 675-1235 (330 x 890); Suckers : 285-551 x 210-450 (367 x 322); Neck : 202-2760 x 115-720 (1007 x 119); Testes size : 4 to 79 (31) (diam.); Testes number : nil to 9; Cirrus pouch : 11-101 x 4-86 (54 x 41); Ovary : 7 to 97 (35); Uterus : 4 - 211 x 4 - 179 (52 x 35); Vagina : 11-105 x 4-60 (54 x 24) (Copulatory portion); Eggs : 4-27 x 4 -23 (12 x 11).

Distribution : India : Uttarakhand (Kotdwar forestation and Srinagar town, Pauri-Garhwal District).

Remarks : Comparative chart of measurements has been given by author. Measurements of major diagnostic characters has been given in the present chapter.

17. *Stilesia kotdwarensis* Malhotra, 1983
(Fig. 6 Plate 6)

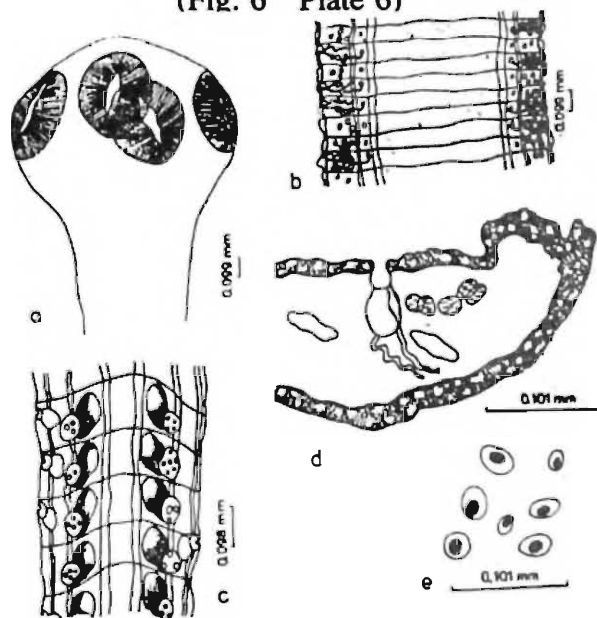


Fig. 6. *Stilesia kotdwarensis* a. scolex with neck; b. mature proglottides; c. gravid proglottides; d-a portion of a transverse section through proglottid showing the genital ducts passing between excretory vessels; e. eggs with oncosphere

1983. *Stilesia kotdwarensis* Malhotra, *Acta Parasitologica Polonica*, 28(38/42) : 399-406.

Host : Sheep.

Loc. : Intestine

Diagnostic characters : (After Malhotra, S.K. 1983) Cestodes small to medium sized measuring 48-234 (115.28) in length and 1.799 in the maximum width. Strobila consists of 717-1395 (1109) proglottids, all broader than long. Scolex large, with four large, unarmed suckers. Testes oval to spherical, located laterally. Cirrus pouch oval, unarmed. Vas deferens does not form dense skein before entering into the cirrus-pouch. Ovary small, spherical. Receptaculum seminis absent. Genital atrium wide and deep. Genital pores irregularly alternate. Uterus small. Eggs round to oval. Paruterine organs small, two in number-one on each lateral side of the ovary.

Measurements : Size of the cestode : 48-234 (115.28) x 1.799; Scolex : 627-1340 x 836-1102 (837 x 926); Suckers : 304-608 x 209-456 (387 x 288); Neck : 494-1710 x 266-525 (888 x 420); Testes size : 8 to 78 (29) (diam.); Testes number : 1 to 12; Cirrus pouch : 22-179 x 11-150 (100 x 796); Ovary : 19 to 97 (45); Uterus : 7 203 x 7-129 (88 x 67); Vagina : 31-66 x 11-51 (49 x 28) (Copulatory portion); Eggs : 8-31 x 8-31 (16 x 17).

Distribution : India : Uttarakhand (Kotdwara forestation, Pauri-Garhwal district), West Bengal.

Elsewhere : Africa, Europe.

Remarks : Comparative chart of measurements has been given by author. Measurements of major diagnostic characters has been given in the present chapter.

Subfamily LINSTOWIINAE Fuhrmann, 1907

Genus *Oochoristica* Luhe, 1898

18. *Oochoristica pauriensis* Malhotra, 1984

1984. *Oochoristica pauriensis* Malhotra, *The Korean Journal of Parasitology*, 22(1) : 99-101.

Host : *Hemidactylus brooki* (Gray) and *Hemidactylus flaviviridis* (Ruppell).

Loc. : Intestine.

Distribution : India : Uttarakhand (Pauri-Garhwal Hills), Rajasthan, Madhya Pradesh, West Bengal, U.P.

Elsewhere : Europe, Africa.

Remarks : Description cannot be provided due to non-availability of literature.

Family DAVAINIIDAE Braun, 1990

Subfamily DAVAINIINAE Braun, 1990

Key to the genera of Davaineinae

1. Rostellar hooks in circular row; ovary median; two to eight eggs per capsule; genitalia single *Railletina*
- Rostellar hook-crown round or oval 2
2. Genital organs consistently double per proglottid; ovaries lateral; egg capsules numerous, each containing single egg *Cotugnia*
- Rostellar hooks typically davaineid, uterus persistent, lobate; genitalia single *Ophryocotyloides*

Genus *Cotugnia* Diamare, 1893

Key to the species of *Cotugnia*

1. Length of strobila more than 3 cm; Large worms, body length upto 29 cm *C. satpuliensis*
- Length of strobila less than 29 cm 2
2. Length of strobila upto 8 cm; Rostellum armed with single row of hooks *C. digonophora*
- Length of strobila upto 3 cm; Rostellum armed with double row of hooks; suckers unarmed *C. fastigata*

19. *Cotugnia digonophora* (Pasquale, 1890)
Blanchard, 1891

1890. *Taenia digonophora* Pasquale, *Giorn. Intern. Sci. med. Napoli*, 12 : 905-910.

1891. *Cotugnia digonophora* Blanchard, *Mem. Soc. Zool. France*, 4 : 420-429.

Material : Host : *Rattus rattus*. **Loc** : Intestine. **Locality** : Chamba, Tehri Garhwal, Uttarakhand. **Collector** : A. Chatterjee & party. **Date** : 30.iv.2002. **Reg. No.** : W8851/1 and W8880/1.

Diagnostic characters : Length upto 8 cm; thickness 1; rostellar hooks in single row, each measuring about 0.05. Diameter of suckers 0.045. Neck may be absent. Genital pore double in each segment. Testes about 100. Ovaries 2 in each segment. Egg measures 0.06.

Distribution : India : Uttarakhand, West Bengal.

Elsewhere : Myanmar (Rangoon).

20. *Cotugnia fastigata* Meggitt, 1920

1920. *Cotugnia fastigata* Meggitt, *Parasitology* 12 : 390-410

Material : Host : Domestic fowl. **Loc** : Intestine. **Locality** : Dehradun, Uttarakhand. **Collector** : A. Chatterjee & party. **Date** : 06.09.2002. **Reg. No.** : W8852/1

Diagnostic characters : Length upto 3 cm. Strobila triangular. Head 0.05-0.06 in diameter with four unarmed suckers and single armed rostellum with 200 hooks of 0.02 in length. Genital pores lateral in the anterior quarter. Genital pores double. Testes forming narrow bands of two or three rows. Cirrus sac long. Ovary lobulated, asymmetrical. Dorsal longitudinal excretory vessel absent in mature segments.

Distribution : India : Uttarakhand, West Bengal.

21. *Cotugnia satpuliensis* Malhotra, 1983

(Fig. 7 - Plate 7)

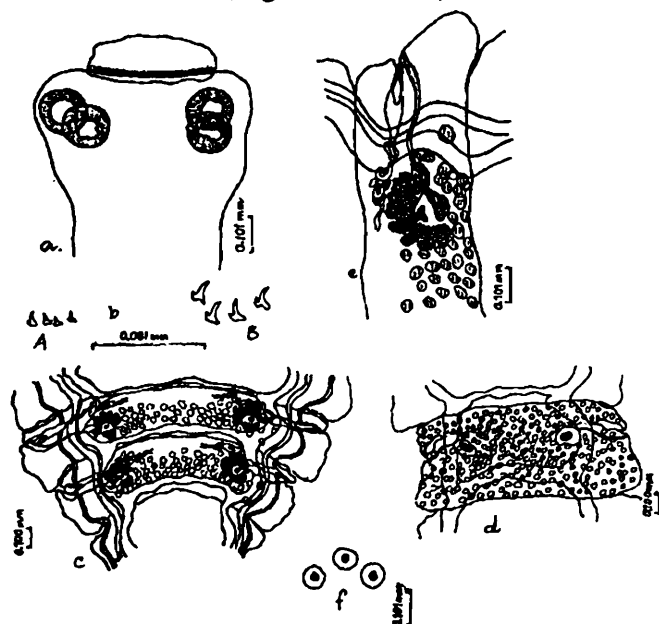


Fig. 7. *Cotugnia satpuliensis* a. scolex, b. rostellar hooks (A outer row, B. inner row); c. mature proglottides; d. gravid proglottid; e. a portion of mature proglottid magnified; f. eggs and oncoephere.

1983. *Cotugnia satpuliensis* Malhotra, *Acta Parasitologica Polonica*, 28 (38/52) : 393-397.

Host : *Columba livia domestica* and *Columba livia intermedia*.

Loc. : Intestine.

Diagnostic characters : (After Malhotra, S.K. 1983) Large cestodes. Strobila length (29-36 x 3.84). Rostellum wide (195 to 368 μ m); Suckers wide (90-135 x 60-135 μ m); Genital pore located in the anterior one third to mid-lateral margin of the proglottid. Genital pore double. Large number of testes (43 to 92, average 62). Cirrus pouch large (19-253 x 4-54) average 126 x 29 reaching the ventral excretory vessels.

Distribution : India : Uttarakhand (Pauri-Garhwal), West Bengal.

Genus *Raillietina* Fuhrmann, 1920

Key to the subgenera of *Raillietina*

1. Genital pores are unilateral and the egg capsule each contain several oncospheres

..... *Raillietina*

Genital pores are irregularly alternate 2

2. Egg capsules each contain a single onchosphere

Skrjabinia

Egg capsules each contain several oncospheres

Fuhrmannetta

Subgenus *Raillietina* Stiles & Orleman 1926

(= *Ransomia* Fuhrmann, 1920)

22. *Raillietina* (*Raillietina*) *thapari* Singh, 1963

(Fig. 8 - Plate 8)

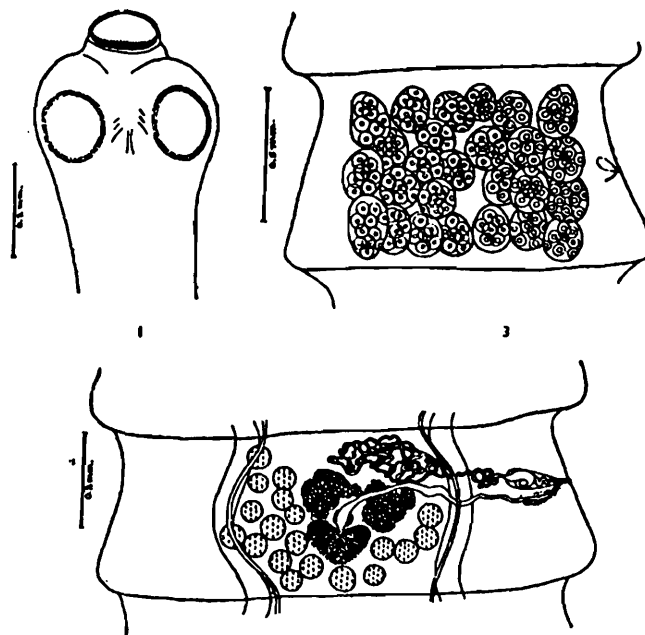


Fig. 8. *Raillietina* (*R*) *thapari* 1. Scolex. 2. Mature proglottid. 3. Gravid proglottid.

1963. *Raillietina* (*Raillietina*) *thapari* Singh, *Ind. J. Helm.*, 15(1) : 1-5.

Host : *Picus squamatus*.

Loc. : Intestine.

Diagnostic characters : (After Singh, K. S. 1963) Parasites are 122.3 in length and 1.513 in breadth. Proglottids all broader than long. Scolex small measuring 0.392 in diameter across the suckers. Rostellum measures 0.14 x 0.112. Rostellum provided with a double crown of hooks. Hooks all of equal size, attached at different levels. Cuticle posterior to the rostellum provided with many small spines. Suckers four in number, muscular and rounded measuring 0.156mm in diameter. Suckers shallow, margin is beset with 8-9 rows of small spines. Neck is 0.14 wide. Testes number 18-22 (20) in each proglottis. Testes rounded to oval measuring 0.056-0.084 (0.066) in diameter. Cirrus pouch pear-shaped with thin walls measuring 0.09-0.11 x 0.042-0.05 (0.102 x 0.045). Ovary is distinctly bilobed and extends 0.2-0.26 (0.245) across. Vitelline gland large in comparison, kidney-shaped, present posterior to ovarian isthmus. It extends 0.11-0.15 (0.135) across. Uterus develops uterine capsules, 23-31 (27) in number. Each capsule contains 8-12 (10) eggs. Eggs measure 0.034-0.036 (0.0353) in diameter. Genital pores are unilateral.

Distribution : India : Uttarakhand (Mukteswar-Kumaun, Nainital), West Bengal.

Subgenus *Fuhrmannetta* Stiles & Orleman, 1926 (= *Johnstonia* Fuhrmann, 1920)

23. *Raillietina (Fuhrmannetta) echinobothrida* (Megnin, 1880) Stiles and Orleman, 1926

1880. *Taenia echinobothrida* Megnin, *Bull. Soc. Zool. France*, 5 : 117-129.

1926. *Raillietina (F) echinobothrida* Stiles and Orleman, *Ann. Parasit.*, 4 : 65-67.

Material : Host : *Gallus gallus domesticus*.

Loc. : Intestine. **Locality :** Badsahi Thaul, Tehri Garhwal dist. Uttarakhand. **Collector :** S. Chakrabarti and party. **Date :** 5.iv.2005. **Reg. No. :** W8853/1.

Diagnostic characters : Length of the worm upto 25 cm. Suckers with 8 to 10 rows of hooks size of which is 0.06 to 0.015. Rostellum with 200 hooks in two rows. Size 0.01-0.013. Testes 20 to 30. Each egg capsule contain 6 to 12 eggs of 0.025 to 0.05 size. Genital pores are irregularly alternate.

Distribution : Uttarakhand, West Bengal, Cosmopolitan.

Elsewhere : New Guinea, East Africa, Nepal, Europe, Myanmar, Brazil.

Subgenus *Skrjabinia* Fuhrmann, 1920

24. *Raillietina (Skrjabinia) cesticillus* (Molin, 1858) Fuhrmann, 1920

1858. *Taenia cesticillus* Molin, *Sitz.-ber. Akad. Wiss. Wien Math. -Naturw. Classe Abt I.*, 30 : 127-158.

1920. *Raillietina (S) cesticillus* Fuhrmann, *Festschrift fur Zschokke, Bale* 1920, 19 pp.

Material : Host *Gallus gallus domesticus*.

Loc. : Intestine. **Locality :** Dehradun, Uttarakhand. **Collector :** S. Chakrabarty & party. **Date :** 18.iv.2005. **Reg. No. :** W8854/1 and W8881/1.

Diagnostic characters : Worms upto 13 cm. Rostellum with 400-500 hooks, in two rows. Hook length 0.07-0.018. Suckers are unarmed. Genital pores irregularly alternate situated in anterior third of margin of segment. Testes 20-30. Cirrus sac extends median to excretory vessels. Uterus breaks down in egg capsule each with one egg.

Distribution : India : Uttarakhand, Meghalaya, West Bengal.

Genus *Ophryocotyloides* Fuhrmann, 1920

Key to the species of *Ophryocotyloides*

1. Testes 25-51 in number *O. srinagarensis*
 Testes lesser in number 2
2. Testes number 10-19 (13) in each proglottid; ovary is kidney shaped *O. picusi*
 Testes number 20-25 (22) in each proglottid; ovary is bilobed but the two lobes are not so well-marked, they are almost fan shaped ..
 *O. makundi*

25. *Ophryocotyloides picusi* Singh, 1962
 (Fig. 9 - Plate 9)

1962. *Ophryocotyloides picusi* Singh, 1962 *Ind. J. Helm.*, 14(2) : 116-121

Host : *Picus xanthopygaeus*.

Loc. : Intestine.

Diagnostic characters : (After Singh, K.S. 1962) Medium sized cestodes measuring 61.5-70.64 (66.07) in length and 0.765-0.854 (0.809) in

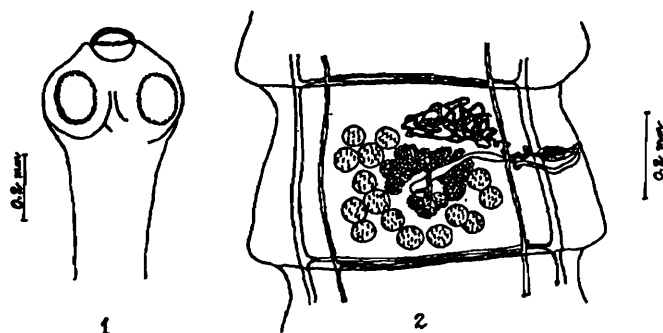


Fig. 9. *Ophryocotyloides picusi* 1. Scolex, 2. Mature proglottid.

maximum breadth. Proglottids broader than long. Scolex measures 0.427-0.436 (0.432) in diameter. Rostellum measures 0.076-0.09 x 0.12-0.16 (0.083 x 0.14) and bears numerous small, hammer-shaped hooks in two rows. Suckers are rounded, muscular and bear 6-7 rows of small spines at the margin. Neck is 0.13-0.22 (0.18) wide. Testes rounded, numbering 10-19 (13) in each proglottid. Testes measure 0.046-0.06 (0.051) in size. Cirrus pouch small, pyriform measuring 0.064-0.094 x 0.036-0.046 (0.084 x 0.041). Cirrus small, unarmed. Ovary a lobed, kidney-shaped organ extending 0.13-0.18 (0.155) across. Vitelline gland compact, lobed, posterior to ovarian isthmus. Vagina a narrow tube. Vagina enlarges to form the receptaculum seminis, 0.02-0.026 (0.024) wide. Genital pores are unilateral. Uterus occupies whole of the proglottid. Eggs measure 0.022-0.025 (0.024) in diameter.

Distribution : India : Uttarakhand (Mukteswar-Kumaun, Nainital), West Bengal, Madhya Pradesh, Nagpur (Maharashtra).

26. *Ophryocotyloides makundi* Singh, 1962
(Fig. 10 - Plate 10)

1962. *Ophryocotyloides makundi* Singh, *Ind. J. Helm.*, 14(2) : 122-126

Host : *Picus xanthopygaeus*.

Loc. : Intestine.

Diagnostic characters : (After Singh, K.S. 1962) Cestodes 103.4 in length and 1.442 in maximum breadth. Scolex rounded and measures 0.436 in breadth. Rostellum measuring 0.08 x 0.623. Rostellar hooks in two rows measuring 0.01 and 0.008 in length. The part of the scolex just posterior to the rostellum is armed with numerous small cuticular spines. The four suckers are

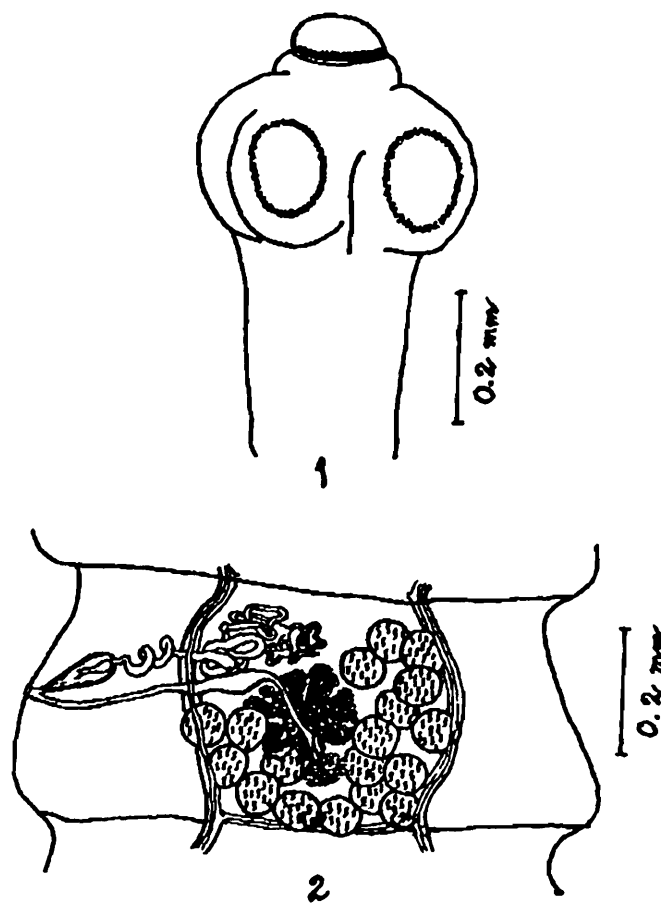


Fig. 10. *Ophryocotyloides makundi* 1. Scolex, 2. Mature proglottid

somewhat oval in shape measuring 0.166 x 0.13. Margins of suckers armed with several rows of small cuticular spines. Testes rounded, numbering 20-25 (22) in each proglottid, measuring 0.054-0.06 (0.058) in diameter. Cirrus pouch is pyriform measuring 0.12-0.13 x 0.052-0.054 (0.127 x 0.053). Cirrus pouch small with thick fibrous wall. Ovary fan-shaped measuring 0.15-0.19 (0.178) across. Vagina wide. Genital pores are unilateral. Receptaculum seminis as wide as 0.03. Uterus simple, sac-like. Eggs measure 0.034-0.044 (0.038) in diameter.

Distribution : India : Uttarakhand (Mukteswar-Kumaun, Nainital), West Bengal, Madhya Pradesh, Maharashtra.

27. *Ophryocotyloides srinagarensis*
Malhotra, 1979.

1979. *Ophryocotyloides srinagarensis* Malhotra, *Bioresearch*, 3(2) : 35-38.

Host : *Corvus macrorhynchos* and *Corvus splendens*.

Loc. : Intestine.

Diagnostic characters : (After Malhotra, S.K. 1979) Small strobila. Suckers measuring (0.05 to 0.01013 x 0.0360 to 0.0855). Large number of rostellar hooks in two circles, numbering 200 to 250. Anterior circle 0.0135 to 0.0158 and posterior circle 0.0158 to 0.018 in length. Testes 25 to 51 in number, measuring (0.0073 to 0.0580 x 0.0073 to 0.0725) Cirrus pouch large, wide measuring (0.0218 to 0.1530 x 0.0073 to 0.0630). Genital pore on anterior third of the lateral margin. Eggs measure (0.0023 to 0.0180 x 0.0023 to 0.0095).

Distribution : India : Uttarakhand (Pauri-Garhwal), West Bengal, Madhya Pradesh, Maharashtra (Nagpur).

Family DILEPIDIDAE Railliet & Henry 1909

Key to genera of Dilepididae

1. Rostellar hooks in two circles *Dilepis*
Rostellar hooks in one circle 2
2. Genital pores regularly alternate
..... *Ivritaenia*
Genital pores irregularly alternate
..... *Choanotaenia*

Genus *Ivritaenia* Singh, 1962

28. *Ivritaenia mukteswarensis* Singh, 1962
(Fig. 11 - Plate 11)

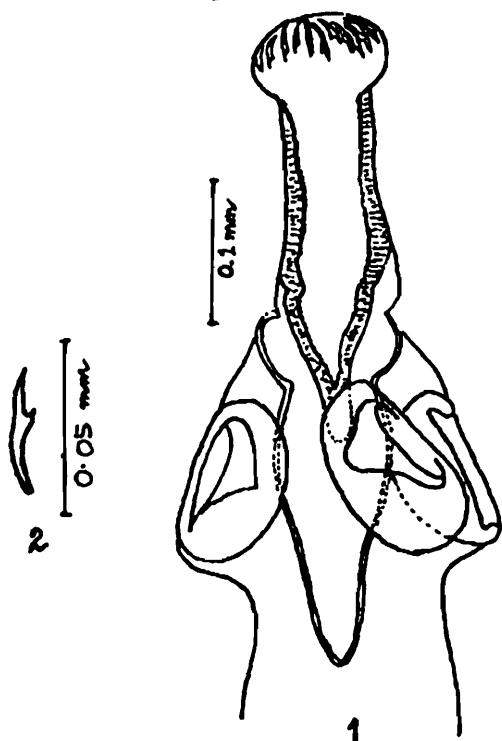


Fig. 11. *Ivritaenia mukteswarensis* 1. Scolex, 2. Rostellar hook.

1962. *Ivritaenia mukteswarensis* Singh, *Ind. J. Helm.*, 14(2) : 127-132

Host : *Dendrocopos auriceps* (Vigors, 1831).

Loc. : Intestine.

Diagnostic characters : (After Singh, K. S. 1962) Parasites small in size measuring 1.709-2.448 (2.077) in length and 0.347-0.472 (0.402) in maximum breadth. Scolex is 0.22-0.25 (0.236) in diameter across the suckers. Rostellum measures 0.06-0.082 (0.071) in diameter. Rostellar pouch measures 0.28-0.312 x 0.09-0.1 (0.292 x 0.096) in length. Rostellum bears single crown of hooks. Hooks are 24 in number and measure 0.028-0.032 (0.03) in length. Suckers are rounded, muscular measuring 0.1-0.112 (0.104) in size. Testes number 15-18 (16) rounded and measure 0.046-0.076 (0.064) in diameter. Cirrus pouch spindle shaped and measures 0.11-0.136 (0.121) in length and 0.032-0.034 (0.0325) in diameter. Ovary distinctly bilobed. Poral lobe much smaller, extends 0.114-0.2 (0.175) across. Vitelline gland compact, oval, present posterior to the ovarian isthmus. Vagina arises as a thin tube, enlarges to form the receptaculum seminis. Uterus sac-like. Uterus with parenchymatous partitions. Each compartment of uterus contains 1-4 eggs. Eggs rounded, 0.032-0.036 (0.034) in diameter.

Distribution : India : Uttarakhand (Mukteswar-Kumaun, Nainital).

Genus *Choanotaenia* Railliet, 1896

29. *Choanotaenia hypoleucia* Singh, 1952
(Fig. 12 - Plate 12)

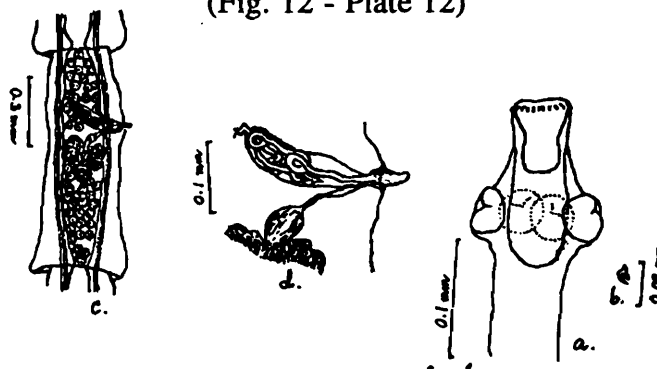


Fig. 12. *Choanotaenia hypoleucia* a. Scolex b. Rostellar hook c. Mature proglottid d. Genital pore

1952. *Choanotaenia hypoleucia* Singh, *Ind. J. Helm.*, 14(1) : 1-72.

Material : Host : *Tringa hypoleucos*. **Loc :** Intestine. **Locality :** Badsahi Thaul, Tehri Garhwal,

Uttarakhand. *Collector* : S. Chakrabarty & party.
Date : 05.iv.2005. *Reg. No.* : W8855/1, W8882/1
 and W8889/1.

Diagnostic characters : Cestodes measure 35-40 in length and 0.42-0.46 in maximum breadth. Scolex is muscular, elongated and comparatively large. Rostellum is muscular and comparatively large armed with a single row of 26 hooks. Each hook 0.006-0.007 in length. Testes are 35-50 in number, present both anterior and posterior to the ovary. Cirrus pouch is sac-like and directed obliquely towards the anterior margin of the proglottid. Genital pores are irregularly alternate. Cirrus is small and is provided with very small spines. Ovary bilobed and lies in the middle of the proglottid. Vitelline gland lobed and posterior to ovary. Uterus occupies almost the whole of the proglottid. Egg is 0.04 in diameter. Genital pores are irregularly alternate.

Distribution : Uttarakhand, U.P. (Lucknow), West Bengal.

Elsewhere : North Atlantic.

Genus *Dilepis* Weinland, 1858
 30. *Dilepis kumaunensis* Singh, 1962
 (Fig. 13 - Plate 13)

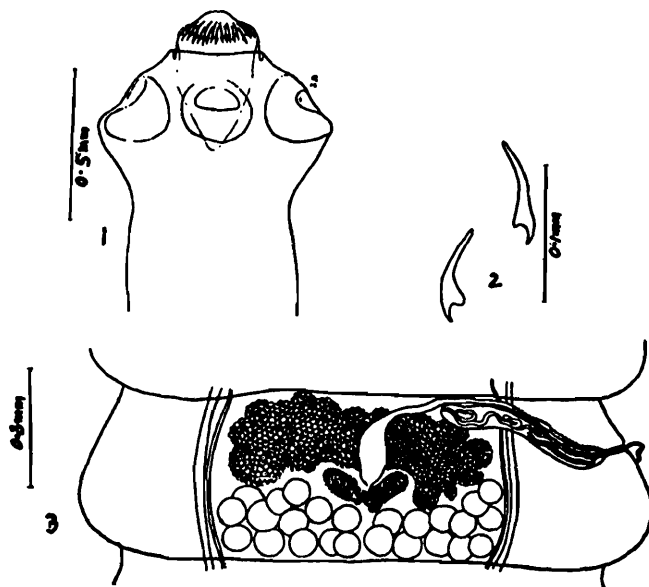


Fig. 13. *Dilepis kumaunensis* 1. Scolex, 2. Rostellar hook sp.; 3. Mature proglottid.

1962. *Dilepis kumaunensis* Singh, *Zoologischer Anzeiger*, 169(11/12) : 485-488.

Host : *Argya subrufa* (Jerdon) and *Turdus merula simillimus* (Jerdon).

Loc. : Intestine.

Diagnostic characters : (After Singh, K.S. and Tandan, B.K. 1962) Parasites are 42.60 to 62.40 (54.40) in length and 1.575 to 1.914 in maximum breadth. Scolex is well developed, muscular measuring 0.623 to 0.765 in diameter. Rostellum measures 0.214 to 0.256 (0.230) in diameter. Rostellum armed with two rows each having thirty-five hooks. Hooks of the anterior row measure 0.088 to 0.096 in length and those of the posterior row measure 0.067 to 0.078 (0.073) in length. Rostellar pouch is 0.481 to 0.534 (0.509) deep. The four suckers are muscular, rounded measuring 0.20 to 0.22 (0.21) in diameter. Neck is constricted with a diameter of 0.534 to 0.659 (0.578). Ovary is well-developed extending 0.460 to 0.676 (0.596) across, lobed though not deeply. Vagina enlarges to form the receptaculum seminis. Uterus is sac-like and soon occupies the whole proglottid. Eggs rounded and measure 0.054 to 0.066 in diameter. Genital pores are unilateral.

Distribution : India : Uttarakhand (Ramgarh, Nainital), West Bengal.

Elsewhere : Europe, Russia

Family PARUTERINIDAE Fuhrmann, 1907
Key to the genera of Paruterinidae

1. Scolex without rostellum or rostellar hooks *Anonchotaenia*
- Scolex with rostellum; rostellum armed with double crown of triangular hooks
 *Biuterina*

Genus *Anonchotaenia* Cohn, 1900
 31. *Anonchotaenia dendrocitta* (Woodland, 1929)
 (Fig. 14 - Plate 14)

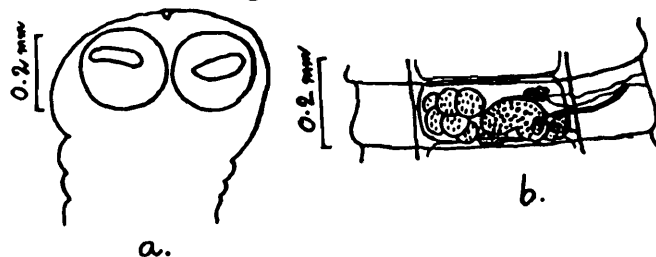


Fig. 14. *Anonchotaenia dendrocitta* Woodland a. Scolex b. Mature proglottid.

1929. *Anonchotaenia dendrocitta* Woodland, *Parasit.*, 21 : 168-179.

Material : Host : *Oriolus oriolus* (Golden Oriole).

Loc. : Intestine. **Locality** : Hrishikesh, Uttarakhand. **Collector** : S. Chatterjee & party. **Date** : 15.ii.2003. **Reg. No.** : W8856/1 W8883/1, W8884/1 and W8885/1.

Diagnostic characters : The worm upto 6cm. No rostellum. Ventral excretory vessel larger than dorsal. Genital duct between dorsal and ventral vessel. Testes 10-12. Paruterine organ develop from poral extremity of uterus. Eggs 0.05 x 0.09.

Distribution : India : Uttarakhand, U.P. (Lucknow), West Bengal.

Elsewhere : Africa.

Genus *Biuterina* Fuhrmann, 1902

32. *Biuterina meggitti* Singh, 1959

1959. *Biuterina meggitti* Singh, *Ind. J. Helminth.* 11(1) : 1-24.

Material : Host : *Dicrurus caerulescens* Linnaeus. **Loc** : Intestine. **Locality** : Hardwar, Uttarakhand. **Collector** : A. Chatterjee and party. **Reg. No.** : W8857/1 and W8886/1.

Diagnostic characters : Scolex is comparatively big, muscular and well developed. Rostellum is flattened. Rostellar hooks are triangular almost 50-55 in number arranged in two rows. Rostellar sac is absent. The 4 oval suckers are big and muscular. Neck is short. Testes about 9-12 in number present posterior to ovary. Cirrus pouch club-shaped and reaches beyond the excretory ducts. Genital pores are irregularly alternate. Bilobed ovary is present in the middle of the proglottid. Vagina is a thin and straight tube. Paruterine organ surrounds the central portion of the uterus. Uterus similar to horse-shoe with wide ends.

Distribution : India : Uttarakhand, U.P. (Lucknow).

Family HYMENOLEPIDIDAE Ariola, 1899

Key to the Subfamilies of HYMENOLEPIDIDAE

1. Longitudinal osmoregulatory canals 6-11; Scolex armed with single crown of ten rostellar hooks FIMBRIARIINAE

Longitudinal osmoregulatory canals 4; genital pores unilateral; genital ducts dorsal to osmoregulatory canals; rostellum armed with single, exceptionally double crown of hooks HYMENOLEPIDINAE

Subfamily FIMBRIARIINAE Wolffhugel, 1899

Genus *Profimbriaria* Wolffhugel, 1936

33. *Profimbriaria backynskae* Malhotra, 1984

1984. *Profimbriaria backynskae* Malhotra, *Current Science* 53(8) : 443-449.

Host : *Tadorna ferruginea*.

Loc. : Intestine.

Distribution : India : Uttarakhand (Pauri-Garhwal), U.P. (Fathepur).

Remarks : Description cannot be provided due to non-availability of literature.

Subfamily HYMENOLEPIDINAE Perrier, 1897

Key to the genera of Hymenolepidinae

1. Cirrus-sac short, not reaching middle of proglottid; ovary trilobate or multilobate *Staphylocistis*
- Cirrus-sac may reach midline; ovary compact, transversely elongated or lobed .. *Hymenolepis*

Genus *Hymenolepis* Weinland, 1858

Key to the species of *Hymenolepis*

1. Scolex unarmed *H. phalacrocorax*
- Scolex armed; rostellum armed with 10 hooks *H. farcminosa*

34. *Hymenolepis phalacrocorax* Woodland, 1929

1929. *Hymenolepis phalacrocorax* Woodland, *Parasit.*, 21 : 168-179.

Material : Host : *Steptopelia chinensis*. **Loc.** : Intestine. **Locality** : Chamba, Uttarakhand. **Collector** : A. Chatterjee & party. **Date** : 14.ix.2002. **Reg. No.** : W8858/1 and W8887/1.

Diagnostic characters : Scolex is unarmed. Genital pores are unilateral and are situated on the left side. Testes three in number, one being poral and the other two are aporal. Cirrus sac is large. Ovary is large and bilobed. Vitelline gland is just behind it and is located ventrally. Vagina is slightly dilated at the terminal portion. Uterus is a tranverse sac.

Distribution : India : Uttarakhand, U.P. West Bengal.

Elsewhere : Myanmar, (Rangoon), Europe, Brazil.

35. *Hymenolepis farcminosa* (Goeze, 1782)

1782. *Hymenolepis farcminosa* Goeze, *Versuch einer Naturgeschichte der Eingeweidewurmer thierischer Korper*, Blakenburg, pp. xi+471.

Material : Host : *Corvus macrorhynchos*. **Loc. :** Intestine. **Locality :** Badsahi Thawl, Tehri Garhwal, Uttarakhand. **Collector :** S. Chakrabarty & party. **Date :** 05.04.2005. **Reg. No. :** W8859/1 and W8888/1.

Diagnostic characters : Length upto 12 cm. Rostellum with 10 hooks 0.018 to 0.023 in length. Genital pores in centre of margin of proglottid in old segment. In young slightly anterior to middle. Testes two aporal, one anterior to other. Cirrus sac long, external seminal vesicle upto middle of the segment, it varies in size in different parts of strobila. Ovary deeply lobed, isthmus very narrow. Uterus partly separate.

Distribution : India : Uttarakhand, West Bengal, Meghalaya.

Elsewhere : Myanmar, (Rangoon), Europe, Brazil

Genus *Staphylocystis* Villot, 1877

36. *Staphylocystis (S) chattraji* Malhotra, 1984

1984. *Staphylocystis (S) chattraji* Malhotra, *Rivista di Parassitologia*, 1(45) : 465.

Host : *Suncus murinus caerulescens*.

Loc. : Intestine.

Diagnostic characters : (After Malhotra, S.K. 1984) Strobila small. Scolex measures (0.17 to 0.24 x 0.21 to 0.41). Rostellum measures (0.02 to 0.05 x 0.03 to 0.07). Rostellar hooks measure (0.013

to 0.017). Suckers measure (0.056 to 0.085 x 0.069 to 0.127). Cirrus pouch (0.006 to 0.019) in diameter. Ovary deeply lobed. Vagina wide. Eggs measure (0.012 to 0.033 x 0.029 to 0.035). Oncopshpere measures (0.018 to 0.020 x 0.20 to 0.40).

Distribution : India : Uttarakhand (Pauri-Garhwal Himalayas).

SUMMARY

The cestodes included in the present study were collected from the different districts of Uttarakhand such as Tehri-Garhwal, Pauri-Garhwal, Dehradun, Rishkesh, Hardwar and Nainital. After investigation it has been found that the Subclass Cestoda is represented by 11 families in the areas surveyed. Systematic studies of 36 species belonging to 25 genera have been reported along with diagnostic characters of most species. General morphology and taxonomy, techniques of collection and preservation with Key to the Orders, families, subfamilies, genera, sub-genera and species are dealt in this work. Species Distribution map of Uttarakhand has also been included.

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LIST OF THE SPECIES, DISTRIBUTION AND HOSTS

Family	Index No.	Parasite	Host		
		Name of species	Scientific name	Common Name	Distribution (District)
I. CAPIGENTIDAE	1	<i>Pseudocaryophyllaeus indica</i>	<i>Clarias batrachus</i>	Magur	Chamba, Tehri-Garhwal
II. LYTOCESTIDAE	2	<i>Lytocestus indicus</i>	<i>Clarias batrachus</i>	Magur	Chamba, Tehri-Garhwal
	3	<i>Lytocestus filiformis</i>	<i>Clarias batrachus</i>	Magur	Chamba, Tehri-Garhwal
	4	<i>Lytocestus fossilisi</i>	<i>Clarias batrachus</i>	Magur	Chamba, Tehri-Garhwal
	5	<i>Lytocestoides paithanensis</i>	<i>Lonchura malacca</i>	Munia	Katgodam-Nainital
III. LECANICEPHALIDAE	6	<i>Guptaia garhwalensis</i>	<i>Schizothorax richardsonii</i>	Trout	Pauri-Garhwal
IV. BOTHRIOCEPHALIDAE	7	<i>Senga nayari</i>	<i>Mastacembelus armatus</i>	Spiny eel	Pauri-Garhwal
	8	<i>Senga teleostei</i>	<i>Channa punctatus</i>	Channa	Pauri-Garhwal
	9	<i>Ptychobothrium nayarensis</i>	<i>Barilius bola</i> and <i>Schizothorax richardsonii</i>	Hill trout	Pauri Garhwal
	10	<i>Bothriocephalus teleostei</i>	<i>Barilius bola</i> and <i>Schizothorax richardsonii</i>	Hill trout	Pauri-Garhwal
V. DIPHYLLOBOTHRIDAE	11	<i>Capooria barilii</i>	<i>Barilius bola</i>	Hill trout	Pauri-Garhwal
VI. PROTEOCEPHALIDAE	12	<i>Gangesia macrones</i>	<i>Heteropneustes fossilis</i>	Singhi	Dehradun
VII. ANOPLOCEPHALIDAE	13	<i>Bertiella indica</i>	<i>Petaurista inornatus</i>	Himalayan flying squirrel	Mukteswar-Kumaun-Nainital
	14	<i>Mosgovoiya pauriensis</i>	<i>Oryctolagus cuniculus</i>		Pauri-Garhwal

Family	Index No.	Parasite	Host		
		Name of species	Scientific name	Common Name	Distribution (District)
	15	<i>Avitellina (Avitellina) bangaonensis</i>	<i>Bos sp. and Capra sp.</i>	Cattle and Goats	Pauri-Garhwal
	16	<i>Stilesia garhwalensis</i>	<i>Capra sp.</i>	Goats	Pauri-Garhwal
	17	<i>Stilesia kotdwarensis</i>	<i>Ovis sp.</i>	Sheep	Pauri-Garhwal
	18	<i>Oochoristica pauiensis</i>	<i>Hemidactylus brooki</i>	House lizard	Pauri-Garhwal
VIII. DAVAINIDAE	19	<i>Cotugnia digonophora</i>	<i>Rattus rattus</i>	Rat	Chamba, Tehri, Garhwal
	20	<i>Cotugnia fastigata</i>	<i>Gallus gallus domesticus</i>	Domestic fowl	Dehradun
	21	<i>Cotugnia satpuliensis</i>	<i>Columba livia domestica</i>	pigeon	Pauri-Garhwal
	22	<i>Raillietina (Raillietina) thapari</i>	<i>Picus squamatus</i>	Scaly-bellied Green Woodpecker	Mukteswar-Kumaun, Nainital
	23	<i>Raillietina (Fuhrmannetta) echinobothrida</i>	<i>Gallus gallus domesticus</i>	Domestic fowl	Tehri-Garhwal
	24	<i>Raillietina (Skrjabinia) cesticillus</i>	<i>Gallus gallus domesticus</i>	Domestic fowl	Dehradun
	25	<i>Ophryocotyloides picusi</i>	<i>Picus xanthopygaeus</i>	Woodpecker	Kumaun-Nainital
	26	<i>Ophryocotyloides makundi</i>	<i>Picus xanthopygaeus</i>	Woodpecker	Kumaun-Nainital
	27	<i>Ophryocotyloides srinagarensis</i>	<i>Corvus macrorhynchos</i>	Crow	Pauri-Garhwal
XI. DIEPIDIDAE	28	<i>Ivritaenia mukteswarensis</i>	<i>Dendrocopos auriceps</i>	Brown-fronted Pied Woodpecker	Kumaun-Nainital

Family	Index No.	Parasite	Host		
		Name of species	Scientific name	Common Name	Distribution (District)
	29	<i>Choanotaenia hypoleucia</i>	<i>Tringa hypoleucos</i>	Common Sandpiper	Tehri-Garhwal
	30	<i>Dilepis kumaunensis</i>	<i>Argya subrufa</i> & <i>Turdus merula similimus</i>	Rufous Babbler	Nainital
X. PARUTERINIDAE	31	<i>Anonchotaenia dendrocitta</i>	<i>Oriolus oriolus</i>	Golden Oriole	Hrishikesh
	32	<i>Biuterina meggitti</i>	<i>Dicrurus caerulescens</i>	South Indian Black Drongo or King Crow	Hardwar
XI. HYMENOLEPIDIDAE	33	<i>Profimbriaria backynskae</i>	<i>Tadorna ferruginea</i>	Ruddy-shel duck or Brahminy duck	Pauri-Garhwal
	34	<i>Hymenolepis phalacrocorax</i>	<i>Streptopelia chinensis</i>	Spotted Dove	Chamba, Tehri-Garhwal
	35	<i>Hymenolepis farcminosa</i>	<i>Corvus macrorhynchos</i>	Jungle Crow	Tehri-Garhwal
	36	<i>Staphylocystis(S) chattroraji</i>	<i>Suncus murinus caerulescens</i>	House Shrew	Pauri-Garhwal

NEMATODA : PLANT AND SOIL NEMATODES

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INTRODUCTION

Nematodes are biologically diverse and versatile, occupying diverse habitats and constitute nearly 90% of all metazoans in number and have 26646 recorded species (Hugot *et al.*, 2001). Soil inhabiting nematodes predominate over all other soil animals, both in number and species. These nematodes display various feeding habits on the basis of which they are classified as plant feeders, bacterial feeders, fungal feeders, predators and omnivores (Yeates *et al.*, 1993). Taxonomically, the orders Tylenchida, and Triplonchida constitute plant feeders, fungal feeders and predaceous forms. Aphelenchida comprises of fungal feeders and predators. Order Dorylaimida includes species that are plant feeders, fungal feeders, predators and omnivores. Bacterial feeders are found in orders Rhabditida, Diplogasterida, Monhysterida, Alaimida and Araeolaimida, whereas predators occur in various orders like Mononchida, Diplogasterida, Aphelenchida and Dorylaimida. All these types of nematodes have been found to co-occur in soil.

Plant parasitic nematodes threaten the agricultural crops throughout the world, particularly in the tropics and subtropics. The average annual yield loss worldwide is around 10% or even more (Ahmad, 1996). On the other hand, bacterial and fungal feeders are very important and beneficial in the decomposition of organic matter and recycling of nutrients in soil. These nematodes possess several attributes that make them useful ecological indicators (Freckman, 1988; Bongers, 1990; Neher, 2001).

Extensive work has been done on the nematode fauna of Uttarakhand. The first plant parasitic nematode from this state was reported by Khan & Siddiqi (1963). Other significant contributions in the field of plant and soil nematodes from different districts of Uttarakhand have been made by Siddiqi

& Husain (1967), Husain & Khan (1967,1975), Jairajpuri (1968,1970), Khan & Khan (1972,1974), Rashid *et al.* (1973), Rashid & Khan (1973), Khera & Chaturvedi (1977), Bajaj & Jairajpuri (1979), Ahmad & Jairajpuri (1980, 1982, 1983, 1987, 1988, 1989), Jairajpuri & Khan (1982), Rahmani *et al.* (1986), Lal & Khan (1989), Thapa (1990), Ahmad *et al.* (1991), Ahmad (1995), Rahman & Ahmad (1995), Singh & Khan (1996,1997,1999), Thapa & Ganguly (1999), Rawat *et al.* (1999), Srivastava *et al.* (2000), Rawat & Ahmad (2000), Chaubey & Sharma (2005), Rathour *et al.* (2006), etc.

The nematode diversity of Uttarakhand is represented by members of most of the orders in which plant and soil nematodes occur. The present paper reports 196 species, which have been reported from Uttarakhand till date. These 196 species have been found to occur under 95 genera and 37 families of 11 orders namely, Tylenchida (72 species), Aphelenchida (02 species), Rhabditida (11 species), Araeolaimida, (04 species), Monhysterida (01 species), Chromadorida (02 species), Enoplida (05 species), Dorylaimida (51 species), Alaimida (05 species), Mononchida (38 species) and Triplonchida (05 species). Out of these 196, two species are new records from India (Rizvi & Bhandari, 2008), 17 species are new distributional records for the state, of which 8 species were recorded from Western Doon Shivalik region (Rizvi, 2007), 2 species from Corbett Tiger reserve (CTR), district Nainital (Rizvi, 2008), 4 species from Dehradun and 1 species from district Chamoli (Rizvi & Bhutia, 2009), other two new records from the state are reported herein. Besides, two new combinations are also proposed and several new hosts / habitats are recorded for these nematodes.

SYSTEMATIC LIST

(Classification followed after Goodey, 1963; Jairajpuri & Ahmad, 1992; Ahmad, 1996, websites of NEMAPLEX and University of Nebraska Lincoln).

(Note : Species not examined but reported by earlier workers are marked with an*).

Phylum Nematoda (Rudolphi, 1808) Lankester, 1877.

Order TYLENCHIDA Thorne, 1949
Suborder TYLENCHINA Thorne, 1949
Superfamily TYLENCHOIDEA Orley, 1880
Family TYLENCHIDAE Orley, 1880
Subfamily TYLENCHINAE Orley, 1880
Genus *Tylenchus* Bastian, 1865

1. **Tylenchus filiformis* Butschli, 1873
2. **Tylenchus arcuatus* Siddiqi, 1963
3. **Tylenchus indicus* Khan *et al.*, 1969

Genus *Ottolenchus* Husain & Khan, 1967

4. **Ottolenchus parvus* (Siddiqi, 1963) Siddiqi, 1979

Subfamily ECPHYADOPORINAE
Skarbilovich, 1959

Genus *Lelenchus* Andrassy, 1954

5. **Lelenchus magnus* Husain & Khan, 1975

Subfamily ATYLENCHINAE
Skarbilovich, 1959

Genus *Aglenchus* Andrassy, 1954

6. **Aglenchus lycopersicus* Husain & Khan, 1975

7. *Aglenchus andrassyi* Sultan, 1986

Subfamily BOLEODORINAE Khan, 1964

Genus *Boleodorus* Thorne, 1941

8. *Boleodorus typicus* Husain & Khan, 1967
9. **Boleodorus atypicus* Khera & Chaturvedi, 1977
10. **Boleodorus longistylus* Khera & Chaturvedi, 1977
11. **Boleodorus constrictus* Rahman & Ahmad, 1995

Genus *Psilenchus* de Man, 1921

12. **Psilenchus dunensis* Thapa & Ganguly, 1999
13. **Psilenchus hilarus* Siddiqi, 1963
14. **Psilenchus minor* Siddiqi, 1963

Genus *Neopsilenchus* Thorne & Malek, 1968

15. **Neopsilenchus citri* (Jairajpuri, 1968) Bello, 1972

Genus *Basiria* Siddiqi, 1959.

16. **Basiria beryllus* (Khan & Khan, 1974) Bajaj & Bhatti, 1979
17. **Basiria elegans* (Khan & Khan, 1974) Bajaj & Bhatti, 1979

Family ANGUINIDAE Nicoll, 1935

Genus *Ditylenchus* Filipjev, 1936

18. **Ditylenchus brassicae* Husain & Khan, 1975

Family BELONOLAIMIDAE
Whitehead, 1960

Subfamily TELOTYLENCHINAE
Siddiqi, 1960

Genus *Tylenchorhynchus* Cobb, 1913

19. *Tylenchorhynchus annulatus* (Cassidy, 1930) Golden, 1971
20. *Tylenchorhynchus mashoodi* Siddiqi & Basir, 1959
21. **Tylenchorhynchus elegans* Siddiqi, 1961

Genus *Bitylenchus* Filipjev, 1934

22. **Bitylenchus brevilineatus* (Williams 1960) Siddiqi, 1986

Genus *Quinisulcius* Siddiqi, 1971

23. **Quinisulcius capitatus* (Allen, 1955) Siddiqi, 1971
24. **Neotylenchus latus* Thorne, 1935

Family HOPLOLAIMIDAE
Filipjev, 1934

Subfamily HOPLOLAIMINAE
Filipjev, 1934

Genus *Hoplolaimus* Daday, 1905

25. **Hoplolaimus indicus* Sher, 1963
26. **Hoplolaimus seinhorsti* Luc, 1958

Genus *Rotylenchus* Filipjev, 1936

27. **Rotylenchus citri* Rashid & Khan, 1974
28. **Rotylenchus pruni* Rashid & Husain, 1972

Genus *Helicotylenchus* Steiner, 1945

29. *Helicotylenchus dihystra* (Cobb, 1893) Sher, 1961
30. *Helicotylenchus indicus* Siddiqi, 1963
31. **Helicotylenchus silvaticus* Lal & Khan, 1989
32. **Helicotylenchus pseudorobustus* (Steiner, 1914) Golden, 1956
33. **Helicotylenchus digonicus* Perry, 1959
34. **Helicotylenchus erythrinae* (Zimmerman, 1904) Golden, 1956
35. *Helicotylenchus multicinctus* (Cobb, 1893) Golden, 1956
36. **Helicotylenchus retusus* Siddiqi & Brown, 1964
37. **Helicotylenchus neoformis* Siddiqi & Husain, 1964

Subfamily ROTYLENCHULINAE
Husain & Khan, 1967Genus *Rotylenchulus* Linford & Oliveira, 1940

38. **Rotylenchulus reniformis* Linford & Oliveira, 1940

Family PRATYLENCHIDAE
Thorne, 1949Subfamily PRATYLENCHINAE
Thorne, 1949Genus *Pratylenchus* Filipjev, 1936

39. *Pratylenchus penetrans* (Cobb, 1917) Filipjev & Stekhoven, 1941
40. **Pratylenchus kumaonensis* Lal & Khan, 1989
41. **Pratylenchus neglectus* (Rensch, 1924) Filipjev & Schur. Steck., 1941
42. **Pratylenchus vulnus* Allen & Jensen, 1951
43. *Pratylenchus coffeae* (Zimmermann, 1898) Filipjev & Schur. Steck., 1941
44. **Pratylenchus crenatus* Loof, 1960
45. **Pratylenchus pratensis* (de Man, 1880) Filipjev, 1936

46. *Pratylenchus typicus* Rashid, 1974

Family HETERODERIDAE

Filipjev & Schur Steck., 1941

Subfamily MELOIDOGYNINAE

Skarbilovich, 1959

Genus *Meloidogyne* Goeldi, 1887

47. **Meloidogyne arenaria* (Neal, 1889) Chitwood, 1949
48. **Meloidogyne hapla* Chitwood, 1949
49. **Meloidogyne incognita* (Kofoid & White, 1919) Chitwood, 1949
50. **Meloidogyne javanica* (Treub, 1885) Chitwood, 1949

Superfamily CRICONEMATOIDEA

Taylor, 1936

Family CRICONEMTIDAE

Taylor, 1936

Subfamily CRICONEMATINAE

Taylor, 1936

Genus *Hemicriconemoides* Chitwood & Birchfield, 1957

51. *Hemicriconemoides mangifera* Siddiqi, 1961
52. **Hemicriconemoides cocophilus* (Loos, 1949) Chitwood & Birchfield, 1957
53. **Hemicriconemoides doonensis* Srivastava *et al.*, 2000

Genus *Criconemella* De Gresse & Loof, 1965

54. **Criconemella curvata* (Raski, 1952) Luc & Raski, 1981
55. **Criconemella xenoplax* (Raski, 1952) Luc & Raski, 1981
56. **Criconemella citricola* (Siddiqi, 1965) Luc & Raski, 1981
57. **Criconemella insignis* (Siddiqi, 1965) Luc & Raski, 1981

Genus *Criconema* Hofmanner & Menzel, 1914

58. **Criconema aberrans* (Jairajpuri & Siddiqi, 1963) Raski & Luc, 1987
59. **Criconema rishikensis* (Singh & Khan, 1999) n. comb.
60. **Criconema bhowaliensis* (Singh & Khan, 1999) n. comb.

Genus *Ogma* Southern, 1914

61. **Ogma regularis* (Rahmani *et al.* 1986) Raski & Luc, 1987
62. **Ogma serratum* (Khan & Siddiqi, 1963) Raski & Luc, 1987
63. **Ogma parvum* Ahmad, Jairajpuri & Rahmani, 1991
64. **Ogma octangulare* (Cobb, 1914) Sch. Stekhoven. & Teunissen, 1938
65. **Ogma tenuicaudatum* (Siddiqi, 1961) Siddiqi, 1986

Subfamily HEMICYCLIOPHORINAE
Skarbilovich, 1959Genus *Hemicycliophora* de Man, 1921

66. **Hemicycliophora dhirendi* Husain & Khan, 1967
67. **Hemicycliophora tarjani* Khan & Basir, 1963

Family TYLENCHULIDAE
Skarbilovich, 1947Subfamily PARATYLENCHINAE
Thorne, 1949Genus *Paratylenchus* Micoletzky, 1922

68. **Paratylenchus tenuicaudatus* Wu, 1961
69. **Paratylenchus nainianus* Edward & Misra, 1963
70. **Paratylenchus curvatus* Van der Linde, 1938
71. **Paratylenchus projectus* Jenkins, 1956

Genus *Tylenchulus* Cobb, 1913

72. **Tylenchulus semipenetrans* Cobb, 1913

Order APHELENCHIDA Siddiqi, 1980

Suborder APHELENCHINA Hooper, 1978

Family APHELENCHIDAE
Fuchs, 1937Genus *Aphelenchus* Bastian, 1865

73. *Aphelenchus avenae* Bastian, 1865

Family APHELENCHOIDIDAE
Skarbilovich, 1947Genus *Aphelenchoides* Fischer, 1894

74. **Aphelenchoides saprophilus* Franklin, 1957

Order RHABDITIDA (Orley, 1880)
Chitwood, 1933Suborder RHABDITINA (Orley, 1880)
Chitwood, 1933

Superfamily RHABDITOIDEA (Orley, 1880) Travassos 1920

Family RHABDITIDAE Orley, 1880

Subfamily MESORHABDITINAE
Andrassy, 1976Genus *Mesorhabditis* (Osche, 1952) Dougherty, 1953

75. *Mesorhabditis cranganorensis* (Khera, 1968) Andrassy, 1983

Genus *Bursilla* Andrassy, 1976

76. *Bursilla vernalis* Andrassy, 1982

Subfamily PELODERINAE
Andrassy, 1976Genus *Caenorhabditis* (Osche, 1952)
Dougherty, 1953

77. *Caenorhabditis elegans* (Maupas, 1899) Dougherty, 1953

Suborder CEPHALOBINA
Filipjev, 1934Family CEPHALOBIDAE
Filipjev, 1934Subfamily CEPHALOBINAE
Filipjev, 1934Genus *Cephalobus* Bastian, 1865

78. *Cephalobus persegnis* Bastian, 1865

Genus *Eucephalobus* Steiner, 1936

79. *Eucephalobus oxyuroides* (de Man, 1876) Steiner, 1936

Subfamily ACROBELINAE Thorne, 1937

Genus *Pseudacrobelus* Steiner, 1938

80. *Pseudacrobelus eurystoma* (Andrassy, 1967) Abolafia *et al.*, 2002

Genus *Acrobeles* von Linstow, 1877

81. *Acrobeles timmi* Chaturvedi & Khera, 1979

Genus *Acrobelloides* (Cobb, 1924) Steiner & Buhrer, 1933

82. *Acrobelloides buetschlii* (de Man, 1884) Steiner & Buhrer, 1933

- Genus *Chiloplacus* Thorne, 1937
83. *Chiloplacus subtenuis* Rashid & Heynes, 1990
- Genus *Zeldia* Thorne, 1937
84. *Zeldia punctata* (Thorne, 1925) Thorne, 1937
- Superfamily PANAGROLAIMOIDEA Thorne, 1937
- Family PANAGROLAIMIDAE Thorne, 1937
- Genus *Trilabiatius* Goodey, 1963
85. **Trilabiatius lignicolus* (Korner, 1954) Goodey, 1963
- Order ARAEOLAIMIDA De Coninck & Sch. Stek. 1933
- Superfamily PLECTOIDEA (Orley, 1880) Chitwood, 1937
- Family PLECTIDAE Orley, 1880
- Subfamily PLECTINAE (Orley, 1880) Micoletzky, 1922
- Genus *Plectus* Bastian, 1865
86. *Plectus cirratus* Bastian, 1865
87. **Plectus thornei* Ruhm, 1956
- Genus *Chiloplectus* Andrassy, 1984
88. *Chiloplectus indicus* Tahseen *et al*, 2004
- Family CAMACOLAIMIDAE (Micoletzky, 1924) Sch. Stek & De Coninck, 1933
- Genus *Paraphanolaimus* Micoletzky, 1923
89. **Paraphanolaimus micoletzkyi* Khera & Chaturvedi, 1977
- Order MONHYSTERIDA Sch. Stek & De Coninck, 1933
- Family MONHYSTERIDAE De Man, 1876
- Subfamily PRISMATOLAIMIDAE Micoletzky, 1922
- Genus *Prismatolaimus* de Man, 1880
90. *Prismatolaimus andrassyi* Khera and Chaturvedi, 1977
- Order CHROMADORIDA (Filipjev, 1917) Chitwood, 1933
- Family CYTHOLAIMIDAE (Micoletzky, 1924) Sch. Stek & De Coninck, 1933
- Genus *Achromadora* Cobb
91. **Achromadora ruricola* (de Man, 1880) Micoletzky, 1925
- Genus *Odontolaimus* de Man, 1880
92. **Odontolaimus aquaticus* Schneider, 1937
- Order ENOPLIDA (Baird, 1853) Chitwood, 1933
- Family IRONIDAE de Man, 1876
- Subfamily IRONINAE (De Man, 1876) Micoletzky, 1922
- Genus *Ironus* Bastian, 1865
93. *Ironus longicaudatus* de Man, 1884
94. **Ironus ignavus* Bastian, 1865
- Genus *Cryptonchus* Cobb, 1913
95. **Cryptonchus abnormis* (Allgen, 1933) Schur. Stek., 1951
- Family ONCHOLAIMIDAE Filipjev, 1918
- Genus *Onchulus* Cobb, 1920
96. **Onchulus longicauda* (Daday, 1899) Andrassy, 1964
- Family TRIPYLIDAE Orley, 1880
- Genus *Tripyla* Bastian, 1865
97. **Tripyla affinis* de Man, 1880
- Order DORYLAIMIDA Pearse, 1942
- Suborder DORYLAIMINA Pearse, 1936
- Superfamily DORYLAIMOIDEA De Man, 1876
- Family DORYLAIMIDAE De Man, 1876
- Subfamily LAIMYDORINAE Andrassy, 1969
- Genus *Amphidorylaimus* Andrassy, 1960
98. **Amphidorylaimus infecundus* (Cobb, 1936) Andrassy, 1960
- Genus *Prodorylaimus* Andrassy, 1959
99. **Prodorylaimus obesus* Ahmad & Jairajpuri, 1982

Genus *Prodorylaimium* Andrassy, 1969

100. **Prodorylaimium brigdammense* (de Man, 1876) Andrassy, 1969

Genus *Mesodorylaimus* Andrassy, 1959

101. **Mesodorylaimus chamolienses* Ahmad, 1995

Genus *Afrodorylaimus* Andrassy, 1960

102. **Afrodorylaimus geniculatus* (Andrassy, 1961) Andrassy, 1964

Subfamily THORNENEMATINAE
Siddiqi, 1969Genus *Thornenema* Andrassy, 1959

103. **Thornenema cavalcantii* (Lordello, 1955) Andrassy, 1959
104. **Thornenema mauritianum* (Williams, 1959) Baqri & Jairajpuri, 1969
105. **Thornenema baldum* (Thorne, 1939) Andrassy, 1959
106. **Thornenema garhwalicum* Srivastava et al., 2000

Genus *Opisthodorylaimus* Ahmad & Jairajpuri, 1982

107. **Opisthodorylaimus chamoliensis* Ahmad & Jairajpuri, 1982
108. **Opisthodorylaimus caudatus* Ahmad & Jairajpuri, 1982

Genus *Coomansinema* Ahmad & Jairajpuri, 1989

109. **Coomansinema dimorphicauda* Ahmad & Jairajpuri, 1989

Family QUDSIANEMATIDAE
Jairajpuri, 1965Subfamily QUDSIANEMATINAE
Jairajpuri, 1965Genus *Baqriella* Ahmad & Jairajpuri, 1988

110. **Baqriella qaiserii* Ahmad & Jairajpuri, 1988

Genus *Ecumenicus* Thorne, 1974

111. **Ecumenicus monohystera* (de Man, 1880) Thorne, 1974

Genus *Labronema* Thorne, 1974

112. **Labronema pararapax* Ahmad & Jairajpuri, 1982

Genus *Eudorylaimus* Andrassy, 1959

113. **Eudorylaimus himalus* Jairajpuri & Ahmad, 1982

Subfamily DISCOLAIMINAE
Siddiqi, 1969Genus *Discolaimus* Cobb, 1913

114. *Discoliamus laksi* Khan & Laha, 1982

Family NORDIIDAE Jairajpuri
& Siddiqi, 1964Subfamily PUNGENTINAE Siddiqi,
1969Genus *Enchodelus* Thorne, 1939

115. **Enchodelus* (*Enchodelus*) *microdoroides* Baqri & Jairajpuri, 1974
116. **Enchodelus* (*Rotundus*) *parateres* Baqri & Jairajpuri, 1974
117. **Enchodelus* (*Parenchodelus*) *constrictus* Jairajpuri & Loof, 1968
118. **Enchodelus* (*Parenchodelus*) *longidens* Jairajpuri & Loof, 1968
119. **Enchodelus* (*Parenchodelus*) *satendri* Baqri & Jairajpuri, 1974

Subfamily ACTINOLAIMOIDINAE
Jairajpuri & Ahmad, 1992Genus *Oriverutus* Siddiqi, 1971

120. **Oriverutus labiatus* Ahmad & Jairajpuri, 1987
121. **Oriverutus paragus* Ahmad & Jairajpuri, 1987
122. **Oriverutus asaccatus* (Dhanachand & Jairajpuri, 1980) Ahmad & Jairajpuri, 1987

Family APORCELAIMIDAE
Heyns, 1965Subfamily APORCELAIMINAE
Heyns, 1965Genus *Aporcelaimellus* Heyns, 1965

123. **Aporcelaimellus maitai* Yeates, 1967
124. **Aporcelaimellus obscurus* (Thorne & Swanger, 1936) Heyns, 1965
125. **Aporcelaimellus baqris* Ahmad & Jairajpuri, 1982

Genus *Aporcelaimus* Thorne & Swanger, 1936

126. **Aporcelaimus litchi* Srivastava et al., 2000

- Superfamily LONGIDOROIDEA
Thorne, 1935
Family LONGIDORIDAE
Thorne, 1935
Subfamily LONGIDORINAE
Thorne, 1935
Genus *Longidorus* Micoletzky, 1922
127. **Longidorus brevicaudatus* (Schur. Stek., 1951) Khan, 1987
128. **Longidorus conicaudatus* Khan, 1986
Genus *Neolongidorus* Khan, 1986
129. **Neolongidorus doonensis* Singh & Khan, 1996
Genus *Paralongidorus* Siddiqi *et al.*, 1963
130. **Paralongidorus sali* Siddiqi *et al.*, 1963
Family XIPHINEMATIDAE
Dalmasso, 1969
Subfamily XIPHINEMATINAE
Dalmasso, 1969
Genus *Xiphinema* Cobb, 1913
131. *Xiphinema americanum* Cobb, 1913
132. **Xiphinema pruni* Singh & Khan, 1997
133. **Xiphinema opisthohysterum* Siddiqi, 1961
134. **Xiphinema inaequale* Khan & Ahmad, 1975
135. **Xiphinema lambertii* Bajaj & Jairajpuri, 1976
136. **Xiphinema arcum* Khan, 1964
137. **Xiphinema insigne* Loos, 1949
Superfamily TYLENCHOLAIMOIDEA
Filipjev, 1934
Family TYLENCHOLAIMIDAE
Filipjev, 1934
Subfamily TYLENCHOLAIMINAE
Filipjev, 1934
Genus *Tylencholaimus* de Man, 1876
138. *Tylencholaimus rumjumi* Khan & Laha, 1982
Subfamily MUMTAZIINAE
Andrassy, 1976
Genus *Promuntazium* Siddiqi, 1982
139. **Promuntazium elongatum* Ahmad & Jairajpuri, 1983
- Family MYDONOMIDAE
Thorne, 1964
Subfamily MYDONOMINAE
Thorne, 1964
Genus *Morasia* Baqri & Jairajpuri, 1969
140. **Morasia parva* Ahmad & Jairajpuri, 1983
Genus *Dorylaimoides* Thorne & Swanger, 1936
141. **Dorylaimoides chamoliensis* Ahmad & Jairajpuri, 1983
Superfamily ACTINOLAIMOIDEA
Thorne, 1939
Family ACTINOLAIMIDAE
Thorne, 1939
Genus *Carcharolaimus* Thorne, 1939
142. **Carcharolaimus denticus* Srivastava *et al.*, 2000
Suborder NYGOLAIMINA Ahmad & Jairajpuri, 1979
Superfamily NYGOLAIMINA
Thorne, 1935
Family NYGOLAIMIDAE
Thorne, 1935
Subfamily NYGOLAIMINAE
Thorne, 1935
Genus *Laevides* Heyns, 1968
143. *Laevides laevis* (Thorne, 1939) Thorne, 1974
Genus *Clavicaudoides* Heyns, 1968
144. *Clavicaudoides clavicaudatus* (Altherr, 1953) Ahmad & Jairajpuri, 1982
145. **Clavicaudoides longidens* Ahmad & Jairajpuri, 1980
Subfamily SOLIDIDENTINAE
Ahmad & Jairajpuri, 1982
Genus *Solididens* Heyns, 1968
146. **Solididens vulgaris* (Thorne, 1930) Thorne, 1974
147. **Solididens australis* (Heyns, 1968) Ahmad & Jairajpuri, 1982
Suborder CAMPYDORINA Jairajpuri, 1983
Superfamily CAMPYDOROIDEA
Thorne, 1935

- Family CAMPYDORIDAE
Thorne, 1935
Subfamily CAMPYDORIDINAE
Thorne, 1935
Genus *Campydora* Cobb, 1920
148. **Campydora demonstrans* Cobb, 1920
Order ALAIMIDA Siddiqi, 1983
Suborder ALAIMINA Siddiqi, 1983
Family ALAIMIDAE
Micoletzky, 1922
Genus *Alaimus* de Man, 1880
149. *Alaimus jaulasali* Siddiqi & Husain, 1967
150. *Alaimus primitivus* de Man, 1880
151. **Alaimus hamulus* Siddiqi & Husain, 1967
Genus *Amphidelus* Thorne, 1939
152. **Amphidelus dolichurus* (de Man, 1876)
Thorne, 1939
153. **Amphidelus loofi* Khera & Chaturvedi, 1977
Order MONONCHIDA Jairajpuri, 1969
Suborder MONONCHINA Kirjanova & Krall, 1969
Superfamily MONONCHOIDEA
Chitwood, 1937
Family MONONCHIDAE
Chitwood, 1937
Subfamily MONONCHINA
Chitwood, 1937
Genus *Mononchus* Bastian, 1865
154. **Mononchus aquaticus* Coetzee, 1968
155. **Mononchus truncatus* Bastian, 1865
156. **Mononchus himalayensis* Rawat & Ahmad, 2000
Subfamily PRIONCHULINAE
Andrassy, 1976
Genus *Clarkus* Jairajpuri, 1970
157. *Clarkus papillatus* (Bastian, 1865)
Jairajpuri, 1970
158. *Clarkus elongatus* Jairajpuri & Khan, 1977
159. **Clarkus sheri* (Mulvey, 1967) Jairajpuri, 1970
160. **Clarkus parvus* (de Man, 1880)
Jairajpuri, 1970
- Genus *Prionchulus* (Cobb, 1916) Wu & Hoeppli, 1929
161. *Prionchulus muscorum* (Dujardin, 1845)
Wu & Hoeppli, 1929
Genus *Coomansus* Jairajpuri & Khan, 1977
162. **Coomansus parvus* (de Man, 1880)
Jairajpuri & Khan, 1977
163. **Coomansus indicus* Jairajpuri & Khan, 1977
164. **Coomansus campbelli* (Allgen, 1929)
Jairajpuri & Khan, 1977
165. **Coomansus minor* Rawat et al., 1999
166. **Coomansus garhwalicus* Rawat et al., 1999
Family MYLONCHULIDAE
Jairajpuri, 1969
Subfamily MYLONCHULINAE
Jairajpuri, 1969
Genus *Mylonchulus* (Cobb, 1916) Altherr, 1953
167. *Mylonchulus brachyuris* (Butschli, 1873)
Altherr, 1954
168. *Mylonchulus minor* (Cobb, 1893)
Andrassy, 1958
169. *Mylonchulus hawaiiensis* (Cassidy, 1931)
Andrassy, 1958
170. *Mylonchulus lacustris* (N.A.Cobb In M.V. Cobb, 1915) Andrassy, 1958
171. **Mylonchulus nainitalensis* Jairajpuri, 1970
172. **Mylonchulus dentatus* Jairajpuri, 1970
173. *Mylonchulus muradi* Jairajpuri, 1970
174. **Mylonchulus contractus* Jairajpuri, 1970.
175. **Mylonchulus sigmaturus* (Cobb, 1917)
Altherr, 1953
176. *Mylonchulus amurus* Khan & Jairajpuri, 1979
177. *Mylonchulus subsimilis* (Cobb, 1917)
Meyl, 1957
Genus *Paramylonchulus* Jairajpuri & Khan 1981
178. **Paramylonchulus mulveyi* (Jairajpuri, 1970) Jairajpuri & Khan 1981
179. **Paramylonchulus mashoodi* (Khan & Jairajpuri, 1979) Jairajpuri & Khan 1981
180. **Paramylonchulus index* (Cobb, 1906)
Jairajpuri & Khan, 1981

Subfamily SPORONCHULINAE

JAIRAJPURI, 1969

Genus *Sporonchulus* (Cobb, 1981) Andrassy, 1958

181. *
- Sporonchulus vagabundus*
- Jairajpuri, 1971

Family IOTONCHIDAE

Jairajpuri, 1969

Subfamily IOTONCHINAE

Jairajpuri, 1969

Genus *Iotonchus* (Cobb, 1916) Altherr, 1950

182. *
- Iotonchus trichurus*
- (Cobb, 1917) Altherr, 1958

183. *
- Iotonchus shafii*
- Khan & Jairajpuri, 1980

184. *
- Iotonchus basidontus*
- Clark, 1960

185. *
- Iotonchus parabasidontus*
- Mulvey & Jensen, 1967

186. *
- Iotonchus risoceiae*
- (Carvalho, 1955) Andrassy, 1958

- 187.
- Iotonchus indicus*
- Jairajpuri, 1969

Genus *Parahadronchus* Mulvey, 1978

188. *
- Parahadronchus shakili*
- (Jairajpuri, 1969) Mulvey, 1978

Suborder BATHYDONTINA

Coomans & Loof, 1970

Superfamily BATHYDONTIDEA

CLARK, 1961

Family BATHYDONTIDAE

CLARK, 1961

Genus *Bathyodontus* Fielding, 1950

189. *
- Bathyodontus cylindricus*
- Fielding, 1950

190. *
- Bathyodontus mirus*
- (Andrassy, 1956) Andrassy in Hooper & Cairns, 1959

Superfamily MONONCHULOIDEA

Family MONONCHULIDAE

Genus *Oionchus* Cobb, 1913

191. *
- Oionchus obtuses*
- Cobb, 1913

Order TRIPLONCHIDA

Cobb, 1920

Suborder DIPHTHEROPHORINA

Coomans & Loof, 1970

Superfamily TRICHODOROIDEA

(Thorne, 1935) Siddiqi, 1973

Family TRICHODORIDAE

(Thorne, 1935) Clark, 1961

Genus *Trichodorus* Cobb, 1913

- 192.
- Trichodorus pakistanensis*
- Siddiqi, 1962

Genus *Paratrichodorus* Siddiqi, 1974

- 193.
- Paratrichodorus porosus*
- (Allen, 1957) Siddiqi, 1974

- 194.
- Paratrichodorus minor*
- (Colbran, 1956) Siddiqi, 1974

195. *
- Paratrichodorus mirzai*
- (Siddiqi, 1960) Siddiqi, 1974

Family DIPHTHEROPHORIDAE

Micoletzky, 1922

Genus *Diphtherophora* De Man, 1880

196. *
- Diphtherophora communis*
- De Man, 1880

SYSTEMATIC ACCOUNT

Order TYLENCHIDA

Suborder TYLENCHINA

Superfamily TYLENCHOIDEA

Family TYLENCHIDAE

Subfamily TYLENCHINAE

Genus *Tylenchus* Bastian, 1865

1. *
- Tylenchus filiformis*
- Butschli, 1873

1873. *Tylenchus filiformis* Butschli, Nova Acta Acad. Caeso. Leop. Carol., 36 : 37.*Dimensions* : Females : L = 0.45 mm; a = 26; b = 5.5; c = 3.2; V = 58; stylet = 11 µm.*Description* : Body cylindrical from medium body to vulva, tapering uniformly to the acute terminus. Tail twice as long as vulva-anus distance. Striae course, 1.5 µm at midbody. Lateral field marked with four incisures, crenate along its borders. Stylet with small rounded knobs. Median bulb ovate. Nerve ring near middle of slender isthmus. Basal bulb elongate-pyriform.*Distribution* : India : Uttar Pradesh, Uttarakhand and West Bengal.*Habitat & Locality* : Soil around roots of Tea Plantations of district Dehradun.*Remarks* : This species was recorded from district Dehradun by Khara & Chaturvedi (1977).

2. *
- Tylenchus arcuatus*
- Siddiqi, 1963

1963. *Tylenchus arcuatus* Siddiqi, Z. Parasitenk., 23 : 398.*Dimensions* : Females : L = 0.74-0.79 mm; a = 27-29; b = 4.9-6.2; c = 7.0-8.5; V = 67-70; stylet = 15-17 µm.

Males : L = 0.67-0.78 mm; a = 30-32; b = 4.9-5.7; c = 7.4-8.3; spicules = 20-23 μ m; gubernaculum = 4.5-5.0 μ m.

Description : Body ventrally curved upon fixation. Lateral fields marked by four incisures, outer ones weakly crenate. Lip region continuous with four distinct annules. Metacarpus near middle of body, strong and globular. Excretory pore at level of basal bulb. Vulval lips slightly protruding. Post-uterine sac 17-22 μ m; vulval-anus distance 1.4-1.6 times tail length. Tail 88-105 μ m long, ventrally strongly curved, terminating in a hook.

Males : slender and comparatively less curved than females. Bursae weak, 26-30 μ m. tail 82-95 μ m long.

Distribution : India : Uttar Pradesh, Uttarakhand and West Bengal

Habitat & Locality : Soil around roots of *Allium cepa*, *Solanum melongena*, *Abelmoschus esculentus*, *M. paradisiaca*, *Prunus domestica* and *Pyrus pyriflora* from district Almora; *Lycopersicon lycopersicum*, *Prunus bokhariensis* and *P. armeniaca* from Nainital.

Remarks : Rashid *et al.* (1973) recorded this species from districts Almora and Nainital.

3. **Tylenchus indicus* Khan *et al.*, 1969

1969. *Tylenchus indicus* Khan *et al.*, *Labdev J. Sci. Technol.*, 78 : 311-314.

Dimensions : Females : L = 0.40-0.50 mm; a = 20-26; c = 5.0-6.0; c' = 6-19; V = 65-68; spear = 12 μ m; annules in pharyngeal region = 46; tail = 80-83 μ m

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat & Locality : Soil around roots of *Allium cepa*, *Solanum melongena*, *Abelmoschus esculentus*, *M. paradisiaca*, *Prunus domestica* and *Pyrus pyriflora* from district Almora; *Lycopersicon lycopersicum*, *Prunus bokhariensis* and *P. armeniaca* from Nainital.

Remarks : Rashid *et al.* (1973) recorded this species from districts Almora and Nainital.

Genus *Ottolenchus* Husain & Khan, 1967

4. **Ottolenchus parvus* (Siddiqi, 1963) Siddiqi, 1979

1963. *Tylenchus (Aglenchus) parvus* Siddiqi, *Z. Parasitenk.*, 23 : 399-400.

1979. *Ottolenchus parvus* Siddiqi, *Nematologica*, 25 : 230.

Dimensions : Females : L = 0.38-0.54 mm; a = 27-33; b = 5.4-7.2; c = 3.8-4.6; V = 58-66; stylet = 7-8 μ m.

Male : L = 0.45 mm; a = 31; b = 6; c = 4; spicules = 14 μ m.

Description : Body annules 2 μ m wide. Lip region continuous, rounded and smooth. Lateral fields marked by a single band. Dorsal pharyngeal gland close to stylet base. Median bulb anterior to base of esophagus. Excretory pore near distal end of basal bulb. Tail filiform, elongate with a rounded terminus.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat & Locality : Soil around roots of *Allium cepa*, *Solanum melongena*, *Abelmoschus esculentus*, *M. paradisiaca*, *P. domestica* and *P. pyriflora* from district Almora; *Lycopersicon lycopersicum*, *Prunus bokhariensis* and *P. armeniaca* from Nainital.

Remarks : This species was recorded from districts Almora and Nainital by Rashid *et al.* (1973).

Subfamily ECPHYADOPORINAE

Genus *Lelenchus* Andrassy, 1954

5. **Lelenchus magnus* Husain & Khan, 1975

1975. *Lelenchus magnus* Husain & Khan, *Indian J. Nematol.*, 5 : 50-52.

Dimensions : Females : L = 0.31-0.40 mm; a = 31-37; b = 5.5-6.0; c = 5.0-6.0; V = 66-70; spear = 5-6 μ m.

Description : Body cylindrical, ventrally arcuate upon fixation, tapering towards both extremities. Cuticle finely striated. Lateral field marked by four incisures. Lip region continuous with the body contour, faintly annulated. Spear short with rounded knobs. Orifice of the dorsal pharyngeal gland at about 1.5 μ m from the spear base. Tail long and filiform with acute terminus, measuring about twice the vulva-anus distance.

Distribution : India : Uttarakhand.

Habitat & Locality : Soil around roots of potato, *Solanum tuberosum* from Ranikhet, district Almora.

Remarks : Husain & Khan (1975) reported and described this species from Ranikhet, district Almora.

Subfamily ATYLENCHINAE

Genus *Aglenchus* Andrassy, 1954

6. **Aglenchus lycopersicus* Husain & Khan, 1975

1975. *Aglenchus lycopersicus* Husain & Khan, *Indian J. Nematol.*, 5 : 49-50.

Dimensions : Females : L = 0.45-0.47 mm; a = 27-32; b = 4.9-5.2; c = 5.0-5.6; V = 64-66; spear = 11-12 µm.

Description : Body cylindrical, tapering towards both extremities, ventrally arcuate upon fixation. Cuticle with striations, 2 µm apart at midbody. Lip region set-off from the body. Spear with strong basal knobs. Orifice of the dorsal pharyngeal gland at about 1.5 µm from spear base. Basal pharyngeal bulb pyriform. Tail measures 87 µm, long and filiform, gradually tapering to acute terminus, about 8-9 times the anal-body width.

Distribution : India : Uttarakhand.

Habitat & Locality : Soil around roots of tomato, *Lycopersicum esculentum* from Ranikhet, district Almora.

Remarks : This species was reported and described by Husain & Khan (1975) from Ranikhet, district Almora.

7. *Aglenchus andrassyi* Sultan, 1986

1986. *Aglenchus andrassyi* Sultan, *Pakistan J. Nematol.*, 4 : 1-8.

Material examined : 1 ♀, Kalsi, Dehradun, 24.v.06, Reg. No. IV. 242, coll. H.S. Mehta & Party.

Dimensions : Females : L = 0.40-0.43 mm; a = 29-31; b = 5.6-5.9; c = 4.1-5.6; c' = 9.4-12.6; V = 60-63; stylet = 14-16 µm.

Description : Lip region rounded and smooth. Lateral fields with four non-areolated incisures. Pharynx 71-77 µm long. Excretory pore at level of basal bulb. Vulval flaps distinct. Vagina directed forward. Vulva-anus distance slightly shorter than tail length.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat & Locality : Soil around roots of pear, *Pyrus communis*, from Ranikhet, district Almora and mango, *Mangifera indica* L. from Kalsi, Dehradun.

Remarks : Soil around the roots of Mango is a new habitat record for the species.

Subfamily BOLEODORINAE

Genus *Boleodorus* Thorne, 1941

8. **Boleodorus typicus* Husain & Khan, 1967

1967. *Boleodorus typicus* Husain & Khan, *Nematologica*, 13 : 497-499.

Dimensions : Female : L = 0.44-0.58 mm; a = 23-27; b = 3.9-5.3; c = 6-9; V = 62-68 spear = 12-14 µm.

Male : L = 0.52-0.56 mm; a = 33-47; b = 4.5-5.3; c = 7; spear = 13-14 µm; spicules = 18-20 µm; gubernaculum = 3-5 µm.

Description : Females : Body assumes open 'C'-shape upon fixation, tapering at both extremities. Cuticle distinctly annulated. Lateral fields marked by six incisures. Head continuous with body contour truncated and copulate. Spear 12-14 µm long with broad basal flanges. Basal pharyngeal bulb pyriform with three gland nuclei Tail elongate-conoid with rounded terminus, ventrally curved, 5-6 times anal body- width long.

Males : Similar to females in general shape and appearance. Testis single and outstretched. Spicules paired, cephalated, 18-20 µm long. Gubernaculum short, simple and rudimentary, measuring 3-5 µm in length. Bursa adanal, nearly twice cloacal body- width.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat & Locality : Soil around roots of *Narcissus* sp. from Mussourie, district, Dehradun.

Remarks : This species was reported by Husain & Khan (1967) from Mussourie, district Dehradun.

9. **Boleodorus atypicus* Khera & Chaturvedi, 1977

1977. *Boleodorus atypicus* Khera & Chaturvedi, *Rec. zool. Surv. India*, 72 : 130-132.

Dimensions : Female : L = 0.58-0.67 mm; a = 31-39; b = 4.8-5.8; c = 7.2-8.9; V = 68-69 stylet = 11-13 µm.

Description : Body straight, cuticle thin with fine striations. Lips rounded, low, unstriated and continuous with body contour. Stylet with basal part about 1/3 total length, bearing flanges. Cephalic framework poorly sclerotized. Lateral field occupying 1/3 the body width. Procorpus 28-29 μm long; median bulb 14 μm , valveless, fusiform, isthmus 21 μm long joining a terminal bulb 44-45 μm posterior end of terminal bulb not overlapping intestine. Tail conoid tapering to a pointed end, with an arcuate terminus.

Distribution : India : Uttarakhand.

Habitat & Locality : Soil around roots of Tea Plantations of Dehradun.

Remarks : This species was first reported & described by Khera & Chaturvedi (1977) from Dehradun.

10. **Boleodorus longistylus* Khera & Chaturvedi, 1977

1977. *B. longistylus* Khera & Chaturvedi, *Rec. zool. Surv. India*, 72 : 128-130.

Dimensions : Female : L = 0.54-0.65 mm; a = 35-36; b = 5.3; c = 8.5-8.7; V = 71-73; stylet = 11-13 μm .

Description : Body slender and straight with posterior end curved ventrally. Cuticle thin with fine transverse striae. Cephalic framework poorly sclerotized. Lateral field occupying 1/4 the body diameter, with four incisures. Head not off set, narrower than body and flattened anteriorly without median involution. Lips amalgamated, lip region without striae. Stylet slender, provided with basal flanges, anterior conical about half of total length. Orifice of dorsal pharyngeal gland at 1.5 μm from stylet base. Ovary anterior, outstretched. Tail 62-76 μm long, conical, elongate with rounded terminus and ventrally curved.

Distribution : India : Uttarakhand.

Habitat & Locality : Soil around roots of Tea Plantations of Dehradun.

Remarks : This species was reported and described from district Dehradun by Khera & Chaturvedi (1977).

11. **Boleodorus constrictus* Rahman & Ahmad, 1995

1995. *Boleodorus constrictus* Rahman & Ahmad, *Indian J. Nematol.*, 25 : 130-132.

Dimensions : Female : L = 0.49-0.55 mm; a = 31.8-37.0; b = 4.6-5.4; c = 6.4-8.0; c' = 6.4-9.0; V = 63.3-67.2; stylet = 11 μm ; conus = 5 μm ; esophagus = 93-133; tail = 68-85.

Description : Females : Body small, closed C-shaped to spiral upon fixation, narrow at head end, distinctly tapering posterior to vulva and anus, terminating as an elongate-conoid tail with hooked terminus. Cuticle finely striated. Lateral fields marked by four incisures. Cephalic framework weak. Stylet slender, weak, conus needle-like, 5 μm long, knobs flange-like, 2.5 μm wide. Dorsal pharyngeal gland opening 2.5 μm behind spear base. Gonad monoprodelphic. Tail elongate-conoid, arcuate with hooked terminus, tip rounded.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat & Locality : Soil around roots of papaya, *Carica papaya* from district Almora.

Remarks : This species was reported and described by Rahman & Ahmad (1995) from district Almora.

Genus *Psilenchus* de Man, 1921

12. **Psilenchus dunensis* Thapa & Ganguly, 1999

1999. *Psilenchus dunensis* Thapa & Ganguly, *Indian J. Nematol.*, 29 : 93-95.

Dimensions : Females : L = 0.935-1.190 mm; a = 40-57; b = 5.9-9.1; c = 6-8; c' = 8-12; V = 44.5-49.0; spear = 18-22 μm ; tail = 115-150 μm , hyaline part of tail = 30-50 μm .

Males : L = 0.88-0.950 mm; a = 41-49; b = 6.3-7.5; c = 5.3-6.3; c' = 8.8-9.4; spear = 18-21 μm ; spicules = 26-28 μm ; tail = 150-170 μm ; hyaline part of tail = 60-70 μm .

Description : Female : Body assumes open or close 'c' shape upon fixation. Lip region conoid rounded smooth and continuous with body contour. Lateral field with four distinct incisures. Spear slender 18-22 μm long, without basal knobs. Procorpus longer than isthmus, median bulb ovate and located 72-88 μm from anterior end. Basal

bulb contains 3 pharyngeal gland nuclei. Gonads didelphic amphidelphic. A small post-anal intestinal sac present. Tail in both the sexes elongated filiform with swollen terminus.

Males : similar to females, but have longer tail with longer hyaline part. Spicules tylenchoid, 26-28 μm long. Gubernaculum simple, 8-10 μm long. Bursa adanal and crenated. Posterior half of the tail and its terminus smooth with a hyaline part measuring 30-50 μm .

Distribution : India : Uttarakhand.

Habitat & Locality : Rhizosphere of Poplar trees at FRI campus, district Dehradun.

Remarks : Thapa & Ganguly (1999) reported and described this species from district Dehradun.

13. **Psilenchus hilarus* Siddiqi, 1963

1963. *Psilenchus hilarus* Siddiqi, *Z. Parasitenk.*, **23** : 399-401.

1963. *Psilenchus neoformis* Jairajpuri & Siddiqi, *Curr. Sci.*, **32** : 318-319.

Dimensions : Females : L = 1.0-1.42 mm; a = 37-43; b = 6.0-7.8; c = 8.2-9.5; c' = 5.7-7.0; V = 49-52; stylet = 15-17 μm .

Males : L = 1.0 mm; a = 45; b = 5.5; c = 7; stylet = 17 μm ; spicules = 29 μm ; gubernaculum = 13 μm .

Description : Lip region elevated abruptly offsets, with fine transverse striae. Lateral fields marked by four incisures. Deirids at level of excretory pore. Phasmids less than one anal body-width behind anus. Orifice of dorsal pharyngeal gland about half stylet length behind its base. Tail elongate, regularly tapering to a large swollen tip. Bursa 72 μm , adanal and 3.5 anal body-widths long.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat & Locality : Soil around roots of *Glycine max* from district Almora; *Pyrus malus* from district Nainital.

Remarks : This species was recorded from districts Almora and Nainital (Rashid *et al.*, 1973.)

14. **Psilenchus minor* Siddiqi, 1963

1963. *Psilenchus minor* Siddiqi, *Z. Parasitenk.*, **23** : 402.

Dimensions : Females : L = 0.85 mm; a = 45; b = 5.6; c = 5.8; c' = 11; V = 47.6; stylet = 13 μm .

Males : L = 0.89 mm; a = 49; b = 6.4; c = 6.3; spicules = 28 μm ; gubernaculum = 6 μm .

Description : Lip region rounded, smooth and continuous with body contour. Lateral fields marked by four incisures. Orifice of dorsal pharyngeal gland 7 μm behind stylet base. Tail elongate-filiform, regularly tapering to a bluntly rounded tip. Bursa adanal, crenate arising near head of spicules and extending up to phasmid.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat & Locality : Soil around roots of *Pyrus malus* from district Nainital.

Remarks : This species was recorded from district Nainital by Rashid *et al.* (1973.)

Genus *Neopsilenchus* Thorne & Malek, 1968

15. **Neopsilenchus citri* (Jairajpuri, 1968) Bello, 1972

1968. *Tylenchus (Filenchus) citri* Jairajpuri, *Labdev J. Sci. Technol.*, **6** : 83-85.

1972. *Neopsilenchus citri* Bello, *Biol. R. Soc. Espanola Hist. Nat. Biol.*, **69** : 299.

Dimensions : Females : L = 0.73 mm; a = 37; b = 6.6; c = 8; c' = 10; V = 70; stylet = 17 μm .

Males : L = 0.66-0.72 mm; a = 37-47; b = 6.0-6.9; c = 6.4-7.0; spicules = 17-18 μm ; gubernaculum = 3-4 μm .

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat & Locality : Soil around roots of *Citrus sinensis* from Nainital.

Remarks : Jairajpuri (1968) reported this species from district Nainital.

Genus *Basiria* Siddiqi, 1959.

16. **Basiria beryllus* (Khan & Khan, 1974) Bajaj & Bhatti, 1979

1974. *Basiroides beryllus* Khan & Khan, *Indian J. Nematol.*, **4** : 194-198.

1979. *Basiria beryllus* Bajaj & Bhatti, *Indian J. Nematol.*, **8** : 98.

Dimensions : Females : L = 0.52-0.70 mm; a = 33-39; b = 5.8-7.0; c = 4-6; c' = 12; V = 55-64; spear = 10.5-12.0 μ m.

Description : Body almost straight upon fixation. Cuticle with transverse striations striae, 1.2-1.5 μ m near midbody. Lateral fields marked by four incisures. Lip region slightly flattened anteriorly giving a truncated appearance to the anterior end. Spear slender, basal knobs minute. Basal pharyngeal bulb elongate-cylindrical. Cardia small, discoid. Tail filiform, slender, about 12 anal body-widths long, tapering to a minutely rounded terminus.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat & Locality : Soil around roots of peach, *Prunus persica* from Ranikhet, Almora.

Remarks : Khan & Khan (1974) reported this species from district Almora.

17. **Basiria elegans* (Khan & Khan, 1974)
Bajaj & Bhatti, 1979

1974. *Basiroides elegans* Khan & Khan, *Indian J. Nematol.*, 4 : 194-198.

1979. *Basiria elegans* Bajaj & Bhatti, *Indian J. Nematol.*, 8 : 97-99.

Dimensions : Females : L = 0.75-0.90 mm; a = 30.5-35.5; b = 5.2-6.9; c = 3.6-5.0; V = 53-60; spear = 11-13 μ m.

Males : L = 0.77-0.79 mm; a = 33.0-33.5; b = 6.0-6.4; c = 4.2-4.5; spear = 11-12 μ m; spicules = 25-26 μ m.

Description : Body almost straight upon fixation. Cuticle with transverse striations, striae, 1.2-1.5 μ m near midbody. Lateral fields marked by four incisures. Spear slender, comprising of two unequal parts, the anterior being slightly longer. Spear knobs minute. Cardia small, discoid. Tail elongate-conoid, slender, 13.4 anal body-widths long, terminating in to a rounded terminus.

Male : Similar to females, spicules 25-26 μ m.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat & Locality : Soil around roots of peach, *Prunus persica* from Ranikhet, Almora.

Remarks : Khan & Khan (1974) reported this species from district Almora.

Family ANGUINIDAE

Genus *Ditylenchus* Filipjev, 1936

18. **Ditylenchus brassicae* Husain & Khan, 1975

1975. *Ditylenchus brassicae* Husain & Khan, *Indian J. Nematol.*, 5 : 52-54.

Dimensions : Females : L = 0.43-0.46 mm; a = 36-42; b = 4.3-4.8; c = 7-11; V = 72-76; spear = 8-9 μ m.

Description : Body cylindrical, tapering towards both extremities, ventrally arcuate upon fixation. Cuticle distinctly striated. Lip region continuous with the body contour. Spear longer than the lip region width and with distinct basal knobs. Orifice of the dorsal pharyngeal gland at about 1.5 μ m from the spear base. Basal bulb slightly overlapping the intestine dorsally. Lateral field marked by four equally spaced incisures. Vulva a transverse slit. Ovary single, prodelphic, outstretched. Tail elongate, convex-conoid, ventrally acute, tapering to a sub-acute terminus, measuring about 6-7 times the anal-body width.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat & Locality : Soil around roots of *Brassica oleacea* from Ranikhet, district Almora.

Remarks : This species was reported and described by Husain & Khan (1975) from Ranikhet, district Almora.

Family BELONOLAIMIDAE

Subfamily TELOTYLENCHINAE

Genus *Tylenchorhynchus* Cobb, 1913

19. *Tylenchorhynchus annulatus* (Cassidy, 1930) Golden, 1971

1930. *Tylopharynx ennulatus* Cassidy, *Hawaii Plant Rec.*, 34 : 381-383.

1971. *Tylenchorhynchus annulatus* Golden, In: *Plant Parasitic Nematodes*, Vol. I. eds : Zuckerman, Mai. & Rohde. Academic Press : 198-200.

Material Examined : 2 ♀♀, Sabbahwala, Dehradun, 30.xi.2005, Reg. No. IV. 262, coll. A.N. Rizvi & Party; 4 ♀♀, Dharmawala, Timli range, Dehradun, 30.xi.2005, Reg. No. IV. 263, coll. A.N. Rizvi & Party; 5 ♀♀, Mohand Rao, Dehradun,

7.xii.05, Reg. No. IV. 264, coll. H.S. Mehta & Party; 2 ♀♀, Selaqui, Dehradun, 5.i.06, Reg. No. IV. 265, coll. S.J.S. Hattar & Party.

Dimensions : Female : L = 0.57-0.61 mm; a = 26-31; b = 5.0-5.2; c = 14-16; c' = 2.8-3; V = 53-56; stylet = 16-18 µm.

Description : Female : Body slightly curved on ventral side upon fixation, cuticle transversely striated. Lateral fields with four incisures. Stylet basal knobs rounded with slight convex anterior surface. Reproductive system amphidelphic with non-functional spermatheca. Tail cylindrical slightly curved ventrally.

Male : Not known.

Distribution : India : Uttar Pradesh, Uttarakhand, Meghalaya, Assam and Tripura.

Elsewhere : U.S.A. and Hawaii.

Habitat & Locality : Soil around roots of sugarcane fields, teak and sal from district Dehradun.

Remarks : This species was recorded for the first time from sugarcane fields of Dehradun by Rizvi (2007).

20. *Tylenchorhynchus mashoodi* Siddiqi & Basir, 1959

1959. *Tylenchorhynchus mashoodi* Siddiqi & Basir, Proc. 46th Indian Science Congr. 35; Siddiqi, 1961 Z. *Parasitenk.*, 21 : 48.

Material Examined : 5 ♀♀, 2 ♂♂, Kalsi, Dehradun, 9.xii.06, Reg. No. IV. 266, coll. S.J.S. Hattar & Party; 7 ♀♀, Doiwala Dehradun, 9.xii.06, Reg. No. IV. 267, coll. S.J.S. Hattar & Party.

Dimensions : Female : L = 0.54-0.72 mm; a = 28-37; b = 4.4-5.8; c = 13-18; c' = 2.5-4.0; V = 52-58; stylet = 16-19 µm.

Male : L = 0.57-0.66 mm; a = 27-35; b = 4.5-5.6; c = 14-17; T = 36-50; spicule = 18-22 µm; gubernaculum = 10-15 µm.

Description : Lip region continuous with body contour, with 3-4 annules. Cuticle marked with distinct transverse striae, 1- 2µm apart. Cephalic framework lightly sclerotized. Stylet with rounded basal knobs which may be anteriorly slightly flattened Tail cylindrical to subcylindrical in shape,

narrowing slightly behind anus, ending in a rounded to bluntly rounded, unstriated terminus, with 14-29 striae. Male tail elongate-conoid with acute or subacute terminus.

Distribution : India : Uttar Pradesh, Uttarakhand and Delhi.

Habitat & Locality : Soil around roots of *Saccharum officinarum* and *Litchi* from Kalsi, district Dehradun.

Remarks : Sugarcane and litchi are new host records for the species. This species was also recorded from districts Almora and Nainital (Rashid *et al.* 1973).

21. **Tylenchorhynchus elegans* Siddiqi, 1961

1961. *Tylenchorhynchus elegans* Siddiqi, Z. *Parasitenk.*, 21 : 48-50.

Dimensions : Female : L = 0.56-0.70 mm; b = 4.4-5.2; c = 15-16; V = 54-55; stylet = 15-18 µm; lip annules = 3; no of tail annules = 23.

Male : stylet = 15-18 µm; spicule = 20; gubernaculum = 12.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat & Locality : Soil around roots of *Abelmoschus seculentus*, *Solanum melongena*, *Lycopersicon lycopersicum*, *Sauria rapa*, *Citrus acida*, *C. aurantium*, *Ficus carica*, *Morus alba* *Prunus domestica*, *P. persica* and *P. armeniaca* from Almora; *Lycopersicon lycopersicum*, *P. armeniaca*, *P. bokharensis* and *Pyrus malus* from Nainital.

Remarks : Rashid *et al.* (1973) recorded this species from districts Almora and Nainital.

Genus *Bitylenchus* Filipjev, 1934

22. **Bitylenchus brevilineatus* (Williams 1960) Siddiqi, 1986

1960. *Tylenchorhynchus brevilineatus* Williams, *Mauritius. Sug. Ind. Res. Inst. Occ. Paper*, 4 : 25.

1961. *Tylenchorhynchus indicus* Siddiqi, Z. *Parasitenk.*, 21 : 51-53.

1986. *Bitylenchus brevilineatus* Siddiqi, *Tylenchida : Parasites of Plants and Insects* : 50.

Dimensions : Female : L = 0.50-0.65 mm; a = 34; b = 5.6; c = 14; V = 53-56.

Description : Female : Body slightly ventrally arcuate upon fixation. Lip region set off, marked by 5-6 striae. Lateral fields marked by four incisures. Stylet 16 μ m long with posteriorly sloping basal knobs. Female reproductive system amphidelphic. Tail sub-cylindrical with hemispherical and smooth terminus, marked by 40-41 striae, about 3 anal body width long.

Male : Similar to female in general morphology. Spicules 23 μ m long, gubernaculum 12 μ m long. Tail conoid.

Distribution : India : Uttar Pradesh, Uttarakhand, Andhra Pradesh, Bihar, Delhi, Gujarat and Haryana.

Elsewhere : U.S.A. and Pakistan.

Habitat & Locality : Soil around roots of pine, *Pinus* sp from district Tehri Garhwal district and mango, *Mangifera indica* from district Champawat.

Remarks : This species was recorded by Chaubey & Sharma (2005) from Tehri Garhwal & from Champawat by Rathour *et al.* (2006).

Genus *Quinisulcius* Siddiqi, 1971

23. **Quinisulcius capitatus* (Allen, 1955)
Siddiqi, 1971

1955. *Tylenchorhynchus capitatus* Allen, *Univ. Calif. Publ. Zool.*, 61 : 135.

1971. *Quinisulcius capitatus* Siddiqi, *Z. Parasitenk.*, 21 : 62-63.

Dimensions : Female : L = 0.63-0.85 mm; a = 30-38; b = 5.0-5.8; c = 12-17; V = 51-58; stylet = 16-18 μ m.

Male : L = 0.57-0.70 mm; a = 31-38; b = 4.3-5.0; c = 13-14; T = 50-65; spicules = 19 μ m; gubernaculum = 7 μ m.

Description : Lip region expanded, hemispherical, offset, bearing 8 annules. Labial framework lightly sclerotized. Stylet moderately developed with rounded basal knobs. Excretory pore near beginning of basal bulb. Cardia small. Tail conoid, ventrally curved with smooth terminus. Phasmid at middle of tail. Spicules and bursa typical of the genus. Gubernaculum with proximal end dorsally bent.

Distribution : India : Uttar Pradesh, Uttarakhand and West Bengal.

Elsewhere : U.S.A. and Pakistan.

Habitat & Locality : Soil around roots of maize, chilli and okra from Champawat.

Remarks : This species was recorded by Rathour *et al.* (2006) from district Champawat.

Genus *Neotylenchus* Thorne, 1935

24. **Neotylenchus latus* Thorne, 1935

1935. *Neotylenchus latus* Thorne, *J. Agric. Res. U.S. Dept. Agric.*, 51 : 513.

Dimensions : Males : L = 0.0.59 mm; a = 30; b = 4.4; c = 21; stylet = 13 μ m, spicule = 21 μ m, gubernaculum = 7 μ m.

Distribution : India : Uttarakhand.

Elsewhere : U.S.A.

Habitat & Locality : Soil around roots of Tea Plantations of Dehradun.

Remarks : Khera & Chaturvedi (1977) recorded this species for the first time from India from Dehradun.

Family HOPLOLAIMIDAE

Subfamily HOPLOLAIMINAE

Genus *Hoplolaimus* Daday, 1905

25. **Hoplolaimus indicus* Sher, 1963

1963. *Hoplolaimus indicus* Sher, *Nematologica*, 9 : 280.

Dimensions : Females : L = 1.02-1.40 mm; a = 22-36; b = 8.4-9.1; b' = 7.0-8.1; c = 45-74; c' = 0.66-0.68; V = 50-59; stylet = 30-34 μ m.

Males : L = 0.94-1.30 mm; a = 26-36; b = 8.9-12.0; b' = 6.2-9.0; c = 31-38; spicules = 37-48 μ m; gubernaculum = 12-20 μ m.

Descriptions : Cuticle coarsely annulated. Lateral fields marked by single incisures or 2-3 incomplete broken incisures. Lip region hemispherical, marked by 3-4 annules, basal annule with 6-12 longitudinal striations. Cephalic framework strongly sclerotized. Stylet robust; basal knobs tulip shaped. Pharyngeal gland with six nuclei. Tail rounded with 8-13 annules. Spicules arcuate and cephalated. Bursa terminal.

Distribution : India : Uttar Pradesh, Uttarakhand, Meghalaya, Delhi, Sikkim, West Bengal, Rajasthan, Tripura, and Himachal Pradesh.

Habitat & Locality : Soil around roots of pine, *Pinus* sp at Tehri Garhwal district.

Remarks : This species was recorded from Tehri Garhwal by Chaubey & Sharma (2005).

26. *Hoplolaimus seinhorsti Luc, 1958

1958. *Hoplolaimus seinhorsti* Luc, *Nematologica*, 3 : 17.

Dimensions : Females : L = 1.1-1.6 mm; incisure = 1; pharyngeal gland nuclei = 6; stylet = 40-49; labial annule = 4; longitudinal striae on basal lip annule = 8-12; tail annule = 10-15.

Distribution : India : Uttar Pradesh and Uttarakhand.

Elsewhere : Africa, Florida, Indonesia, Philippines, Pakistan and Thailand.

Habitat & Locality : Soil around roots of okra from district Champawat.

Remarks : This species was recorded from Champawat by Rathor *et al.* (2006).

Genus Rotylenchus Filipjev, 1936

27. *Rotylenchus citri Rashid & Khan, 1974

1974. *Rotylenchus citri* Rashid & Khan, *Indian J. Nematol.*, 3 : 50-53.

Dimensions : Females : L = 0.62-0.82 mm; a = 30-36; b = 5.1-9.0; c = 41-54; V = 68-72; stylet = 26-29 μ m.

Description : Female : Body assuming shape of a close spiral upon fixation. Cuticle with coarse striae, 2.0 μ m apart near midbody. Head hemispherical not set off, continuous with body contour with 4-5 annules. Labial framework moderately sclerotized. Spear with anteriorly cupped and posteriorly convex basal knobs, 5 μ m x 2 μ m. Orifice of the pharyngeal gland, 12-14 μ m from the base of the spear. Pharyngeal gland overlapping the intestine dorsally and laterally. Ovaries paired, opposed and outstretched. Tail short, quadrangular, bearing 8-13 annules ventrally.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat & Locality : Soil around roots of *Citrus aurantium* from Almora.

Remarks : This species was reported from Almora by Rashid & Khan (1973).

28. *Rotylenchus pruni Rashid & Husain, 1972

1972. *Rotylenchus pruni* Rashid & Khan, *Bull. Ent.*, 12 : 1-3.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat & Locality : Soil around roots of plum, *Pyrus domestica* L. from Nainital.

Remarks : This species was reported from district Nainital by Rashid & Husain (1972).

Genus Helicotylenchus Steiner, 1945

29. Helicotylenchus dihystra (Cobb, 1893)

Sher, 1961

1893. *Tylenchus dihystra* Cobb, *Dept. Agr. N. S. Wales. Misc. Publ.*, 13.

1961. *Helicotylenchus dihystra* Sher, *Nematologica*, 6 : 157.

1968. *H. punicae* Swarup & Sethi, *Bull. Ent. Loyala. Coll.*, 9 : 78-79.

1972. *H. dihysteroides* Siddiqi, *Nematologica*, 18 : 76-78.

1980. *H. crenatus* Das, *Z. Parasitenk.*, 19 : 560.

Material Examined : 8 ♀ ♀, Langha, Dehradun, 27.iv.2005, Reg. No. IV. 268, coll. S.J.S. Hattar & Party; 2 ♀ ♀, Selaqui, Dehradun, 5.i.2006, Reg. No. IV. 269, coll. S.J.S. Hattar & Party; 6 ♀ ♀, Bruttiwala, Dehradun, 5.i.2006, Reg. No. IV. 270, coll. S.J.S. Hattar & Party; 5 ♀ ♀, Doiwala, Dehradun, 19.xii.2006, Reg. No. IV. 271, coll. S.J.S. Hattar & Party; 7 ♀ ♀, Tantapur, Haridwar, 18.i.2007, Reg. No. IV. 272, coll. P.T. Bhutia & Party.

Dimensions : Female : L = 0.50-0.57 mm; a = 21-28; b = 4.3-6.6; b' = 3.7-5.2; c = 32-65; c' = 1.1-1.3; V = 61-66.

Description : Female : Body spiral, cuticle with distinct transverse striae. Lip region continuous with body, hemispherical. Cephalic framework conspicuous. Esophagus with overlapping glands. Both genital branches equally developed. Spermatheca rounded, offset, without sperm. Tail dorsally convex-conoid, usually with slight ventral projection.

Male : Not found.

Distribution : India : Tripura, Sikkim, Manipur, West Bengal, Bihar, Uttar Pradesh, Himachal Pradesh & Uttarakhand.

Elsewhere : Australia, Germany, Italy, Pakistan and Spain.

Habitat & Locality : Soil around roots of sugarcane from Selaqui and Bruttiwala, district Dehradun; sugarcane from Haridwar; soybean, okra, papaya and pumpkin from Champawat.

Remarks : This species is recorded for the first time from district Dehradun.

30. *Helicotylenchus indicus* Siddiqi, 1963

1963. *Helicotylenchus indicus* Siddiqi, *Z. Parasitenk.*, **23** : 399.

Material Examined : 3 ♀♀, Corbett Tiger Reserve (CTR), Nainital, 26.ii.05, Reg. No. IV. 243, coll. A.N. Rizvi & party.

Dimensions : Female : L = 0.45-0.541 mm; a = 23-25; b = 4.5-5.8; b' = 3.5-5.1; c = 24-39; c' = 1.1-1.5; V = 59-65; stylet = 24-26 µm.

Description : Female : Body spirally curved. Lip region conoid-rounded with 4-5 indistinct annules. Lateral field 1/7th of body width, marked with four incisures, continuous till the tip of the tail. Tail hemispherical.

Male : Not found.

Distribution : India : Uttar Pradesh, Uttarakhand, Himachal Pradesh, Bihar and West Bengal.

Elsewhere : Spain and Pakistan

Habitat & Locality : Soil around roots of Teak plantations of CTR, district Nainital; pine, *Pinus* sp at Tehri Garhwal district (Chaubey & Sharma, 2005) and from Pauri Garhwal by Lal & Khan (1989) around the soils of mango, *Mangifera indica*, teak, *Tectona grandis*, *Populus* sp. and *Pinus* sp.

Remarks : The specimen fit in well with the dimensions and descriptions given by earlier workers except for slightly longer stylet (22-24 µm).

31. **Helicotylenchus silvaticus* Lal & Khan, 1989

1989. *Helicotylenchus silvaticus* Lal & Khan, *Ind. J. Nematol.*, **19** : 44.

Dimensions : Females : L = 0.55-0.62 mm; a = 32.5-38.0; b = 6.4-6.9; b' = 4.1-4.8; c = 35.5-37.5; c' = 1.8-2.4; V = 63.0-6.0; spear = 19.5-21.5 µm.

Males : L = 0.53-0.56 mm; a = 35-38; b = 6.0-6.8; b' = 4.2-4.5; c = 27.5-30.5; T = 26.5-30.0; spear = 15.5-17.8 µm; spicules = 18.0-20.0 µm.

Description : Female : Body assuming loose spiral shape after fixation. Lip legion conical, rounded, continuous with the body, without annules. Spear 19.5-21.5 µm long with rounded basal knobs. Tail 1.8-2.4 times anal body width long, marked with 10-16 annules ventrally bearing a pronounced conical terminal projection.

Male : Body taking the shapes of circle when relaxed by gentle heat. Other characters are similar to female. Testis single, outstretched, spicules 18-20µm long, slightly ventrally curved, gubernaculums well developed 6.5µm long. Tail 18-20 µm long with sharply pointed tip, completely enveloped by well-developed striated bursa 25-27 µm.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat & Locality : Rhizosphere of *Quercus incana* from Pauri Garhwal district.

Remarks : This species was reported and described by Lal & Khan (1989) from Pauri Garhwal district.

32. **Helicotylenchus pseudorobustus* (Steiner, 1914) Golden, 1956

1914. *Tylenchus robustus* Steiner, *Arch. Hydrobiol.*, **9** : 425.

1956. *Helicotylenchus pseudorobustus* Golden, *Bull. Md. Agric. Exp. Stn.*, **A-85** : 22.

Dimensions : Female : L = 0.65 mm, a = 30; b = 5.3, c = 38; V = 61.

Description : Body spiral when relaxed. Lip region conoid, rounded, bearing 5 annules. Sometime annules are very minute and scarcely visible. Spear 310 µm long with cupped knobs. Dorsal pharyngeal gland outlet 10 µm behind spear. Tail with 7-9 ventral annules, bearing an elongated terminus which is slightly annulated.

Distribution : India : Uttar Pradesh, Uttarakhand and Bihar.

Elsewhere : U.S.A. and Pakistan.

Habitat & Locality : Soil around roots of *Cedrela toona*, *C. deodara*, *Ficus glomerata*, *Pinus* sp and *Litchi chinensis* from district Pauri Garhwal and soybean, okra pumpkin, papaya from district Champawat.

Remarks : Lal & Khan (1989) recorded this species from district Pauri Garhwal and Rathour *et al.* (2006) from district Champawat.

33. **Helicotylenchus digonicus* Perry, 1959

1959. *Helicotylenchus digonicus* Perry, *Bull. Wis. agric. Exp. Stn.*, **207** : 8.

Dimensions : Female : L = 0.51-0.63 mm, a = 20-24, b = 4.6-5.9, b' = 3.6-4.4, c = 40-52, c' = 0.8-0.8; V = 66-68, stylet = 24-26 μ m, stylet = 25-28 μ m.

Description : Female : Body spiral when relaxed. Lip region truncate with four annules. Spear 25 μ m long with cupped knobs. Dorsal pharyngeal gland openings 10-14 μ m behind spear knobs. Tail bluntly conoid to rounded, rarely with slight projection.

Distribution : India : Uttar Pradesh, Uttarakhand and Bihar.

Elsewhere : Australia, Austria, Germany, Italy, Pakistan, Spain and Netherlands.

Habitat & Locality : Soil around roots of Tea Plantations of Dehradun.

Remarks : This species was recorded by Khera & Chaturvedi (1977) from Tea Plantations of Dehradun.

34. **Helicotylenchus erythrinae* (Zimmerman, 1904) Golden, 1956

1904. *Tylenchus erythrinae* Zimmerman, *Mitt. Lanw. Vers. Sta. Rostock.*, **1** : 73-75.

1956. *Helicotylenchus erythrinae* Golden, *Maryland Agric. Exp. Stn. Bull.*, **A-85** : 15.

Dimensions : Females L = 0.40-0.71 mm; a = 23; b = 5.2; b' = 4.3; c = 29; c' = 1.35; V = 62; stylet = 22.3 μ m.

Description : Lip region hemispherical, with 4-5 annules. Stylet knobs indented anteriorly. Hemizonid 0.2 annules from excretory pore, 2 annules long. Tail dorsally curved, tapering gradually to form a projection with a pointed tip.

Distribution : India : Uttar Pradesh, Bihar, Sikkim, West Bengal and Uttarakhand.

Elsewhere : U.S.A.

Habitat & Locality : Soil around roots of *Abelmoschus esculentus*, *Lycopersicon lycopersicum*, *Solanum melongena*, *Dolichos lablab*, *Citrus acida*, *C. aurantium*, *Ficus carica*, *Morus alba*, *Prunus domestica*, *P. persica* and *P. armeniaca*, *Pyrus pyriflora* from Almora; *Brassica oleracea botrytis*, *P. armeniaca*, *P. bokharensis*, *Vitis vinifera* and *Pyrus malus* from Nainital.

Remarks : Rashid *et al.* (1973) recorded this species from districts Almora and Nainital.

35. *Helicotylenchus multicinctus* (Cobb, 1893) Golden, 1956

1893. *Tylenchus multicinctus* Cobb, *Mem. vol. Linn. Soc. N. S. W.*, **1** : 260.

1956. *Helicotylenchus multicinctus* Golden, *Maryland Agric. Exp. Stn. Bull.*, **A-85** : 18.

Material Examined : 6 ♀♀, Tantapur, Haridwar, 18.i.2007, Reg. No. IV. 273, coll. P.T. Bhutia & Party.

Dimensions : Females L = 0.40-0.67 mm; a = 26; b = 5.3; b' = 4.4; c = 31-66; c' = 1.02; V = 61-76; stylet = 20-28 μ m.

Description : Lip region hemispherical, continuous with the body contour, with 4-5 annules. Stylet knobs indented anteriorly. Excretory pore posterior to esophago-intestinal junction. Tail dorsally curved, with hemispherical terminus marked with 10-14 annules.

Distribution : India : Uttar Pradesh, Bihar, Meghalaya, West Bengal and Uttarakhand.

Elsewhere : U.S.A.

Habitat & Locality : Soil around roots of *Citrus acida*, *C. aurantium*, *Ficus carica*, *Morus alba*, *Prunus domestica*, *P. persica* and *P. armeniaca*, *Pyrus pyriflora* from Almora; *P. armeniaca*, *P. bokharensis*, *Vitis vinifera* and *Pyrus malus* from Nainital; *Saccharum officinarum* from Dehradun.

Remarks : This species is recorded for the first time from district Dehradun.

36. **Helicotylenchus retusus* Siddiqi & Brown, 1964

1964. *Helicotylenchus retusus* Siddiqi & Brown, *Proc. Helminth. Soc. Wash.*, **31** : 209-211.

Dimensions : Females L = 0.59-0.63 mm; a = 22-27; b = 6.2-7.0; c = 53-62; V = 61-64; stylet = 22-24 μ m.

Description : Body curved spirally upon fixation. Cuticle with distinct transverse striae, 1.5-2.0 μ m thick. Lip region continuous with the body contour, with 4-5 annules. Stylet knobs indented anteriorly. Vulva, a transverse slit Tail with well developed terminal projection, marked with 6-12 annules.

Distribution : India : Uttar Pradesh, Meghalaya, West Bengal and Uttarakhand.

Elsewhere : U.S.A.

Habitat & Locality : Soil around roots of *Citrus acida*, *C. aurantium*, *Ficus carica*, *Morus alba* *Prunus domestica*, *P.persica* and *P. armeniaca*, *Pyrus pyriflora* from Almora; *P. armeniaca*, *P. bokharensis*, *Vitis vinifera* and *Pyrus malus* from Nainital.

Remarks : Rashid *et al.* (1973) recorded this species from districts Almora and Nainital.

37. *Helicotylenchus neoformis Siddiqi & Husain, 1964

1964. *Helicotylenchus neoformis* Siddiqi & Husain, *Proc. Helminth. Soc. Wash.*, **31** : 213.

Dimensions : Females L = 0.52-0.61 mm; c = 36-56; V = 59-66; stylet = 20-21 μ m;

Description : Body shape spiral upon fixation. Lip region hemispherical. Tail shape rounded.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat & Locality : Soil around roots of *Citrus acida*, *C. aurantium*, *Ficus carica*, *Morus alba* *Prunus domestica*, *P. persica* and *P. armeniaca*, *Pyrus pyriflora* from Almora; *P. armeniaca*, *P. bokharensis*, *Vitis vinifera* and *Pyrus malus* from Nainital.

Remarks : Rashid *et al.* (1973) recorded this species from districts Almora and Nainital.

Subfamily ROTYLENCHULINAE Husain & Khan, 1967

Genus *Rotylenchulus* Linford & Oliveira, 1940

38. *Rotylenchulus reniformis Linford & Oliveira, 1940

1940. *Rotylenchulus reniformis* Linford & Oliveira, *Proc. Helm. Soc. Wash.*, **7** : 35-37.

Distribution : India : Uttar Pradesh, Uttarakhand, West Bengal, Meghalaya, Sikkim, Delhi and Bihar.

Elsewhere : Austria, Spain, Netherlands, Hawaii and Pakistan.

Habitat & Locality : Soil around roots of castor, okra, papaya from Champawat.

Remarks : Rathour *et al.* (2006) recorded this species from district Champawat.

Family PRATYLENCHIDAE

Subfamily PRATYLENCHINAE

Genus *Pratylenchus* Filipjev, 1936

39. Pratylenchus penetrans (Cobb, 1917)
Filipjev & Stekhoven, 1941

1917. *Tylenchus penetrans* Cobb, *J. agr. Res.*, **11** : 32.

1927. *Tylenchus pratensis* Stiener, *J. agric. Res.*, **35** : 961

1941. *Pratylenchus penetrans* Filipjev & Stekhoven, *E. J. Brill. Leiden*, 712.

Material Examined : 4 ♀♀, Tipperpur, Dehradun, 8.v.2007, Reg. No. IV. 274, coll. A.N. Rizvi & Party.

Dimensions : Females : L = 0.43-0.65 mm; a = 17-30; b = 5.7 -6.5; c =15-21; V = 78-83; stylet =13-18 μ m.

Description : Lip region bearing three annules. Spear 16 to 18 μ m long, with broadly rounded knobs. Spermatheca present usually filled with spermatozoa. Posterior uterine branch about as long as vulva body width. Tail dorsally convex-conoid, the posterior portion being somewhat subcylindroid and ending in a broadly rounded terminus.

Distribution : India : Uttar Pradesh Uttarakhand, Bihar, Himachal Pradesh and Tripura.

Elsewhere : Australia, Austria, Belgium, Germany, Italy, Poland, Netherlands, Pakistan and Spain.

Habitat & Locality : Soil around roots of Tea Plantations and rice fields of Dehradun.

Remarks : Rice is a new host record for the species.

40. **Pratylenchus kumaonensis* Lal & Khan, 1989

1989. *Pratylenchus kumaonensis* Lal & Khan, *Ind. J. Nematol.*, **19** : 44.

Dimensions : Females : L = 0.39-0.48 mm; a = 25.0-29.0; b = 5.8-6.8; b' = 3.9-4.8; c = 20.0-24.0; c' = 2.0-2.5; V = 81.0-82.5; spear = 14.0-15.0 μ m.

Description : Female : Body straight or slightly arcuate upon fixation, head almost continuous with body contour with 3 annules, heavily sclerotized skeleton extending to two annules. Stylet 14-15 μ m long with rounded basal knobs. Opening of dorsal pharyngeal gland 2.8-3.5 μ m posterior to spear knobs.

Distribution : India : Uttarakhand.

Habitat & Locality : Roots and soil around *Populus* species at Forest Nursery, district Nainital.

Remarks : This species was reported and described by Lal & Khan (1989) from district Nainital.

41. **Pratylenchus neglectus* (Rensch, 1924)
Filipjev & Schur. Stekh., 1941

1924. *Tylenchus neglectus* Rensch, *Mitt. Deut. Landwirts. Ges.*, **38** : 412-414.

1941. *Pratylenchus neglectus* Filipjev & Schur. Stekhoven, *E. J. Brill, Leiden*, 714.

Dimensions : Females : L = 0.32-0.58 mm; a = 16.5-32.2; b = 4.9-7.8; c = 13.8-26.8; V = 75.5-86.5; stylet = 15-19 μ m.

Description : Females obtained from roots are more robust than females obtained from the rhizosphere, which become more linear when relaxed. Spear knobs 4-6 μ m across, typically indented on anterior surfaces. Tail variable in shape usually conoid with little curvature of ventral surface with 15-20 annules.

Distribution : India : Uttar Pradesh and Uttarakhand.

Elsewhere : Germany, Belgium, Italy, Australia, Netherlands, Pakistan and Australia.

Habitat & Locality : Soil around the roots of *Eucalyptus* species from reserved forest, near Chila FRH, Haridwar.

Remarks : Lal & Khan (1989) recorded this species from district Haridwar.

42. **Pratylenchus vulnus* Allen & Jensen, 1951

1951. *Pratylenchus vulnus* Allen & Jensen, *Proc. Helminth. Soc. Wash.*, **18** : 49.

Dimensions : Females : L = 0.51-0.64 mm; a = 28-33; b = 5.2-5.4; b' = 4.5-5.2; c = 19-23; c' = 2.0-2.5; V = 77-80; spear = 13-14 μ m.

Descriptions : Female : Cuticle marked by distinct transverse striae. Lip region almost continuous with body contour. Spear 16-18 μ m long with well developed conspicuous basal knobs. Wide muscular bands connect spear base with the heavily sclerotized labial framework. Median pharyngeal bulb slightly ovate, equipped with a refractive valvular apparatus.

Distribution : India : Uttar Pradesh and Uttarakhand.

Elsewhere : Belgium, Germany, Italy, Poland, Netherlands, Pakistan and Australia.

Habitat & Locality : Roots of walnut collected from reserved natural forests of district Nainital.

Remarks : This species was recorded from reserved natural forests of district Nainital by Lal & Khan (1989).

43. *Pratylenchus coffeae* (Zimmermann, 1898)
Filipjev & Schuurmans Stekhoven, 1941

1898. *Tylenchus coffeae* Zimmermann, *Meded. Pl. Tuin. Batavia*, **27** : 16-19.

1941. *Pratylenchus coffeae* Filipjev & Schuurmans Stekhoven, *E. J. Brill. Leiden*, 715.

Material Examined : 5 ♀♀, 2 ♂♂, Tantapur, Haridwar, 18.i.2007, Reg. No. IV. 275, coll. P.T. Bhutia & Party.

Dimensions : Females : L = 0.38-0.68 mm; a = 18-23; b = 5.4-7.8; b' = 3.3; c = 13-24; V = 76-84; stylet = 15-17 μ m.

Males : L = 0.40-0.56 mm; a = 24-32; b = 5.9-7.7; c = 18-23; stylet = 15-19 μ m; spicules = 16-20 μ m; gubernaculum = 4-7 μ m.

Descriptions : Body almost straight upon fixation. Lip region low, consists of two annules. Cuticle distinctly transversely striated. Lateral field

marked with four incisures, about $1/5^{\text{th}}$ of body-width. Stylet stout with well developed basal knobs. Spermatheca filled with sperms. Tail slightly tapering, tip rounded, indented or truncated.

Male : Similar to females in general morphology. Spicules slender. Bursa terminal.

Distribution : India : Uttar Pradesh, Bihar, Himachal Pradesh, Tripura, West Bengal and Uttarakhand.

Elsewhere : U.S.A.

Habitat & Locality : Soil around roots of *Abelmoschus esculentus*, *Solanum melongena*, *Brassica oleracea botrytis*, *Prunus persica* *Pyrus pyriflora* from Almora; *Lycopersicon lycopersicum*, *P. armeniaca*, *P. bokharensis* and *Pyrus malus* from Nainital; *Saccharum officinarum* from Haridwar.

Remarks : Sugarcane field is a new host record for the species and it is recorded for the first time from district Haridwar.

44. **Pratylenchus crenatus* Loof, 1960

1960. *Pratylenchus crenatus* Loof, *T. Pl. Ziekten*, 66 : 30.

Dimensions : Females : L = 0.40-0.45 mm; a = 25-30; b = 4.8-6.4; b' = 3.8-4.7; c = 15-21; c' = 2.0-2.5; V = 80-84; stylet = 17-18 μm .

Descriptions : Body straight, sometimes ventrally curved in posteriorly region upon fixation. Cuticle transversely striated. Lateral fields marked by four incisures. Head continuous. Cephalic framework strongly cuticularized. Stylet knobs well developed. Tail cylindrical, striated terminus.

Distribution : India : Uttar Pradesh, Bihar, Sikkim and Uttarakhand.

Elsewhere : U.S.A.

Habitat & Locality : Soil around roots of *Prunus persica*, *Pyrus pyriflora* from Almora; *P. armeniaca*, *P. bokharensis* and *Pyrus malus* from Nainital.

Remarks : Rashid *et al.* (1973) recorded this species from districts Almora and Nainital.

45. **Pratylenchus pratensis* (de Man, 1880) Filipjev, 1936

1880. *Pratylenchus pratensis* de Man, *Tijds. Nederland. Dierk. Vereen.*, 5 : 10.

1936. *Pratylenchus pratensis* Filipjev, *Proc. Helminth. Soc. Wash.*, 3 : 80-82.

Dimensions : Females : L = 0.37-0.70 mm; a = 22-32; b = 4-6; c = 19-24; V = 80-84; stylet = 17-19 μm .

Males : L = 0.32-0.54 mm; a = 22-31; b = 6; c = 16-20; T = 45-67; stylet = 17-19 μm .

Descriptions : Lip region with annules. Stylet with slightly cupped knobs. Tail, cylindrical in posterior half, posteriorly ending in a blunt, rounded terminus with thick annules.

Distribution : India : Uttar Pradesh, Bihar, Himachal Pradesh and Uttarakhand.

Elsewhere : U.S.A.

Habitat & Locality : Soil around roots of *Prunus persica* *Pyrus pyriflora* from Almora; *P. armeniaca*, *P. bokharensis* and *Pyrus malus* from Nainital.

Remarks : Rashid *et al.* (1973) recorded this species from districts Almora and Nainital.

46. *Pratylenchus typicus* Rashid, 1974

1974. *Pratylenchus typicus* Rashid, *Proc. 61st Indian Sci Cong.*, 61 part III C, p. 65.

Material Examined : 3 ♀♀, Doiwala, Dehradun, 19.xii.06, Reg. No. IV. 276, coll. S.J.S. Hattar & party.

Dimensions : Female : L = 0.59-0.68 mm; a = 27-37; b = 5.0-6.2; c = 10-26; V = 79-84; spear = 15-17 μm .

Descriptions : Body straight upon fixation. Lip region slightly offset, with four-five labial annules. Labial framework well developed and strongly sclerotized. Body annulations 1-2 μm at midbody. Lateral field marked by four incisures, reaching up to the tail tip. Spear strong, basal knob rounded, 7 μm wide and 3 μm high. Orifice of dorsal pharyngeal gland 6 μm behind spear base. Excretory pore at 80 μm from the anterior end of body. Glandular lobe of esophagus overlapping intestine both ventrally and laterally. Vulva a transverse slit, ovary single, outstretched with a single row of oocytes. Spermatheca filled with sperms. Tail conoid, rounded and smooth terminus.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat & Locality : Soil around roots of sugarcane, *Saccharum officinarum* from Doiwala, Dehradun.

Remarks : This species is being recorded for the first time from state Uttarakhand and sugarcane is a new host record.

Family HETERODERIDAE Filipjev & Schuurmans Stekhoven, 1941
Subfamily MELOIDOGYNINAE Skarbilovich, 1959
Genus *Meloidogyne* Goeldi, 1887
47. **Meloidogyne arenaria* (Neal, 1889)
Chitwood, 1949

1889. *Anguillulina arenaria* Neal, U.S. Dept. Agr. Div. Ent. Bull., 20.

1949. *Meloidogyne arenaria* Chitwood, Proc. Helminth. Soc. Wash., 16 : 92.

Dimensions : Females : Stylet = 14-16 µm.

Males : Stylet = 20-24 µm; orifice of dorsal pharyngeal gland = 4-7 µm; spicule = 24-31 µm; lip annules = 2

Second stage larvae : L = 0.45-0.49 mm; tail length = 52-59 µm; stylet = 10 µm.

Descriptions : Numerous short, disordered striae occur near the lateral lines where the dorsal and ventral striae meet. Arch low and rounded except when the ventral striae are extended to form wings. Perineal patterns of this species never have the punctuate markings above the anus. Males have two testes.

Distribution : India : Uttar Pradesh and Uttarakhand.

Elsewhere : Belgium, Germany, Netherlands, Hungary, Romania, Spain, Pakistan, South Africa and Australia.

Habitat & Locality : Soil around roots of tomato, eggplant, pepper, okra and cucumber from Nainital, Uttarkashi, Tehri Garhwal, Pauri Garhwal Dehradun, Chamoli, Almora and Pittorahgarh.

Remarks : Khan *et al.* (1993) recorded this species from districts Nainital, Uttarkashi, Tehri Garhwal, Pauri Garhwal, Dehradun, Chamoli, Almora and Pittorahgarh.

48. **Meloidogyne hapla* Chitwood, 1949

1949. *Meloidogyne hapla* Chitwood, Proc. Helminth. Soc. Wash., 16 : 93.

Dimensions : Females : Stylet = 12-14 µm.

Males : Stylet = 17-18 µm; orifice of dorsal pharyngeal gland = 4-6 µm; spicule = 29-31 µm; lip annules = 2.

Second stage larvae : L = 0.31-0.46 mm; tail length = 33-70 µm; stylet = 8-10 µm.

Descriptions : Distinct punctuations present at the body terminus just above the anus. Lateral lines marked by only slight irregularities in the striae or the striae of the dorsal and ventral sectors meet at a slight angle along the lines. Arch low, somewhat rounded. Ventral striae frequently extended laterally to form wings on one or both sides, the symmetry of the perineal pattern being broken and not continuous. Striae of both sectors smooth or slightly wavy. Males with one or two testes.

Distribution : India : Uttar Pradesh and Uttarakhand.

Elsewhere : Belgium, Germany, Hungary, Romania, Spain, Pakistan, Austria and Australia.

Habitat & Locality : Soil around roots of tomato, eggplant, pepper, okra and cucumber from Nainital, Uttarkashi, Tehri Garhwal, Pauri Garhwal Dehradun, Chamoli, Almora and Pittorahgarh.

Remarks : Khan *et al.* (1993) recorded this species from districts Nainital, Uttarkashi, Tehri Garhwal, Pauri Garhwal, Dehradun, Chamoli, Almora and Pittorahgarh.

49. **Meloidogyne incognita* (Kofoid & White, 1919) Chitwood, 1949

1919. *Meloidogyne incognita* Kofoid & White, J. Am. med. Ass., 72 : 567-569.

1949. *Meloidogyne incognita* Chitwood, Proc. Helminth. Soc. Wash., 16 : 95.

Dimensions : Females : L = 500-723 µm; width = 331-520 µm; stylet = 13-16 µm; width of stylet base = 3-5 µm; orifice of dorsal pharyngeal gland = 2-4 µm.

Males : L = 1.11-1.95 mm; a = 31-35; stylet = 23-33 µm; width of stylet base = 4.7-6.8 µm; orifice of dorsal pharyngeal gland = 1.4-2.5 µm.

Second stage larvae : L = 0.34-0.40 mm; a = 25-32; b = 2.0-2.1; b' = 6.4-8.4; tail length = 38-55 µm; stylet = 9.6-11.7 µm.

Distribution : India : Uttar Pradesh, West Bengal, Bihar, Himachal Pradesh, Tripura, Delhi and Uttarakhand

Elsewhere : Italy, Germany, Hungary, Spain, Pakistan and Australia.

Habitat & Locality : Soil around roots of litchi, chilli, okra, papaya, from Champawat and around roots of tomato, egg plant, pepper, okra and cucumber from Nainital, Uttarkashi, Tehri Garhwal, Pauri Garhwal Dehradun, Chamoli, Almora and Pitorahgarh.

Remarks : Khan *et al.* (1993) recorded this species from districts Nainital, Uttarkashi, Tehri Garhwal, Pauri Garhwal Dehradun, Chamoli, Almora and Pitorahgarh. Rathour *et al.* (2006) recorded this species from district Champawat.

50. **Meloidogyne javanica* (Treub, 1885)
Chitwood, 1949

1885. *Heterodera javanica* Treub, *Meded. Uit's Lands Plantentuin*, 2 : 35.

1949. *Meloidogyne javanica* Chitwood, *Proc. Helminth. Soc. Wash.*, 16 : 96.

Dimensions : Females : L = 0.63 mm; width = 0.45 mm; stylet = 16 µm; width of stylet base = 4 µm.

Males : L = 0.83 mm; a = 25; stylet = 20 µm; width of stylet base = 4 µm; spicules = 29 µm; gubernaculum = 7 µm.

Second stage larvae : L = 0.34-0.40 mm; tail length = 36-60 mm; stylet = 10 µm.

Descriptions : Cylindroid body, anteriorly tapering. Head continuous, stylet knobs round to sloping backwards. Lateral lines distinct incisures cutting through the striae of the perineal pattern so that few or no striae extend unbroken from the dorsal to the ventral sector. Arch low and rounded. Ventral striae smooth usually unbroken. Tail bluntly rounded. Spicules slightly curved with ventral and lateral flanges. Gubernaculum crescentic. Perineal pattern, fine striae, closely spaced and round.

Distribution : India : Uttar Pradesh, West Bengal, Meghalaya, Bihar, Himachal Pradesh, Tripura, Delhi and Uttarakhand.

Elsewhere : Italy, Hungary, Spain, Pakistan, South Africa, Indonesia and Australia.

Habitat & Locality : Soil around roots of litchi, chilli, okra, papaya, from Champawat and around roots of tomato, eggplant, pepper, okra and cucumber from Nainital, Uttarkashi, Tehri Garhwal, Pauri Garhwal Dehradun, Chamoli, Almora and Pitorahgarh.

Remarks : Khan *et al.* (1993) recorded this species from districts Nainital, Uttarkashi, Tehri Garhwal, Pauri Garhwal Dehradun, Chamoli, Almora and Pitorahgarh. Rathour *et al.* (2006) recorded this species from district Champawat.

Superfamily CRICONEMATOIDEA

Family CRICONEMTIDAE

Subfamily CRICONEMATINAE

Genus *Hemicriconemoides* Chitwood & Birchfield, 1957

51. *Hemicriconemoides mangifera* Siddiqi, 1961

1961. *Hemicriconemoides mangifera* Siddiqi, *Proc. Helm. Soc. Wash.*, 28 : 28.

Material examined : 2 ♀♀, Mohand Rao, Dehradun, 7.xii.05, Reg. No. IV. 277, coll. H.S. Mehta & Party; 4 ♀♀, Doiwala, Dehradun, 19.xii.2006, Reg. No. IV. 278, coll. S.J.S. Hattar.

Dimensions : Females : L = 0.48-0.51 mm; a = 13-14; b = 4.2-4.7; c = 13-15; V = 90-92; VL/VB = 1.2-1.5; R = 136-145; Rv = 14-16; Ran = 8-14; Rvan = 3-5; Rst = 23-25; Roes = 28-38; Rex = 31-46; stylet = 70-86 µm.

Description : Female : Cuticular sheath attached to body at anterior end. Lip region slightly offset with 2 annules, angular, directed outward. Labial disc slightly elevated, cephalic framework strongly sclerotized, hexaradiate with lateral sectors larger than submedians. Stylet knobs strong, 5-7 µm across, anterior margins directed forward. Excretory pore 3-4 annules posterior to pharyngeal base. Vulva transverse, vulval sheath absent. Spermatheca rounded. Tail convex-conoid or rounded.

Male : Not found.

Distribution : India : Uttar Pradesh, Uttarakhand, West Bengal and Tripura.

Elsewhere : Florida and Pakistan.

Habitat & Locality : Soil around roots of sugarcane fields and Tea plantations of Dehradun; Jamun and sugarcane fields from Haridwar;

mango from Champawat (Rathour *et al.*, 2006); *M. paradisiaca*, *Pyrus malus*, *P. pyriflora* from Nainital and *Prunus armeniaca* from Almora (Rashid *et al.*, 1973).

Remarks : This species was recorded for the first time from sugarcane fields of Dehradun by Rizvi (2007).

52. *Hemicriconemoides cocophilus (Loos, 1949) Chitwood & Birchfield, 1957

1949. *Criconemoides cocophilus* Loos, *J. zool. Soc. India*, **1** : 25.

1957. *Hemicriconemoides cocophilus* Chitwood & Birchfield, *Proc. Helm. Soc. Wash.*, **24** : 82.

1969. *Hemicriconemoides communis* Edward & Misra, *Nematologica*, **9** : 407.

Dimensions : Females : L = 0.42-0.54 mm; a = 13-18; b = 4.9-5.1; V = 90-94; R = 109-120; Rv = 8-12; Rst = 14-15; stylet = 50-54 μ m.

Description : Female : Body robust, straight upon fixation, Cuticular sheath attached to the inner cuticle at the anterior end. Cuticle distinctly annulated, 3-5 μ m wide at mid-body. Lip region with 2 annules, slightly demarcated from body. Stylet 50-54 μ m long, with well developed basal knobs, which are 5-7 μ m wide. Orifice of the dorsal pharyngeal gland 5-7 μ m from basal knobs; esophagus typical criconemoid type. Tail convex conoid to attenuated.

Distribution : India : Uttar Pradesh, Uttarakhand, West Bengal and Bihar.

Elsewhere : Spain, Florida and Pakistan.

Habitat & Locality : Soil around roots of teak and sal in the FRI forest of Dehradun.

Lycopersicon lycopersicum *M. paradisiaca*, *Pyrus malus*, *P. pyriflora* from Nainital and *Prunus armeniaca* and *Sauria rapa* from Almora (Rashid *et al.*, 1973).

Remarks : This species was recorded from districts Almora and Nainital by Rashid *et al.* (1973) and from Dehradun by Thapa (1990).

53. *Hemicriconemoides doonensis Srivastava *et al.*, 2000

2000. *Hemicriconemoides doonensis* Srivastava *et al.*, *Indian J. Nematol.*, **30** : 97-99.

Dimensions : Females : L = 0.62-0.71 mm; a = 14-17; b = 3.9-4.7; c = 8.0-9.6; c' = 1.7-2.4; V = 89-94; R = 140-145; Rv = 120-128; Ran = 10-12; Rvan = 4-6; Rst = 18-21; Roes = 34-36; Rex = 36-39; stylet = 80-88 μ m; esophagus = 150-163 μ m; tail = 38-43 μ m.

Description : Female : Body curved ventrally upon fixation, tapering towards both extremities, posteriorly terminating as elongate conoid tail. Lip region slightly offset with one annule. Lip width 10 μ m and lip height 3 μ m. Stylet well developed; metenchium slender, 62-63 % of total stylet length; telenchium 28-30 % long, basal knobs anchor-shaped, 5 μ m long and 9 μ m wide. Tail elongate-conoid slightly swelling near the tip, finely rounded.

Distribution : India : Uttarakhand.

Habitat & Locality : Soil around roots of litchi, *Litchi chinensis* from Vikasnagar and Herbetpur, Dehradun.

Remarks : Srivastava *et al.* (2000) reported this species from Dehradun.

Genus *Criconemella* De Grisse & Loof, 1965

54. *Criconemella curvata (Raski, 1952) Luc & Raski, 1981

1952. *Criconemoides curvata* Raski, *Proc. Helminth. Soc. Wash.*, **19** : 88.

1963. *Criconemoides nainitalense* Edward & Misra, *Nematologica*, **9** : 220.

1981. *Criconemella curvata* Luc & Raski, *Revue Nematol.*, **4** : 4.

Dimensions : Females : L = 0.41-0.52 mm; a = 7.6-10.7; b = 3.3-5.9; c = 21.4-30.5; V = 90-93; stylet = 55-71 μ m.

Description : Female : Body cylindrical tapering more towards the anterior region and ventrally curved upon fixation. Body annules 100-110, retrose, approximately 5.2 μ m wide. Mouth situated on a labial disc, and lip region highly sclerotized. The first and second annules 13 and 19 μ m wide respectively, fairly retrose, sub-lateral lobes present and not projecting beyond labial disc. Basal knobs prominent and anteriorly arcuate, 11 μ m long and 4.5 μ m wide. Caudal end truncate-conoid. Last annule small, 6 μ m, forming a forked tip.

Distribution : India : Uttar Pradesh and Uttarakhand.

Elsewhere : U.S.A.

Habitat & Locality : Soil around roots of *Prunus puddam* Roxb., from Nainital.

Remarks : This species was reported by Edward & Misra (1963) from district Nainital.

55. *Criconemella xenoplax (Raski, 1952)
Luc & Raski, 1981

1952. *Criconemoides xenoplax* Raski, *Proc. Helminth. Soc. Wash.*, 19 : 90.

1981. *Criconemella xenoplax* Luc & Raski, *Revue Nematol.*, 4 : 6.

Dimensions : Females : L = 0.40-0.62 mm; a = 8-14; b = 3-5; c = 23-56; V = 90-95; VL/VB = 0.92; R = 87-114; Rv = 6-11; Ran = 4-8; Rvan = 3-5; Rex = 25-35; stylet = 71-86 µm.

Description : Female : Annules retrorse (200 or fewer) with smooth or slightly rough posterior margins, especially towards tail. Head broad, first annule entire or emarginated laterally. Lip region conspicuous, elevated. Tail broadly rounded to more conoid, terminus generally a simple rounded or lobed button.

Distribution : India : Uttar Pradesh, Uttarakhand and Himachal Pradesh.

Habitat & Locality : Soil roots of Teak and Sal from FRI forest of Dehradun.

Remarks : This species was recorded from Dehradun by Thapa (1990).

56. *Criconemella citricola (Siddiqi, 1965)
Luc & Raski, 1981

1965. *Criconemoides citricola* Siddiqi, *Nematologica*, 11 : 241.

1981. *Criconemella citricola* Luc & Raski, *Revue Nematol.*, 4 : 3.

Dimensions : Females : L = 0.38-0.47mm; a = 9-11; b = 4-6; c = 22-32; V = 90-92; VL/VB = 1.07; R = 73-78; Rv = 8-9; Ran = 4-5; Rex = 23-26; stylet = 48-51 µm.

Distribution : India : Uttar Pradesh and Uttarakhand.

Elsewhere : U.S.A.

Habitat & Locality : Soil around roots of *Prunus armeniaca* from Almora; *P. bokharensis* from Nainital.

Remarks : Rashid *et al.* (1973) recorded this species from districts Almora and Nainital.

57. *Criconemella insignis (Siddiqi, 1965) Luc & Raski, 1981

1961. *Criconemoides insignis* Siddiqi, *Proc. Helminth. Soc. Wash.*, 28 : 22.

1981. *Criconemella insignis* Luc & Raski, *Revue Nematol.*, 4 : 8.

Dimensions : Females : L = 0.40-0.53mm; a = 11-13; b = 4-5; c = 30-35; V = 92-95; R = 65-69; RV = 6-7; Ran = 4; Rex = 22-23; stylet = 60-61 µm.

Distribution : India : Uttar Pradesh and Uttarakhand.

Elsewhere : U.S.A.

Habitat & Locality : Soil around roots of *Lycopersicon lycopersicum*, *Lagenaria leucantha*, *Glycine max* and *Solanum melongena* from Almora; *Lycopersicon lycopersicum* from Nainital.

Remarks : Rashid *et al.* (1973) recorded this species from districts Almora and Nainital.

Genus *Criconema* Hofmanner & Menzel, 1914

58. *Criconema aberrans (Jairajpuri & Siddiqi, 1963) Raski & Luc, 1987

1963. *Criconemoides aberrans* Jairajpuri & Siddiqi, *Z. Parasitkde.*, 23 : 344.

1987. *Criconema aberrans* Raski & Luc, *Revue Nematol.*, 10 : 421.

Dimensions : Females : L = 0.38-0.58 mm; a = 7-10; b = 3.2-4.7; c = 9-20; V = 81-94; VL/VB = 0.7-1.3; R = 40-48; Rst = 7-10; Roes = 10-15; Rv = 4-6; Rex = 10-13; Ran = 3-4; Rvan = 1-2; stylet = 61-79 µm; Metenchium = 49-67 µm.

Distribution : India : Uttar Pradesh, and Uttarakhand.

Habitat & Locality : Soil around roots of apple, *Malus pumila* from Ramgarh, Nainital and pear, *Pyrus communis* from Chamoli district.

Remarks : This species was recorded by Rahmani *et al.* (1986) from districts Nainital and Chamoli.

59. **Criconema rishikensis* (Singh & Khan, 1999) n. comb

1999. *Lobocriconema rishikensis* Singh & Khan, *Indian J. Nematol.*, **29** : 48.

Dimensions : Females : L = 0.32-0.47 mm; a = 7.5-9.1; b = 3.3-5.11; V = 91.2-92.8; spear = 62-74 µm; R = 39-45; Rst = 8-10; Roes = 11-15; Rv = 3-4.

Description : Female : Body assumes almost straight posture upon fixation, plump, cylindrical, tapering at either end. Body annules with thick cuticle. Head separate from body and comprises of two annules. Labial framework strongly developed. Spear extending over 8-10 annules, 62-74 µm long, and shaft 7-8 µm in length, spear knobs anteriorly cupped and 9 µm across. Tail terminus spinate.

Distribution : India : Uttar Pradesh, and Uttarakhand.

Habitat & Locality : Soil around roots of Plum at Rishikesh, district Dehradun.

Remarks : This species was reported by Singh & Khan (1999) from Rishikesh, district Dehradun. Genus *Lobocriconema* is synonymized with the genus *Criconema* (Ahmad, 1996 and Website NEMAPLEX, 2007), hence a new combination is proposed for this species.

60. **Criconema bhowaliensis* (Singh & Khan, 1999) n. comb

1999. *Lobocriconema bhowaliensis* Singh & Khan, *Indian J. Nematol.*, **29** : 49.

Dimensions : Females : L = 0.39-0.53 mm; a = 7.4-8.5; b = 3.5-4.2; V = 90.5-93.5; spear = 70-80 µm; R = 36-42; Rst = 7-10; Roes = 9-11; Rv = 3-4.

Description : Female : Body thick, plump, almost straight with 36-42 body annules. Body cuticle thick with coarse annules. Body tapering anteriorly to a flat truncate head, posteriorly to an obtusely rounded tail terminus. Labial sclerotization strongly developed, hexaradiate. Spear extending over 7-8 annules, spear knobs anchor shaped, 10-11 µm across. Tail terminus conoid, rounded.

Distribution : India : Uttar Pradesh, and Uttarakhand.

Habitat & Locality : Soil around roots of Peach at Bhowali, district Nainital.

Remarks : This species was reported and described by Singh & Khan (1999) from Bhowali, district Nainital. Genus *Lobocriconema* is synonymized with the genus *Criconema* (Ahmad, 1996 and Website NEMAPLEX, 2007), hence a new combination is proposed for this species.

Genus *Ogma* Southern, 1914

61. **Ogma regularis* (Rahmani *et al.*, 1986) Raski & Luc, 1987

1986. *Neolobocriconema regularis* Rahmani *et al.*, *Indian J. Nematol.*, **16** : 87-89.

1987. *Ogma regularis* Raski & Luc, *Revue Nematol.*, **10** : 440.

Dimensions : Females : L = 0.67-0.68 mm; a = 9.7-10; b = 4.4-4.5; V = 92; VL/VB = 1.1; R = 32-33; Rst = 6; Roes = 8-9; Rv = 3-4; Rex = 13; Ran = 2-3 stylet = 102-106 µm

Description : Female : Body straight upon fixation, tapering very slightly towards extremities. Lip annule dome-shaped, 19-20 µm high and 40 µm wide bearing submedian lobes. Body annules 21-22 µm apart at midbody, 8 or 9 annules in pharyngeal region, 20 annules from esophago-intestinal junction to vulva, one annule from vulva to anus and 2 or 3 annules from anus to tail tip. Tail conoid, one anal body width.

Distribution : India : Uttar Pradesh, and Uttarakhand.

Habitat & Locality : Soil around roots of wild plants Rishikesh, district Dehradun.

Remarks : This species was reported and described by Rahmani *et al.* (1986) from Rishikesh, district Dehradun.

62. **Ogma serratum* (Khan & Siddiqi, 1963) Raski & Luc, 1987

1963. *Criconema serratum* Khan & Siddiqi, *Curr. Sci.*, **32** : 414-415.

1987. *Ogma serratum* Raski & Luc, *Revue Nematol.*, **10** : 442.

Dimensions : Females : L = 0.5-0.6 mm; a = 10-11; b = 3.1-3.5; V = 90-94; spear = 90-96 µm.

Description : Female : Body with 36-38 annules covered with abnormally thick cuticle. Body annules retrorse with a continuous fringe of

reduced spines, which give a serrated appearance. The posterior margins of annules bear lobe-like outgrowths. Head with two annules, the anterior one directed outward and forward. The oral apertures guarded by two liplets, lateral in position. Cephalic skeleton sclerotized, hexaradiate. Spear strongly developed, with anteriorly cupped basal knobs. Caudal extremity rounded.

Distribution : India : Uttar Pradesh, Uttarakhand.

Elsewhere : Florida.

Habitat & Locality : Soil around roots of Peach tree from Almora district.

Remarks : This species was reported and described from Almora district by Khan & Siddiqi (1963).

63. **Ogma parvum* Ahmad, Jairajpuri & Rahmani, 1991

1991. *Ogma parvum* Ahmad, Jairajpuri & Rahmani, *Nematol. Medit.*, 19 : 57-59.

Dimensions : Females : L = 0.25-0.29 mm; a = 9-11; b = 3.5-4.2; c = 12-20; V = 86-88; VL/VB = 1.5; R = 78-83; spear = 39-46 μ m

Description : Female : Body slightly curved upon fixation, cylindrical, tapering towards extremities. Body annuli 3-4 μ m apart at midbody, 19-24 annuli in pharyngeal region, four annuli from vulva to anus and 8 annuli from anus to tail tip. Lip region 4-5 μ m high, set off, with two unequal annuli, first annulus with anteriorly directed margins, 9-11 μ m wide, second lip annulus 11-13 μ m wide. Basal knobs of spear 7-8 μ m across, located at 14-16th annulus from anterior extremity. Tail conoid, nearly one and half to two vulva-anus distances long.

Distribution : India : Uttar Pradesh, and Uttarakhand.

Habitat & Locality : Soil around roots of apple, *Malus pumila* from district Chamoli.

Remarks : This species was reported and described by Ahmad *et al.* (1991) from district Chamoli.

64. **Ogma octangulare* (Cobb, 1914) Sch. Stek. et Teunissen, 1938

1914. *Iota octangulare* Cobb, *Amer. Micr. Soc. Trans.*, 33 : 75.

1938. *Ogma octangulare* Sch. Stek. et Teunissen, *Explor. Parc. Natn. Albert. Miss. G.F.de Witte, Fasc.*, 22 : 30.

Dimensions : Females : L = 0.31-0.44 mm; a = 8-12; b = 3.2-4.6; c = 8-12; V = 84-88; VL/VB = 1.4-2.1; R = 60-71; RV = 10-13; Ran = 8-10; Rvan = 2-4; Rst = 11-15; Roes = 15-17; Rex = 21; spear = 61-64 μ m; conus = 45-49 μ m.

Distribution : India : Uttar Pradesh, Uttarakhand, Himachal Pradesh and Nepal.

Elsewhere : Germany, Italy, Hungary, Netherlands and Poland

Habitat & Locality : Soil around roots of plum and Indian redwood from district Dehradun and apricot from Almora district.

Remarks : This species was recorded by Ahmad *et al.* (1991) from districts Dehradun and Almora.

65. **Ogma tenuicaudatum* (Siddiqi, 1961) Siddiqi, 1986

1961. *Criconema tenuicaudatum* Siddiqi, *Proc. Helminth. Soc. Wash.*, 28 : 30.

1986. *Ogma tenuicaudatum* Siddiqi, *Farham Royal, UK, Comm. Agric. Bureaux*, 150.

Dimensions : Females : L = 0.34-0.46 mm; a = 6-8; b = 2.5-3.3; c = 8-14; V = 76-91; VL/VB = 1.1-2.0; R = 51-63; RV = 9-11; Ran = 5-7; Rvan = 3-5; Rst = 16-20; Roes = 19-23; Rex = 20; spear = 99-112 μ m; conus = 81-94 μ m.

Distribution : India : Uttar Pradesh and Uttarakhand.

Elsewhere : UK and Florida.

Habitat & Locality : Soil around roots of apricot from Almora district and Wild tree from Chamoli district.

Remarks : This species was recorded by Ahmad *et al.* (1991) from Almora and Chamoli districts.

Subfamily HEMICYCLIOPHORINAE
Skarbilovich, 1959

Genus *Hemicycliophora* de Man, 1921

66. **Hemicycliophora dhirendi* Husain & Khan, 1967

1967. *Hemicycliophora dhirendi* Husain & Khan, *Proc. Helminth. Soc. Wash.*, 34 : 180.

Dimensions : Females : L = 0.62-0.76 mm; a = 18-30; b = 4-6; c = 7-11; V = 83-86; R = 170-214; Rv = 30-43; Ran = 19-30; Rex = 38-42; stylet = 52-60 μ m.

Males : L = 0.52-0.56 mm; a = 27-28; b = 6; c = 11; T = 16-24; spicules = 32-39 μ m.

Description : Body annules 3-4 μ m apart, 31-40 annules in pharyngeal region, 100-132 annules from esophago-intestinal junction to vulva, 10-16 annules from vulva to anus and 19-30 annules from anus to tail tip. Labial disc slightly elevated. Basal knobs of stylet smoothly rounded, sloping backward. Orifice of dorsal pharyngeal gland 4-6 μ m from stylet base. Tail elongate-conoid, 3-4 anal body-widths long.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat & Locality : Soil around roots of *Glycine max* and *Solanum melongena* from Almora; *Brassica oleracea botrytis* from Nainital.

Remarks : Rashid *et al.* (1973) recorded this species from districts Almora and Nainital.

67. **Hemicycliophora tarjani* Khan & Basir, 1963
1963. *Hemicycliophora tarjani* Khan & Basir, *Nematologica*, 9 : 103.

Dimensions : Females : L = 0.89-1.1 mm; a = 25-35; b = 4-6; V = 76-86; R = 320-355; Rex = 55; stylet = 82-103 μ m.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat & Locality : Soil around roots of *Glycine max* and *Solanum melongena* from Almora; *Brassica oleracea botrytis* from Nainital.

Remarks : Rashid *et al.* (1973) recorded this species from districts Almora and Nainital.

Family TYLENCHULIDAE

Subfamily PARATYLENCHINAE

Genus *Paratylenchus* Micoletzky, 1922

68. **Paratylenchus tenuicaudatus* Wu, 1961

1961. *Paratylenchus tenuicaudatus* Wu, *Can. J. Zool.*, 39 : 163.

Dimensions : Females : L = 0.34-0.39 mm; a = 21-24; b = 4.2; c = 13.6-14.0; V = 80-82; stylet = 25-31 μ m.

Distribution : India : Uttarakhand.

Elsewhere : Spain.

Habitat & Locality : Soil around roots of Tea Plantations of Dehradun.

Remarks : This species was recorded from Dehradun by Khera & Chaturvedi (1977).

69. **Paratylenchus nainianus* Edward & Misra, 1963

1963. *Paratylenchus nainianus* Edward & Misra, *Nematologica*, 9 : 215-217.

Dimensions : Females : L = 0.25-0.29 mm; a = 21.2-25.5; b = 4.0-5.5; c = 19.4-20.4; V = 80-84; spear = 22-27 μ m.

Description : Females : Body tapering at both ends, in the normal relaxed position ventrally curved, cuticle fairly well- marked by transverse striae about 0.7 microns wide. The lip region somewhat conoid-truncate. Lateral field marked by four incisures. Median bulb criconemoid with a prominent valvular apparatus, leading into a pear shaped basal bulb through an isthmus. Intestine with a rectum and fairly distinct anus.

Distribution : India : Uttar Pradesh, Uttarakhand, Delhi, Himachal Pradesh, Punjab, Rajasthan and Bihar.

Habitat & Locality : Soil around roots of *Prunus persica* from Nainital; *Digitalis purpurea* from district Almora.

Remarks : This species was reported and described by Edward & Misra (1963) from Nainital.

70. **Paratylenchus curvatus* Van der Linde, 1938
1938. *Paratylenchus curvatus* Van der Linde, *Ent. Mem. Dept. Agric. For. S. Afr.*, 2 : 35.

Dimensions : Females : L = 0.32-0.44 mm; a = 22-24; b = 4.0-4.9; c = 11-13; V = 81-87; spear = 21-29 μ m.

Description : Females : Cuticle with transverse striae about 2.0 μ m wide. The lip region truncate, continuous with the body contour and bearing six lips. Lateral field marked by four incisures, Spear with heavy knob. Dorsal pharyngeal gland opens into the lumen of esophagus at about 4-6 μ m behind the base of the spear. Gonad single.

Distribution : India : Uttar Pradesh, Uttarakhand, Himachal Pradesh, Delhi and West Bengal.

Elsewhere : U.S.A., Italy and Spain.

Habitat & Locality : Soil around roots of litchi and soybean from Champawat.

Remarks : Rathour *et al.* (2006) recorded this species from district Champawat.

71. **Paratylenchus projectus* Jenkins, 1956

1956. *Paratylenchus projectus* Jenkins, *J. Wash. Acad. Sci.*, 46 : 275.

Dimensions : Females : L = 0.28-0.48 mm; a = 17-25; b = 3.4-4.7; c = 13-17; c' = 2.2-3.0; V = 81-87; spear = 25-37 µm; excretory pore = 61-90.

Distribution : India : Uttar Pradesh and Uttarakhand.

Elsewhere : Pakistan and U.S.A.

Habitat & Locality : Soil around roots of *Digitalis purpurea* from Almora.

Remarks : Rashid *et al.* (1973) recorded this species from Almora and Nainital.

Genus *Tylenchulus* Cobb, 1913

72. **Tylenchulus semipenetrans* Cobb, 1913

1913. *Tylenchulus semipenetrans* Cobb, *J. Wash. Acad. Sci.*, 3 : 288-289.

Dimensions : Females : L = 0.31-0.46 mm; a = 3.5-6.4; b = 2.4-4.3; V = 88-93; stylet = 11-12 µm; body width at vulva = 21-31 µm; dorsal pharyngeal gland nuclei = 4-6 µm; pharyngeal length = 104-159 µm; excretory pore = 265-400 µm.

Males : L = 0.34-0.38 mm; a = 28-35; b = 2.9-3.7; T = 25-36; dorsal pharyngeal gland nuclei = 4-6 µm; pharyngeal length = 97-131 µm; excretory pore = 197-238 µm; tail = 35-45 µm; spicules = 15-18 µm; gubernaculum = 3-4 µm.

Description : Body translucent white, 60-70% of body variably saccate, widest at excretory pore, narrowing at vulva and ending in a digitate terminus. Lip region hemispherical, smooth; labial sclerotization weak. Stylet knobs rounded. Gonad convoluted extending anteriorly to basal bulb. Males with degenerate stylet and esophagus. Spicules slender and arcuate. Tail slightly tapering to a broadly rounded terminus.

Distribution : India : Uttar Pradesh, Himachal Pradesh, Meghalaya, Tripura, West Bengal, Delhi and Uttarakhand.

Elsewhere : Pakistan and U.S.A.

Habitat & Locality : Soil around roots of *Citrus acida*, *C. aurantium* and *C. medica limonia* from Almora.

Remarks : Rashid *et al.* (1973) recorded this species from district Almora.

Order APHELENCHIDA Siddiqi, 1980
Suborder APHELENCHINA Hooper, 1978
Family APHELENCHIDAE FUCHS, 1937
Genus *Aphelenchus* Bastian 1865

73. *Aphelenchus avenae* Bastian 1865

1865. *Aphelenchus avenae* Bastian, *Linn. Soc. Lond. Trans.*, 25 : 122.

Material examined : 13 ♀♀, Chakrata, Dehradun, 24.v.06, Reg. No. IV. 279, coll. H.S. Mehta & Party; 2 ♀♀, Sahiya, Dehradun, 24.v.06, Reg. No. IV. 280, coll. H.S. Mehta & Party; 1 ♀, Ghangharia, Chamoli, 20.viii.06, Reg. No. IV. 281, coll. D. Bisht & Party; 7 ♀♀, Doiwala, Dehradun, 19.xii.2006, Reg. No. IV.2 82, coll. S.J.S. Hattar.

Dimensions : Female : L = 0.54-0.68 mm; a = 28-35; b = 7-8; c = 29-42; V = 73-79; stylet = 12-17 µm.

Description : **Female** : Body cylindrical and tapers towards extremities. Cuticle finely striated. Lip region hemispherical. Stylet knobs absent. Esophagus aphelenchoid type. Nerve ring just behind median bulb. Vulva posterior with slightly protruding vulval lips. Ovary monoprodelphic. Post vulval sac empty. Tail cylindroid with round terminus.

Male : Not found.

Distribution : India : Uttar Pradesh, Rajasthan, Delhi, Uttarakhand, West Bengal, Assam, and Sikkim.

Elsewhere : Bangladesh, Nepal, Pakistan, Belgium, Germany, Poland, Sweden and U.S.A.

Habitat & Locality : Soil around roots of deodar, potato sugarcane, Tea Plantations from Dehradun; Oak from Chamoli.

Remarks : Soil around roots of potato is a new habitat record for the species.

Family APHELENCHOIDIDAE Skarbilovich, 1947

Genus *Aphelenchoides* Fischer, 1894

74. **Aphelenchoides saprophilus* Franklin, 1957

1957. *Aphelenchoides saprophilus* Franklin, *Nematologica*, 2 : 309.

Dimensions : Female : L = 0.63-0.65 mm; a = 34-46; b = 8.0-9.6; b' = 4.4-4.6; c = 13-16; V = 69-71; stylet = 11-12 μ m.

Description : Body almost straight, cylindrical, narrowing towards both extremities. Lateral field marked with four incisures. Stylet with minute knobs. Esophagus aphelenchoid. Tail cylindrical, tapering with a mucro at its tip.

Distribution : India : Uttarakhand, Sikkim, West Bengal and Bihar.

Elsewhere : U.S.A.

Habitat & Locality : Soil around roots of Tea Plantations of Dehradun.

Remarks : This species was recorded by Khera & Chaturvedi (1977) from Dehradun.

Order RHABDITIDA

Suborder RHABDITINA

Superfamily RHABDITOIDEA

Family RHABDITIDAE

Subfamily MESORHABDITINAE

Genus *Mesorhabditis* (Osche, 1952)

Dougherty, 1953

75. *Mesorhabditis cranganorensis* (Khera, 1968) Andrassy, 1983

1968. *Rhabditis* (*Uniovaria*) *cranganorensis* Khera, *J. Zool. Soc., India*, 20 : 38.

1983. *Mesorhabditis cranganorensis* Andrassy, *ORSTOM, Paris*, 70.

Material examined : 2 ♀♀, CTR, Nainital, 26.ii.05 coll. Reg. No. IV. 244, A.N. Rizvi & Party; 2 ♀♀, CTR, Nainital, 26.ii.05, Reg. No. IV. 245, coll. A.N. Rizvi & Party; 8 ♀♀, Timli FRH, Dehradun, 06.ix.2005; Reg. No. IV. 283, coll. A.N. Rizvi & Party; 13 ♀♀, Chakrata, Dehradun, 24.v.06, Reg. No. IV. 284, coll. H.S. Mehta.

Dimensions : Female : L = 0.46-0.62 mm; a = 22-24; b = 3.5-4.3; c = 8-10; V = 72-75.

Description : Female : Body small, thin and transparent with elongated conical tail. Body

cuticle striated. Head broad, not offset with six rounded closed lips, each bearing 2 spiny papillae. Amphids not visible. Mouth opening terminal. Stoma long and wide, 15-17 μ m by 3 μ m. Cheilorhardions small, protostom cylindrical, its component fused. Metarhabdions each with 3 tubercles, telorhabdions small. Pharyngeal collar covers posterior third of stoma. Esophagus with corpus, median bulb, isthmus and a terminal valvated bulb. Corpus about the same length as isthmus and terminal bulb combined. Procorpus stout and muscular 44 μ m by 7 μ m wide. Median bulb 14 μ m long by 14 μ m wide, more muscular than Procorpus. Isthmus narrow and slender, 43 μ m long and 5 μ m wide. Terminal bulb 15 μ m long and 13 μ m wide. Both isthmus and terminal bulb mostly glandular and slightly muscular. Triradiate esophago-intestinal valve present. Nerve ring surrounds the isthmus at its middle. Excretory pore opens posterior to nerve ring. Ovary single, prodelphic and reflexed. A temporarily distended part of uterus functions as seminal receptacle. Uterine walls thin. Vagina short and narrow. Phasmids at anterior 1/6th of tail.

Male : unknown.

Distribution : India : Uttar Pradesh, Uttarakhand, Kerala and Sikkim.

Habitat & Locality : Soil around roots of Sal, CTR, district Nainital; Sal, Timli forests, and Deodar Chakrata, Tea Plantations (Khera & Chaturvedi, 1977) from Dehradun.

Remarks : This species was recorded for the first time from CTR by Rizvi (2008).

Genus *Bursilla* Andrassy, 1976

76. *Bursilla vernalis* Andrassy, 1982

1982. *Bursilla vernalis* Andrassy, *Revue Nematol.*, 5 : 43-44.

1983. **Material examined** : 10 ♀♀, 1 ♂, FRI. Dehradun, 8.viii.07, Reg. No. IV. 350, coll. A.N. Rizvi & Party.

Dimensions : Female : L = 0.41-0.69 mm; a = 16-21; b = 3.6-5.2; c = 7.8-19.1; V = 72-76.

Description : Female : Body small and broad. Cuticle very thin. Head expanded, about 6.0-7.8 μ m. Lips six, rounded and distinctly separated each bearing setose apical papilla. Stoma, 14.8-16.2 μ m long. Cheilostom not cuticularized. Buccal tube

tubular. Metastom isoglottid with rounded swellings having two pointed denticles. Pharyngeal collar absent. Esophagus long with weak median bulb and strong basal bulb. Rectum about two anal body diameter. Gonad prodelphic, ovary reflexed, vulval lips projected, vagina short. Post-uterine sac absent. Oviparous with uterus containing single egg, 55-85 x 24-28 μm . Phasmids near anal opening. Anal body 15-18 μm in diameter.

Male : Similar to females in general morphology. Testis single, tip reflexed. Spermatozoa small and spherical. Spicule, 25 μm long, about as long as half of tail length, slightly bent ventrally and fused distally. Gubernaculum thin, 9.2 μm long. Tail 51.3 μm long and 2.5 times anal body width. Genital papillae six pairs, three pairs preanal, one pair adanal and two pairs postanal in position.

Distribution : Uttarakhand.

Elsewhere : Vietnam.

Habitat & Locality : Bark beetle frass from *Pinus* sp from FRI forest, Dehradun.

Remarks : The female specimens of *B. vernalis* examined here are very similar to those of the original description (Andrassy, 1982) apart from their smaller and slender body ($L = 0.41-0.56$ mm, $a = 16-21$ vs. $0.64-0.69$ mm; $a = 17.1-18.4$). Male also resembles the original description in having ventrally bent spicules, about $\frac{1}{2}$ of tail length; gubernaculum about 2.5th of spicule length and number and arrangement of caudal papillae. This species was recorded for the first time from India by Rizvi & Bhandari (2008).

Subfamily PELODERINAE

Genus *Caenorhabditis* (Osche, 1952)

Dougherty, 1953

77. *Caenorhabditis elegans* (Maupas, 1899)

Dougherty, 1953

1899. *Rhabditis elegans* Maupas, Arch. zool. expt. gen. 8 : 480.

1953. *Caenorhabditis elegans* Dougherty, Thapar Comm. Vol. I : 70.

Material examined : 5 ♀♀, 2 ♂♂, FRI, Dehradun, 10.viii.05, Reg. No. IV. 285, coll. A.N. Rizvi & Party.

Dimensions : Female : $L = 0.70-1.1$ mm; $a = 19-21$; $b = 6-8$; $c = 8-10$; $V = 52-55$.

Male : $L = 0.53-0.65$ mm; $a = 16-18$; $b = 4.2-4.8$; $c = 22-25$.

Description : Female : Body tapering slightly at extremities. Lips bearing the usual circlets of six and four papillae. Prostom 15 μm long, 4 μm wide; denticles on metarhabdions not clearly visible. Pharyngeal collar surrounds about half the stoma. Corpus of esophagus with prominent basal swelling. Esophagus without a median bulb. Basal bulb with valve. Lateral fields marked by four incisures. Nerve ring near middle of isthmus. Excretory pore opposite anterior end of bulb. Vulva median, ovaries paired, opposed, reflexed. Female tail conical and fairly long. Phasmids located at one-fourth –one-third the third tail.

Male tail peloderan with 9 pairs of bursal papillae. Spicules straight to slightly curved. Gubernaculum straight

Distribution : India : Uttar Pradesh and Uttarakhand.

Elsewhere : Germany, France, Bulgaria, Italy, England, Denmark, Soviet Union, China, Algeria, and United States.

Habitat and Locality : Soil around roots of pine from FRI forest, Dehradun.

Remarks : This species was recorded for the first time from Uttarakhand by Rizvi & Bhutia (2009).

Suborder CEPHALOBINA

Family CEPHALOBIDAE

Subfamily CEPHALOBINAE

Genus *Cephalobus* Bastian, 1865

78. *Cephalobus persegnis* Bastian, 1865

1865. *Cephalobus persegnis* Bastian, Linn. Soc. Lond. Trans., 25 : 80.

Material examined : 2 ♀♀, Mohand Rao, Dehradun, 7.xii.05, Reg. No. IV. 286, coll. H.S. Mehta & Party, 2 ♀♀, Khajawar, 07.xii.2005, Reg. No. IV. 287, coll. H.S. Mehta & Party; 1 ♀, Chakrata, Dehradun, 24.v.06, Reg. No. IV. 288, coll. H.S. Mehta & Party.

Dimensions : Female : $L = 0.50-0.62$ mm, $a = 21-23$, $b = 3.9-4.9$, $c = 13-15$, $V = 68-69$.

Description : Female : Body spindle shaped more attenuated anteriorly. Cuticle transversely

striated. Lips low, rounded, obscurely duplex, the submedian slightly asymmetrical. Esophagus cylindrical, except in basal fifth where it tapers to an isthmus from which it is separated only by a break in the musculature, with a terminal valvular bulb. Female gonad single, prodelphic, reflexed, Spermatheca at the bend, ovary with double flexure in posterior part. Tail usually uniformly conoid to blunt terminus.

Male : Not found.

Distribution : India : Uttar Pradesh, Uttarakhand, West Bengal and Sikkim.

Elsewhere : Poland, Germany, Italy, Sweden, USA and Netherlands.

Habitat & Locality : Soil around roots of Sugarcane, Mohand Rao, Teak from Khaj nawar and Deodar from Chakrata, district Dehradun.

Remarks : This species recorded for the first time from WDS region by Rizvi (2007).

Genus *Eucephalobus* Steiner, 1936

79. *Eucephalobus oxyuroides* (de Man, 1876)
Steiner, 1936

1876. *Cephalobus oxyuroides* de Man, *Tijds. Nederland. Dierk. Vereen.* 2 : 80.

1936. *Eucephalobus oxyuroides* Steiner, *Proc. Helminth. Soc. Wash.*, 3 : 76.

Material examined : 2 ♀ ♀, CTR, Nainital, 26.ii.05, Reg. No. IV. 246, coll. A.N. Rizvi & Party; 2 ♀ ♀, Mohand Rao, Dehradun, 7.xii.05, Reg. No. IV. 289, coll. H.S. Mehta & Party; 1 ♀, Kalsi, Dehradun, 4.v.06, Reg. No. IV. 290, coll. H.S. Mehta & Party; 4 ♀ ♀, Chakrata, Dehradun, 24.v.06, Reg. No. IV. 291, coll. H.S. Mehta & Party; 1 ♀, Timli, Dehradun, 06.ix.2005, Reg. No. IV. 292, coll. A.N. Rizvi & Party; 5 ♀ ♀, Dharmawala, Timli range. 30.xi.2005, Reg. No. IV. 293, coll. A.N. Rizvi & Party; 2 ♀ ♀, Khaj nawar, Dehradun, 07.xii.2005, Reg. No. IV. 294, coll. H.S. Mehta & Party; 4 ♀ ♀, FRI, Dehradun, 5.vii.06, Reg. No. IV. 295, coll. A.N. Rizvi & Party; 3 ♀ ♀, Tipperpur, Dehradun, 8.v.07, Reg. No. IV. 296, coll. A.N. Rizvi & Party.

Dimensions : Female : L = 0.47-0.56 mm, a = 21-24, b = 3.2-4.1, c = 4.9-8.3, V = 57-60.

Description : Female : Body straight to slightly curved upon fixation. Cuticle finely striated, lateral field marked by three incisures. Lips conoid, pointed with papillae well down on their outer contour. Amphid apertures slightly dorsal to median line. Cheilostom hexagonal. Prothabds slightly constricted near middle. Glottoid apparatus present. Dorsal metarhabdion somewhat dentate. Stoma 9-10 µm deep. Corpus of Esophagus slender, cylindrical with nerve ring surrounding its base. Basal bulb with strongly sclerotized valve. Cardia conoid. Gonads with spermatheca at first flexure and double flexure in distal portion. Vulva post equatorial. Ovary mono-prodelphic, reflexed. Tail uniformly conoid to acute terminus, usually ventrally bent in posterior third.

Male : Not found.

Distribution : India : Uttar Pradesh, Uttarakhand, Sikkim.

Elsewhere : Belgium, Sweden, Germany, Hungary Italy, Netherlands and USA.

Habitat & Locality : Soil around roots of Deodar from Chakrata, Sugarcane from Mohand Rao, Mango from Kalsi, Pine from FRI, Sal from Timli forest, Teak from Dharmawala, Khaj nawar and Rice from Tipperpur, district Dehradun and Sal forests from CTR, district Nainital.

Remarks : This species was recorded for the first time from WDS by Rizvi (2007). Mango and Deodar are new habitat records for the species.

Subfamily ACROBELINAE

Genus *Pseudacrobhelus* Steiner, 1938

80. *Pseudacrobhelus eurystoma* (Andrassy, 1967) Abolafia *et al.*, 2002

1967. *Heterocephalobus eurystoma* Andrassy, *Acta Zool. Acad. Sci. Hung.*, 13 : 32.

2002. *Pseudacrobhelus eurystoma* Abolafia *et al.*, *J. Nema. Morph. Syst.*, 4 : 138.

Material examined : 10 ♀ ♀, 6 ♂ ♂, FRI, Dehradun, 16.viii.07, Reg. No. IV. 349, coll. A.N. Rizvi & Party.

Dimensions : Female : L = 0.45-0.61 mm; a = 21-26; b = 3.3-3.6; c = 11.5-12.5; V = 65-76.

Male : L = 0.39-0.42 mm; a = 23-24; b = 3.5-3.8; c = 14-18; spicule = 20-22 mm; gubernaculum = 10-13 mm.

Description : Female : Body length 0.45-0.61mm. Body cylindrical, tapering towards extremities, more pronounced posteriorly and slightly curved ventrally upon fixation. Lateral fields marked by three incisures, becoming inconspicuous near the phasmid. Cephalic probolae absent. Labial probolae high with low ridges connected to adjacent lips. Stoma cephaloboid, cheilorhabdions bar shaped. corpus cylindrical 2.6-2.9 times as long as isthmus. Basal bulb ovoid. Cardia conoid. Excretory pore at 71-73% of neck length, near the posterior end of corpus at 44-50 annuli from labial region (R_{ep}). Dierids at the level of isthmus at about 80-82% of neck length, at 50-55 annuli from the anterior end (R_{dei}). Rectum 1.4-1.6 times anal body width.

Reproductive system monodelphic-prodelphic. Ovary without double flexure, with oocytes arranged in two rows anteriorly and then in a single row. Oviduct short. Spermatheca with spermatozoa. Uterus narrow tubular. Postvulval uterine sac with a proximal transverse septum. Vagina thick walled. Tail conical, ventrally curved with a short subventral mucro.

Male : Similar to females but more curved ventrally. Assumes 'J' shape upon fixation. Reproductive system monorchic. Testis reflexed anteriorly. Tail conical, ventrally curved bearing a small mucro about 2.2 - 2.8 μ m. Spicules ventrally curved : manubrium rounded, calamus tapering, lamina ventrally curved and with dorsal hump. Gubernaculum with arched cuneus. Caudal papillae five pairs, two pairs anterior to phasmids and three near the tail tip.

Distribution : India : Uttarakhand.

Elsewhere : Hungary, Scotland, Russia and Mongolia.

Habitat & locality : Bark beetle frass from *Pinus sp* from FRI forest, Dehradun.

Remarks : All the body measurements are in agreement with the earlier workers except for slightly longer tail mucro in females. This species is found for the first time from pine beetle frass and it is a new record from India. This species was recorded for the first time from India by Rizvi & Bhandari (2008).

Subfamily ACROBELINAE

Genus *Acrobeles* von Linstow, 1877

81. *Acrobeles timmi* Chaturvedi & Khera, 1979

1979. *Acrobeles timmi* Chaturvedi & Khera, *Zool. Surv. India. Tech. Monogr.*, 2 : 95.

Material examined : 2 ♀ ♀, CTR, Nainital, 26.ii.05, Reg. No. IV. 247, coll. A.N. Rizvi & Party; 2 ♀ ♀, CTR, Nainital, 26.ii.05, Reg. No. IV. 248, coll. A.N. Rizvi & Party; 6 ♀ ♀, Mohand Rao, Dehradun, 7.xii.05, Reg. No. IV. 297, coll. H.S. Mehta & Party; 2 ♀ ♀, Timli Dehradun, 06.ix.2005; Reg. No. IV. 298, coll. A.N. Rizvi & Party; 1 ♀, Sabbahwala, Timli range, Dehradun, 30.xi.2005, Reg. No. IV. 299, coll. A.N. Rizvi & Party; 3 ♀ ♀, Dharmawala, Timli range, Dehradun, 30.xi.2005, Reg. No. IV. 300, coll. A.N. Rizvi & Party; 4 ♀ ♀, Ghangharia, Chamoli, 20.viii.06, Reg. No. IV. 301, coll. D. Bisht & Party, 8 ♀ ♀, Doiwala, Dehradun, 19.xii.06, Reg. No. IV. 302, coll. S.J.S. Hattar & Party; 2 ♀ ♀, Haridwar, 19.xii.06, Reg. No. IV. 303, coll. S.J.S. Hattar & Party.

Dimensions : Female : L = 0.4-0.52 mm, a = 16.8-18.7; b = 3.5-3.7; c = 10.2-11.7; V = 60-61.

Description : Female : Body robust, tapering towards both ends. Cuticle thick and coarsely striated. Lateral fields marked with four incisures. Labial probolae deeply furcated, 10-12 μ m long, furcating at about half of length. Cephalic probolae reaching half way to labials, acute, forwardly pointing, lightly fringed. Head offset, 13-14 μ m wide. Stoma 10-12 μ m deep. Esophagus with sub cylindrical corpus, short isthmus and valvated terminal bulb. Vulva post equatorial. Ovary single, anterior and reflexed. Post-vulval sac very small. Tail conoid.

Male : Not found.

Distribution : India : Uttarakhand, West Bengal, Sikkim.

Habitat & Locality : Soil around roots of Sal forests of CTR, Nainital; Sugarcane fields from Mohand Rao, Doiwala, Sal from Timli forests, Sabbahwala and Dharmawala, district Dehradun, Jamun from district Haridwar and silver oak from district Chamoli.

Remarks : This species was recorded for the first time from WDS by Rizvi (2007). Soil around roots of sal, sugarcane and silver oak are new habitat records for the species.

Genus *Acrobeloides* (Cobb, 1924) Steiner & Buhrer, 1933

82. *Acrobeloides buetschlii* (de Man, 1884) Steiner & Buhrer, 1933

1884. *Cephalous buetschlii*, de Man, *der niederlandischen Fauna*, 92.

1933. *Acrobeloides buetschlii* Steiner & Buhner, *Plant Dis. Repr.*, 17 : 172-173.

Material examined : 2 ♀ ♀, CTR, Nainital, 26.ii.05, Reg. No. IV. 249, coll. A.N. Rizvi & Party; 2 ♀, ♀, CTR, Nainital, 26.ii.05, Reg. No. IV. 250, coll. A.N. Rizvi & Party; 9 ♀ ♀, Kalsi, Dehradun, 4.v. 06, Reg. No. IV. 304, coll. H.S. Mehta & Party; 4 ♀ ♀, Mohand Rao, Dehradun, 7.xii.05, Reg. No. IV. 305, coll. H.S. Mehta & Party; 7 ♀ ♀, Chakrata, Dehradun, 24.v.06, Reg. No. IV. 306, coll. H.S. Mehta & Party; 2 ♀ ♀, Sahiya, Dehradun, 7.xii.05, Reg. No. IV. 307, coll. H.S. Mehta & Party; 1 ♀, Sabbahwala, Timli range, Dehradun, 30.xi.2005, Reg. No. IV. 308, coll. A.N. Rizvi & Party; 7 ♀ ♀, Ghangharia, Chamoli, 20.viii.06, Reg. No. IV. 309, coll. D. Bisht & Party; 3 ♀ ♀, Doiwala, Dehradun, 19.xii.06, Reg. No. IV. 310, coll. S.J.S. Hattar & Party; 2 ♀ ♀, FRI, Dehradun, 5.vii.06, Reg. No. IV. 311, coll. A.N. Rizvi & Party.

Dimensions : Female : L = 0.30-0.62 mm; a = 12-19; b = 3.2-5.2; c = 14-16; V = 61-65.

Description : Female : Body small, straight, tapering at extremities. Cuticle transversely annulated. Lip region slightly expanded, with three rounded- conical labial probolae. Stoma about a head-width long. Cheilostom triquetrous. Prostom and glottoid apparatus forming a narrow triquetrous tube. Metarhabdions only about as long as meso-and telorhabdions, the dorsal segment somewhat dentate. Lateral field with three incisures. Labial papillae conoid. Basal half of corpus forming an elongated spindle shaped swelling. Isthmus about as long as neck width. Nerve ring encircles isthmus near middle. Excretory pore opposite to nerve ring. Basal bulb well developed, with valvular apparatus. Cardia conoid. Vulva post equatorial. Ovary monodelphic, reflexed, flexure extends beyond vulva. Tail sub cylindrical, tapering to a bluntly rounded terminus.

Male : Not found.

Distribution : India : Uttar Pradesh Uttarakhand, Bihar, Sikkim.

Elsewhere : U.S.A. Germany, Italy, Poland, Spain and Sweden.

Habitat & Locality : Soil around roots of Sal, from CTR, Nainital. Mango, Litchi from Kalsi , Sugarcane from Mohand Rao and Doiwala, Sal

from Sabbahwala, Pine from FRI forest, Tea plantations from district Dehradun; silver oak from Ghangharia, district Chamoli.

Remarks : Soil around litchi, mango, sugarcane sal and thumer are new habitat records for the species.

Genus *Chiloplacus* Thorne, 1937

83. *Chiloplacus subtenuis* Rashid & Heynes, 1990

1990. *Chiloplacus subtenuis* Rashid & Heynes, *Phytophylactica*, 22 : 192.

Material examined : 2 ♀ ♀, 2 ♂ ♂, Mohand Rao, Dehradun, 7.xii.05, Reg. No. IV. 312, coll. H.S. Mehta & Party; 2 ♀ ♀, Sabbahwala, Timli range, Dehradun, 30.xi.2005, Reg. No. IV. 313, coll. A.N. Rizvi & Party; 2 ♀ ♀, Dharmawala, Timli range, Dehradun, 30.xi.2005, eg. No. IV. 314, coll. A.N. Rizvi & Party; 5 ♀ ♀, Doiwala, Dehradun, 19.xii.2006, Reg. No. IV. 315, coll. S.J.S. Hattar.

Dimensions : Female : L = 0.71-0.75 mm; a = 27-28.6; b = 3.2-3.8; c = 16-18; V = 66-67.

Male : L = 0.74 mm; a = 28.6; b = 3.5; c = 17.4; T = 49, spicule = 35 µm.

Description : Body straight or bent slightly in vulval region. Cuticle annulated, annules 1.8-2.0 µm wide. Lateral fields areolated with five incisures, equally spaced. Labial probolae bifurcate up to 20% of the length, with blunt margins. Cephalic probolae flap-like and separated by prominent primary axils. Secondary axils not so prominent. Cephalic probolae with two circlets of ten papillae. Amphidial aperture elliptical, at base of cephalic probolae. Stoma with widely spaced cheilostomal walls and tubular gymnostomal and stegosomal walls. Pharyngeal corpus cylindrical, seven to eight times longer than isthmus. Nerve ring at 135-145 µm from anterior end. Cardia conoid, 3.5-4.5 µm long. Gonad single, prodelphic. Ovary reflexed, often with post -vulval flexures. Post-uterine sac present, 72-90 µm long. Vulva with protruding radially ridged lips. Rectum 24-28 µm long. Tail long, cylindrical, with 22-24 annules and rounded terminus. All five lateral incisures reaching up to the tail tip, not interrupted by phasmids, located at about 46-50 % of tail length.

Males : Similar to females in general body characters. Monorchic, testis reflexed anteriorly. Spicules arcuate and cephalated, 1.3-1.6 anal body

diameter long. Gubernaculum simple, about half of spicule length. Tail short, conoid with bluntly rounded terminus. Lateral incisures five, just anterior to phasmids, four at level of phasmids, three posterior to phasmids and two at the tail tip. Genital papillae, eight pairs, four pairs pre-cloacal, ventro-lateral in position and four pairs post-cloacal in position. Of the post-cloacal pairs, two ventro-lateral, one lateral and one dorso-lateral in position. In addition, a single pre-cloacal papilla present on anterior cloacal tip. Phasmids 20-28 µm from cloaca, just posterior to lateral post-cloacal papillae.

Distribution : India : Uttar Pradesh Uttarakhand, and Gujarat.

Elsewhere : Namibia and Spain.

Habitat & Locality : Soil around roots of Sugarcane, Mohand Rao, Doiwala, Sal from Sabbahwala and Teak from Dharmawala, Dehradun.

Remarks : This species recorded for the first time from WDS by Rizvi (2007).

Genus *Zeldia* Thorne, 1937

84. *Zeldia punctata* (Thorne, 1925) Thorne, 1937

1925. *Acrobeles punctata* Thorne, *Trans. Amer. Micr. Soc.*, 44 : 200.

1935. *Acrobeles glaphyrus* Steiner, *Proc. Helm. Soc. Wash.*, 2 : 41.

1937. *Zeldia punctata* Thorne, *Proc. Helm. Soc. Wash.*, 4 : 15.

1972. *Zeldia minor* Allen & Noffsinger, *Proc. Helm. Soc. Wash.*, 39 : 220.

Material examined : 1 ♀, Chakrata, Dehradun, 24.v.06, Reg. No. IV. 316, coll. H.S. Mehta & Party.

Dimensions : Female : L = 0.75 mm; a = 18.6; b = 3.5; c = 11.5; V = 58.

Description : Body straight or slightly curved ventrally upon fixation. Cuticle without punctuation. Cuticle annulated, annules 1.8 mm at anterior end, 1.9 at midbody and 2.6 mm on tail. Lateral fields marked by five incisures; not crenate. Outer incisures widely spaced areolated; three inner incisures very closely placed and not visible clearly. Lip region 10 mm wide, 2.5 mm high. Labial probolae with rounded margins and shallow

grooves. Cephalic probolae six, flap-like, edges crenate anteriorly projecting margins at the primary cephalic axils. Amphidial apertures elongate oval. Cheilostome wall prominent. Gymnostom smaller than stegostom. Pharyngeal corpus cylindrical, six or eight times isthmus length. Basal bulb valvated, 23 x 20 mm. Dierids in posterior region of corpus, in the area of the nerve ring. Excretory pore opposite nerve ring. Cardia conoid, 3.0 mm long. Gonad single, prodelphic. Ovary reflexed, with additional flexures near the tip. Post-uterine sac 15 mm. Vulval lips depressed, radially ridged. Rectum 24 mm long. Tail conoid, terminus pointed. Phasmids anterior to middle of tail.

Male : Not found.

Distribution : India : Uttar Pradesh and Uttarakhand.

Elsewhere : Namibia, Hungary, Poland, Spain and U.S.A.

Habitat and Locality : Soil around roots of Deodar from Chakrata, district Dehradun.

Remarks : This species was recorded for the first time from Uttarakhand by Rizvi & Bhutia (2009). Deodar is new habitat record.

Superfamily PANAGROLAIMOIDEA

Family PANAGROLAIMIDAE

Genus *Trilabiatatus* Goodey, 1963

85. **Trilabiatatus lignicolus* (Korner, 1954) Goodey, 1963

1954. *Tricephalobus lignicolis* Korner, *Zool. Jber. Neapel*, 82 : 250.

1963. *Trilabiatatus lignicolus* Goodey, *Soil and freshwater nematodes* : 265.

Dimensions : Male : L = 0.59 mm; a = 35; b = 4.3; c = 9.5; spicule = 21 mm; gubernaculum = 8 mm.

Description : Male : Head with 3 broad lips each bearing somewhat 2 rings of papillae. Promesostom with parallel sides, shorter than metasom. Esophagus swelling to a median bulb. Terminal bulb with valve plates. Gonads of both sexes panagrolaimid. Mail tail conical with an off set short finger-like terminus, with 8 pairs of papillae. Spicules with knobbed rips; gubernaculum with bifid distal end.

Distribution : India : Uttarakhand, Sikkim and Bihar.

Habitat & Locality : Soil around roots of Tea Plantations of Dehradun.

Remarks : This species was recorded by Khera & Chaturvedi (1977) from Dehradun.

Order ARAEOLAIMIDA

Superfamily PLECTOIDEA

Family PLECTIDAE

Subfamily PLECTINAE

Genus *Plectus* Bastian, 1865

86. *Plectus cirratus* Bastian, 1865

1865. *Plectus cirratus* Bastian, *Linn. Soc. Lond. Trans.*, 25 : 95.

Material Examined : 2 ♀ ♀, Sahiya, Dehradun, 7.xii.05, Reg. No. IV. 317, coll. H.S. Mehta & Party.

Dimensions : Female : L = 0.90-0.93 mm, a = 21-22; b = 4.1-4.3; c = 7.9-8.1; V = 47-49.

Description : Female : Body arcuate ventrally upon fixation. Cuticle thick finely striated. Head slightly set off, 9-10 µm wide. Setae behind the head region. Amphid open circle. Stoma 21-30 µm long, 4-5 µm wide. Esophagus cylindrical with a valvular terminal bulb. Cardia long, surrounded by intestine. Vulva median. Ovaries two, opposed reflexed. Tail long tapering, terminus with spinneret.

Male : Not found.

Distribution : India : Uttarakhand, Uttar Pradesh, Sikkim.

Elsewhere : South Africa.

Habitat & Locality : Soil from rice fields, Sahiya, district Dehradun.

Remarks : This species was recorded for the first time from Uttarakhand by Rizvi & Bhutia (2009) and also for the first time from rice fields.

87. **Plectus thornei* Ruhm, 1956

1956. *Plectus thornei* Ruhm, *Parasit. Schr. Reihe.*, 6 : 412.

Dimensions : Female : L = 0.44 mm, a = 24; b = 3.5; c = 9.4; V = 50.

Description : Body arcuate, cuticle transversely striated, lateral field marked with four incisures, inner pair feeble and with wider gap.

Many glands open in the lateral field. Esophagus cylindrical with a valvular terminal bulb, anterior to the terminal bulb, a swollen structure present.

Male : Not found.

Distribution : India : Uttar Pradesh, Uttarakhand and West Bengal.

Elsewhere : Germany.

Habitat & Locality : Soil around roots of Tea Plantations of Dehradun.

Remarks : This species was recorded by Khera & Chaturvedi (1977) from Dehradun.

Genus *Chiloplectus* Andrassy, 1984

88. *Chiloplectus indicus* Tahseen *et al.*, 2004

2004. *Chiloplectus indicus* Tahseen *et al*, *Nematology.*, 6 : 760-763.

Material Examined : 3 ♀ ♀, Ghangharia, Chamoli, 20.viii.06, Reg. No. IV. 318, coll. D. Bisht & Party.

Dimensions : Female : L = 0.48-0.52 mm, a = 17-20; b = 3.5-3.7; c = 11-12; V = 53.2-54.

Description : Female : Body arcuate towards posterior extremity. Cuticle thick, strongly annulated. Lateral fields with three incisures. Lip region strongly offset, with conical lips, separated from each other by a distinct gap, with inner setose projections pointing towards oral aperture. Cephalic setae 2-3 µm long, originating from second to thirteenth annule. Cervical setae 7-9 in number. Stoma with cuticularized cheilostome. Amphidial apertures plectoid, located anterior to middle of stoma, at 5-6 annules from base of lips. Esophagus with corpus, slightly narrower isthmus and a basal bulb with post bulbar extension leading to a small cardia. Basal pharyngeal bulb with a six pairs of denticulate ridges in grinder. Reproductive system didelphic, genital tract weakly developed. Ovaries small, reflexed. Vagina straight with weak sphincter muscles. Vulval lips protruding. Tail ventrally curved, gradually narrowing towards tip with a subterminal mid dorsal spur and three pairs of caudal setae.

Male : Not found.

Distribution : India : Uttarakhand, Uttar Pradesh, and Arunachal Pradesh.

Habitat & Locality : Soil around roots of thumer, *Taxus baccata* and silver oak from Ghangharia, district Chamoli.

Remarks : *Chiloplectus indicus* was recorded for the first time from Uttarakhand by Rizvi & Bhutia (2009) from district Chamoli at an altitude of 10.000ft. Soil around roots of thumer is a new habitat record.

Family CAMACOLAIMIDAE

Genus *Paraphanolaimus* Micoletzky, 1923

89. **Paraphanolaimus micoletzkyi* Khera & Chaturvedi, 1977

1977. *Paraphanolaimus micoletzkyi* Khera & Chaturvedi, *Rec. zool. surv. India*, **72** : 135.

Dimensions : Female : L = 0.52 mm; a = 25; b = 7.7; c = 5.7; V = 51.

Description : Female : Body recurved ventrally upon fixation. Tail conical, gradually narrowing behind anus. With a narrow and pointed tip, ending in a terminal spike. Cuticle transversely striated, striations course, 1.6µm apart in the vulval region. Lateral field narrow, 1.5µm wide, 2 incisures, crenate, beginning in the pharyngeal region and continuing far behind anus. Series of gland cells present under the lateral field and connected to the exterior by a pore through the cuticle, 2 in the pharyngeal region, 13 over the intestine, 1 opposite anus and 1 on the tail. Head not offset, rounded, lips and papillae obscure, 4 cephalic setae, each 6µm long. Amphids large, far forward on head, open spiral, almost ring-like. Stoma slightly less than one head deep, tapering towards base and provided with 3 short local thickenings of wall. Esophagus cylindrical followed by spear shaped bulb 91µm long. Esophago-intestinal cell 10 µm long. Excretory gland cell at 63µm from anterior end. Ovaries two, opposed and reflexed.

Distribution : India : Uttarakhand.

Habitat & Locality : Soil around roots of Tea Plantations of Dehradun.

Remarks : This species was reported and described by Khera & Chaturvedi (1977) from Dehradun.

Order MONHYSTERIDA

Family MONHYSTERIDAE

Subfamily MONHYSTERINAE

Genus *Prismatolaimus* de Man, 1880

90. *Prismatolaimus andrassyi* Khera and Chaturvedi, 1977

1977. *Prismatolaimus andrassyi* Khera & Chaturvedi, *Rec. Zool. Surv. India*, **72** : 137-138.

Material Examined : 1 ♀, CTR, Nainital, 26.ii.05, Reg. No. IV. 251, coll. A. N. Rizvi and Party.

Dimensions : Female : L = 0.66 mm, a = 38; b = 4.3; c = 3.2; V = 54.

Description : Female : Body slender, curved ventrally upon fixation. Cuticle with fine transverse striations. Head low and rounded anteriorly. Cephalic setae in two circlets of six and four. Stoma 8 µm long, walls cuticularized, posterior part narrow, provided with denticulate basal part and dorsal tooth. Esophagus cylindrical with slight expansion towards the posterior end. Esophago-intestinal valve oval with 2 rows of 4 cells. Gonad mono prodelphic and reflexed. Tail long, narrow and filiform with a spinneret

Male : Not found.

Distribution : India : Uttarakhand, West Bengal, Bihar, Uttar Pradesh.

Habitat & Locality : Soil around Sal from CTR, district Nainital and Tea Plantation from Dehradun.

Remarks : This species was recorded for the first time from Tea Plantations of Dehradun by Chaturvedi & Khera (1977). Soil around Sal is a new habitat record from CTR, Nainital.

Order CHROMADORIDA

Family CYTHOLAIMIDAE

Genus *Achromadora* Cobb, 1913

91. **Achromadora ruricola* (de Man, 1880) Micoletzky, 1925

1880. *Cytholiamus ruricola* de Man, *Tijdschr. ned. dierk. Vereen*, **5** : 18.

1913. *Achromadora minima* Cobb, *J. Wash. Acad. Sci.*, **3** : 440.

1925. *Achromadora ruricola* Micoletzky, *K. danske. Vidensk. Selsk. Skr. Natur. Og. Math. Afd. ser 8* **10** : 133.

Dimensions : Female : L = 0.41-0.72 mm; a = 23-24; b = 5.5-6.2; c = 6.5-8.5; V = 47-49.

Description : Female : Body stout, cylindrical, curved ventrally, narrowing posteriorly. Cuticle transversely striated, striae ornamented with rows of punctuations. Head truncated lips with small apical papillae. Amphid spiral, 10 µm from anterior end. Stoma funnel shaped, dorsal tooth situated near the base of stoma. Esophagus cylindrical; with a terminal bulb. Tail long, conoid, curved ventrally with a terminal peg. Caudal glands present.

Distribution : India : Uttar Pradesh, Uttarakhand, West Bengal and Sikkim.

Elsewhere : Canada, Netherlands, Poland, Belgium, Hungary, Italy, Scotland, Spain, Kenya and Tanzania.

Habitat & Locality : Soil around roots of Tea Plantations of Dehradun.

Remarks : This species was recorded by Khera & Chaturvedi (1977) from Dehradun.

Genus *Odontolaimus* de Man, 1880

92. **Odontolaimus aquaticus* Schneider, 1937

1937. *Odontolaimus aquaticus* Schneider, *Arch. Hydrobiol. Suppl.*, 15 : 86.

Dimensions : Female : L = 0.72 mm; a = 36; b = 6.3; c = 2.8; V = 38.

Distribution : India : Uttarakhand.

Elsewhere : Sumatra.

Habitat & Locality : Soil around roots of Tea Plantations of Dehradun.

Remarks : This species was recorded by Khera & Chaturvedi (1977) from Dehradun.

Order ENOPLIDA

Family IRONIDAE

Subfamily IRONINAE

Genus *Ironus* Bastian, 1865

93. *Ironus longicaudatus* de Man, 1884

1884. *Ironus longicaudatus* de Man, *der niederlandischen Fauna*, 102.

Material examined : 2 ♀ ♀, CTR, Nainital, 23.ii.05, Reg. No. IV. 252, coll. A. N. Rizvi and Party; 2 ♀ ♀, CTR, Nainital, 24.ii.05, Reg. No. IV. 253, coll. A. N. Rizvi and Party; 1 ♀, CTR,

Nainital, 26.ii.05, Reg. No. IV. 254, coll. A. N. Rizvi and Party; 1 ♀, CTR, Nainital, 26.ii.05, Reg. No. IV. 255, coll. A.N. Rizvi and Party; 2 ♀ ♀, Mohand Rao, Dehradun, 7.xii.05, Reg. No. IV. 319, coll. H.S. Mehta & Party; 3 ♀ ♀, Selaqui, Dehradun, 5.1.06, Reg. No. IV. 320, coll. S.J.S. Hattar & Party; 2 ♀ ♀, Kalsi, Dehradun, 4.v.06, Reg. No. IV. 321, coll. H.S. Mehta & Party; 1 ♀, Chakrata, Dehradun, 24.v.06, Reg. No. IV. 322, coll. H.S. Mehta & Party; 2 ♀ ♀, FRI, Dehradun, 5.vii.06, Reg. No. IV. 323, coll. A. N. Rizvi and Party; 3 ♀ ♀, Haridwar, 19.xii.06, Reg. No. IV. 324, coll. S.J.S. Hattar & Party.

Dimensions : Female : L = 1.4-1.6 mm; a = 50-55; b = 5.3-6.1; c = 4.1-4.9; V = 42-44.

Description : Female: Body slender, tapering towards extremities, ventrally curved in position upon fixation. Cuticle smooth. Head set off, 12-13 µm wide, 5-7 µm high. Lips round, each with an apical papilla and four submedian setae. Amphid cup-shaped. Pharynx composed of sclerotized shields with three teeth at its base, one dorsal and two subventral. Stoma tubular, 3-4 µm wide, 82-84 µm long. Esophagus almost cylindrical. Cardia long and conical. Vulva pre-equatorial. Ovary paired, opposed and reflexed. Tail very long and filiform.

Distribution : India : Uttar Pradesh, Uttarakhand Bihar, West Bengal and Sikkim.

Elsewhere : South Africa, Germany, Hungary, Poland and Austria.

Habitat and Locality : Soil around roots of Sal from CTR, Nainital. Sugarcane from, Selaqui, Mohand Rao, Mango from Kalsi and Deodar from Chakrata, Pine from FRI district Dehradun and Jamun from Haridwar.

Remarks : This species was recorded for the first time from WDS by Rizvi (2007) Soil around Mango and Deodar and Jamun are new habitat records for this species.

94. **Ironus ignavus* Bastian, 1865

1865. *Ironus ignavus* Bastian, *Trans. Linn. Soc. Lond.*, 25 : 104.

Dimensions : Female : L = 1.40-1.54 mm; a = 40-50; b = 5.2-5.9; c = 4.7-5.3; V = 45-49.

Description : Female : Body slender. Cuticle without striations, setae or lateral alae. Head offset

by shallow constriction. Stoma long tubular, with 3 anterior eversible hook-like tooth. Vulva equatorial, gonads paired, opposed and reflexed. Tail tapering to fine point.

Distribution : India : Uttar Pradesh and Uttarakhand.

Elsewhere : South Africa, Germany, Hungary, Poland Romania and.

Habitat & Locality : Soil around roots of Tea Plantations of Dehradun.

Remarks : This species was recorded by Khera & Chaturvedi (1977) from Dehradun.

Genus *Cryptonchus* Cobb, 1913

95. **Cryptonchus abnormis* (Allgen, 1933)
Schuermans Stek, 1951

1933. *Cylindrolaimus abnormis* Allgen, *Zool. Anz.*, **103** : 317.

1951. *Cryptonchus abnormis* Schuurmans Stek, *Mem. Inst. Sci. nat. Belg.*, **2** : 39.

Dimensions : Female : L = 0.98-1.06 mm; a = 44-47; b = 4.6-4.7; c = 3.3-3.4; V = 43-44.

Description : Females : Cuticle smooth, head flat. Stoma about 13 times longer than wide, with 2 small dorsal ridge-like teeth at its base. Esophagus cylindrical with prominent, cuticularized lumen. Tail long and filiform. Caudal glands present.

Distribution : India : Uttarakhand and West Bengal.

Elsewhere : Sweden, Denmark, Germany and Poland.

Habitat & Locality : Soil around roots of Tea Plantations of Dehradun.

Remarks : This species was recorded from district Dehradun by Khera & Chaturvedi (1977)

Family Oncholaimidae

Genus *Onchulus* Cobb, 1920

96. **Onchulus longicauda* (Daday, 1899)
Andrassy, 1964

1899. *Monhsytera longicauda* Daday, *Math. Term. tud. Akad. Bpest.*, **17** : 560.

1920. *Onchulus longicaudatus* Cobb, *Contr. Sci. Nematol.*, **9** : 313.

1964. *Onchulus longicauda* Andrassy, *Opusc.zool.Bpest.*, **5** : 29.

Dimensions : Female : L = 0.92 mm; a = 48; b = 5.2; c = 2.7; V = 38.

Distribution : India : Uttarakhand.

Elsewhere : Hungary.

Habitat & Locality : Soil around roots of Tea Plantations of Dehradun.

Remarks : This species was recorded from Dehradun by Khera & Chaturvedi (1977).

Family TRIPYLIDAE

Genus *Tripyla* Bastian, 1865

97. **Tripyla affinis* de Man, 1880

1880. *Tripyla affinis* de Man, *Tijdschr. ned. dierk. Vereen.*, **5** : 12.

Dimensions : Female : L = 0.60-0.97 mm; a = 25-29; b = 3.8-5.0; c = 7.7.

Distribution : India : Uttar Pradesh and Uttarakhand.

Elsewhere : Denmark, Netherlands, France, Germany, Czech Republic, Zaire, Austria, Italy, Poland and Sweden.

Habitat & Locality : Soil around roots of Tea Plantations of Dehradun.

Remarks : This species was recorded from Dehradun by Khera & Chaturvedi (1977).

Order DORYLAIMIDA

Suborder DORYLAIMINA

Superfamily DORYLAIMOIDEA

Family DORYLAIMIDAE

Subfamily LAIMYDORINAE

Genus *Amphidorylaimus* Andrassy, 1960

98. **Amphidorylaimus infecundus* (Cobb, 1936) Andrassy, 1960

1936. *Dorylaimus infecundus* Cobb in Thorne & Swanger, *Capita. zool.*, **6** : 31.

1960. *Amphidorylaimus infecundus* (Cobb, 1936) Andrassy, *Acta zool. Hung.*, **6** : 12.

Dimensions : Female : L = 0.90-0.95 mm; a = 45 b = 4.3; c = 3.5-3.7; V = 36-37; stylet = 10-11 μ m.

Description : Females : Small nematodes, characterized by the well off set, well-developed head. Lips angular and set off by a deep constriction. Esophagus gradually expanding near its middle. Tail tapering evenly beyond anus, about 10 anal-body widths long.

Distribution : India : Uttarakhand.

Elsewhere : Japan and Belgium.

Habitat & Locality : Soil around roots of Tea Plantations of Dehradun.

Remarks : This species was recorded by Khera & Chaturvedi (1977) from Dehradun.

Genus *Prodorylaimus* Andrassy, 1959

99. **Prodorylaimus obesus* Ahmad & Jairajpuri, 1982

1982. *Prodorylaimus obesus* Ahmad & Jairajpuri, *Nematologica*, 28 : 42.

Dimensions : Female : L = 1.63-1.80 mm; a = 26-30; b = 4.6-5.2; c = 26-30; V = 50-56; G₁ = 21-27; G₂ = 20-27; odontostyle = 23-25; odontophore = 32-33; esophagus = 345-365 µm; prerectum = 55-68 µm; rectum = 37-42 µm; tail = 61-70 µm; ABD = 30-33 µm.

Description : Female : Body curved ventrally upon fixation and tapering more towards both extremity. Cuticle with fine transverse striae. Lip region offset by a depression. Odontostyle 1.3-1.4 lip widths long, its aperture about 1/3rd of its length. Guiding ring 'double', 13-14 µm or 0.7-0.8 lip width from anterior end. Odontophore simple rod-like, 1.3-1.5 times the odontostyle length. Reproductive system amphidelphic. Tail elongate-conoid, dorsally curved, about two anal body widths long with a pair of caudal pores on each side.

Distribution : India : Uttar Pradesh, Uttarakhand.

Habitat & Locality : Soil around roots of mosses and grasses from Ramgarh, district Nainital.

Remarks : This species was reported and described from district Nainital by Ahmad & Jairajpuri (1982).

Genus *Prodorylaimium* Andrassy, 1969

100. **Prodorylaimium brigdammense* (de Man, 1876) Andrassy, 1969

1876. *Dorylaimus brigdammense* de Man, *Tijdschr. ned. dierk. Vereen.*, 2 : 85.

1969. *Prodorylaimium brigdammense* Andrassy, *Opuscula Zoologica, Bpst.*, 9 : 230.

Dimensions : Female : L = 1.49-1.74 mm; a = 41-45; b = 5.4-5.7; c = 5-6; c' = 13-15; V = 46-49; G₁ = 12-16; G₂ = 12-14; odontostyle = 13-14; odontophore = 17-18; esophagus = 276-312 µm; prerectum = 60-62 µm; rectum = 27-31 µm; tail = 259-344 µm; ABD = 20-23 µm.

Male : L = 1.43 mm; a = 45; b = 5; c = 5; c' = 12; T = 40; odontostyle = 13; odontophore = 18; esophagus = 282 µm; spicules = 35 µm; lateral guiding pieces = 9 µm, ventromedian supplements = 7; prerectum = 76 µm; rectum = 37-42 µm; tail = 174 µm; ABD = 23 µm.

Distribution : India : Uttar Pradesh, Uttarakhand.

Elsewhere : Hungary.

Habitat & Locality : Soil around roots of unidentified bushy plants from Govindghat, district Chamoli.

Remarks : This species was recorded from district Chamoli by Ahmad & Jairajpuri (1982)

Genus *Mesodorylaimus* Andrassy, 1959

101. **Mesodorylaimus chamolienses* Ahmad, 1995

1995. *Mesodorylaimus chamolienses* Ahmad, *Afro Asian J. Nematol.*, 5 : 210.

Dimensions : Female : L = 0.86-0.92 mm; a = 32-36; b = 3.9-4.2; c = 4.2-4.8; c' = 10-12; V = 46-47; G₁ = 9-12; G₂ = 10-13; odontostyle = 11-12; odontophore = 14-15; tail = 185-270 µm.

Description : Female : Body slightly curved ventrally upon fixation and tapering posteriorly into a whip-like, filiform tail. Cuticle finely striated. Lateral, dorsal and ventral pores indistinct. Odontostyle 1.3-1.4 lip widths long, its aperture about 33 % of its length. Guiding ring single, at 7 µm or 0.8-0.9 lip width from anterior end. Odontophore simple rod-like. Pharyngeal length 210-217 µm. Expanded part of esophagus 38-40% of pharyngeal length. Cardia small, hemispheroid, 10-13 µm long. Reproductive system amphidelphic. Tail 185-270 µm, 10-12 anal body widths long with a pair of caudal pores on each side.

Male : Not found.

Distribution : India : Uttar Pradesh, Uttarakhand, Jammu & Kashmir.

Elsewhere : Japan.

Habitat & Locality : Soil around roots of grasses from Chamoli.

Remarks : This species was reported and described by Ahmad (1995) from district Chamoli.

Genus *Afrodorylaimus* Andrassy, 1960

102. **Afrodorylaimus geniculatus* (Andrassy, 1961) Andrassy, 1964

1961. *Dorylaimus geniculatus* Andrassy, *Ann. Hist. nat. Mus. Nat. Hung.*, **53** : 295.

1964. *Afrodorylaimus geniculatus* Andrassy, *Acta. Zool. Hung.*, **10** : 55.

Dimensions : Female : L = 1.43 mm; a = 35-40; b = 3.5-3.9; c = 5-6; c' = 11-14; V = 49-53; G₁ = 7-8; G₂ = 8-9; odontostyle = 23-24; odontophore = 19-20; esophagus = 315-326 µm; prerectum = 42-46 µm; rectum = 26-30 µm; tail = 225-255 µm; ABD = 18-21 µm.

Male : L = 1.19 mm; a = 32; b = 3.5; c = 33; c' = 1.4; T = 51; odontostyle = 24; odontophore = 19; esophagus = 338 µm; spicules = 36 µm; lateral guiding pieces = 12 µm, ventromedian supplements = 8; prerectum = 66 µm; tail = 36 µm; ABD = 26 µm.

Distribution : India : Uttar Pradesh, Uttarakhand.

Elsewhere : Hungary.

Habitat & Locality : Soil around roots of grasses from Chamoli.

Remarks : This species was recorded from district Chamoli by Ahmad & Jairajpuri (1982).

Subfamily THORNENEMATINAE

Genus *Thornenema* Andrassy, 1959

103. **Thornenema cavalcantii* (Lordello, 1955) Andrassy, 1959

1955. *Dorylaimus cavalcantii* Lordello. *Revta. Bras. Biol.*, **5** : 216.

1959. *Thornenema cavalcantii* Andrassy, *Acta. zool. Hung.*, **5** : 196.

Dimensions : Female : L = 0.95-1.05 mm; a = 32-33; b = 3.8-4.2; c = 10-11; c' = 4-5; V = 43-46; odontostyle = 11-12; odontophore = 16-17; esophagus = 245-248 µm; Prerectum = 50-55 µm; rectum = 26-27 µm; tail = 93-101 µm; ABD = 20-21 µm.

Description : Female : Body slightly ventrally arcuate upon fixation, tapering towards both extremities. Cuticle with fine transverse striae thickest at tail. Lateral hypodermal chords about 1/8th of body width near midbody. Lip region smoothly rounded, continuous with body contour. Odontostyle slightly longer than lip width, its aperture about two-fifths of its length. Guiding ring single Odontophore rod-like, 1.2-1.4 times the odontostyle length. Expanded part of esophagus 46-51% of pharyngeal length. Reproductive system amphidelphic. Pre-rectum 1.6-1.22 anal body widths long. Rectum 1.2-1.6 anal body widths long. Tail short, conoid with a pair of caudal pores on each side.

Distribution : India : Uttar Pradesh, Uttarakhand and Sikkim.

Elsewhere : Brazil, Venezuela and Hungary.

Habitat & Locality : Soil around roots of Tea Plantations from Dehradun and around wild trees from district Chamoli.

Remarks : This species was recorded from Dehradun by Khera & Chaturvedi (1977) and by Ahmad & Jairajpuri (1982) from Chamoli.

104. **Thornenema mauritianum* (Williams, 1959) Baqri & Jairajpuri, 1969

1959. *Chrysonema mauritiana* Williams, *Occ. Pap. Maurit. Ind. Res. Inst.*, **3** : 28.

1964. *Thornenema viriosum* Williams, *Nematologica*, **10** : 346.

1965. *Thornenema filiforme* Siddiqi, *Labdev. J. Sci. Tech.*, **3** : 129.

1965. *Thornenema africanum* Andrassy, *Opusc. Zool. Bpest.*, **2** : 139.

1965. *Thornenema delhiensis* Prasad & Chawla, *Indian J. Ent.*, **27** : 140.

1964. *Thornenema mauritianum* Baqri & Jairajpuri, *Nematologica*, **13** : 358.

Dimension : Female : L = 1.55 mm; a = 46; b = 4; c = 5.5; V = 31; stylet = 11.2.

Description : Female : Body ventrally arcuate upon fixation. Lip region distinctly setoff from body, expanded, discoid. Odontostyle 15µm long; slightly smaller lip region; aperture about 1/3 of odontostyle length. Odontophore slightly longer than

odontostyle. Female reproductive system amphidelphic. Prerectum more than one anal body-width long. Tail dorsally convex conoid, about one anal body-width long.

Distribution : India : Uttar Pradesh Uttarakhand, Andamans and Delhi.

Elsewhere : Africa, Hungary and Mauritius.

Habitat & Locality : Soil around roots of Tea Plantations of Dehradun.

Remarks : This species was recorded from Dehradun by Khera & Chaturvedi (1977).

105. **Thornenema baldum* (Thorne, 1939)
Andrassy, 1959

1939. *Dorylaimus baldus* Thorne, *Capita Zoologica.*, 8 : 10.

1959. *Thornenema baldum* Andrassy, *Acta zool. Hung.*, 32 : 215.

Dimensions : Female : L = 1.1-1.2 mm; body width at mid-body = 37-43; body width at neck = 36.0-41.5; body width at anus = 21.5-22.5; a = 27-31; b = 4.9-5.2; c = 8.2-9.7; c' = 5.6-6.5; V = 33-35; G₁ = 11.0-12.5; G₂ = 12-18; lip region width = 10.5 µm; lip region height = 4.8 µm; odontostyle = 11-12; odontophore = 20.0-21.5; nerve ring from anterior end = 97-100 µm; expanded part of esophagus = 83.0-89.5; prerectum = 51-56 µm; rectum = 26.5-33.5 µm; tail = 120-140 µm; ABD = 20-21 µm.

Distribution : India : Uttar Pradesh, Uttarakhand and Maharashtra.

Elsewhere : Sumatra, Mauritius, Russia, Malaysia, Australia, South Africa, Brazil, Papua New Guinea, Hungary.

Habitat & Locality : Soil around roots of grasses from Ranikhet, district Almora.

Remarks : This species was recorded by Siddiqi (1965) from Ranikhet, district Almora.

106. **Thornenema garhwalicum* Srivastava
et al., 2000

2000. *Thornenema garhwalicum* Srivastava et al., *Indian J. Nematol.*, 30 : 48.

Dimension : Female : L = 1.37-1.47 mm; a = 33.8-42.8; b = 4.8-5.2; c = 6.6-9.1; c' = 6.4-7.2; V = 34.7-42.4; odontostyle = 9-13 µm; odontophore = 6.5-8.0 µm; esophagus = 259-307 µm; rectum = 25-29 µm; tail = 161-210 µm.

Male : L = 1.35 mm; a = 34; b = 4.8; c = 67.9; odontostyle = 12 µm; odontophore = 16 µm; esophagus = 280 µm; spicule = 50 µm; tail = 20 µm; VMS = 14.

Description : Female : Body slightly curved upon fixation, more towards posterior half, tapering gradually at both extremities. Odontostyle cylindrical, aperture occupying one third of odontostyle length. Odontophore slightly longer than odontostyle. Guiding ring at 15-16 µm from anterior region. Nerve ring at 130-140 µm from anterior end. The basal bulb of esophagus about 45-55% of the total pharyngeal length. Cardia conoid, 10-15 µm long. Female reproductive system mono-opisthodelphic Tail narrow, elongated and about 6-7 anal body-width long, narrow rounded terminus with two caudal pores on each side.

Male : Body similar to female except for tail shape. Spicules stout, slightly curved, 50 µm or about two anal body-width long., lateral guiding pieces 10 µm, one adanal and 14 ventro-median supplements (VMS). Tail short, convex-conoid, about half of the anal body-width diameter with a small conical projection.

Distribution : India : Uttarakhand.

Habitat & Locality : Soil around roots of Litchi, *Litchi chinensis* from district Dehradun.

Remarks : Srivastava et al. (2000) reported and described this species from Dehradun.

Genus *Opisthodorylaimus* Ahmad & Jairajpuri, 1982

107. **Opisthodorylaimus chamoliensis*
Ahmad & Jairajpuri, 1982

1982. *Opisthodorylaimus chamoliensis* Ahmad & Jairajpuri, *Revue Nematol.*, 5 : 265.

Dimensions : Female : L = 1.21-1.24 mm; a = 30-34; b = 4.3-4.6; c = 5 c' = 11-12; V = 36-40; G₂ = 11-12; odontostyle = 18 µm; odontophore = 21 µm; esophagus = 262-285 µm; prerectum = 36-39 µm; rectum = 31-32 µm; tail = 246-254 µm; ABD = 21-23 µm.

Description : Female : Body slightly curved ventrally upon fixation and tapering towards both extremities. Lip region truncated, slightly offset from body by a depression, 13 µm or about 1/3rd of body width at base of esophagus. Odontostyle 1.

4 lip widths long, its aperture about $1/3^{\text{rd}}$ of its length. Guiding ring single at 10-11 μm or 0.7-0.8 lip width from anterior end. Odontophore simple rod-like, about 1.2 times the odontostyle length. Expanded part of esophagus occupying 43-44% of pharyngeal length. Reproductive system opisthomonodelphic. Tail long filiform with pointed terminus with 1-2 caudal pores on each side.

Distribution : India : Uttar Pradesh, Uttarakhand.

Habitat & Locality : Soil around roots of mosses and grasses from district Chamoli.

Remarks : This species was reported and described by Ahmad & Jairajpuri (1982) from district Chamoli.

108. **Opisthodorylaimus caudatus* Ahmad & Jairajpuri, 1982

1982. *Opisthodorylaimus caudatus* Ahmad & Jairajpuri, *Revue Nematol.*, 5 : 267.

Dimensions : Female : L = 1.35-1.37 mm; a = 31-34; b = 4.0-4.5; c = 12-15; c' = 4-5; V = 47-48; $G_2 = 13$; odontostyle = 18-19 μm ; odontophore = 21-23 μm ; esophagus = 326-345 μm ; prerectum = 39-48 μm ; rectum = 39-44 μm ; tail = 90-115 μm ; ABD = 27-30 μm .

Description : Female : Body slightly curved ventrally upon fixation and tapering towards both extremities. Odontostyle 1.4-1.6 lip widths long, its aperture about $1/3^{\text{rd}}$ of its length. Guiding ring single, at 10-11 μm or 0.7-0.8 lip width from anterior end. Odontophore simple rod-like, 1.1-1.3 times the odontostyle length. Expanded part of esophagus occupying 42-46% of pharyngeal length. Cardia elongate conoid, 19-23 μm long. Reproductive system opisthomonodelphic. Tail elongate-conoid dorsally curved with two caudal pores on each side.

Distribution : India : Uttar Pradesh, Uttarakhand.

Habitat & Locality : Soil around roots of sheesham, *Dalbergia sissoo* from Rajpur and from ferns and mosses from Mussourie, district Dehradun.

Remarks : This species was reported and described by Ahmad & Jairajpuri (1982) from district Dehradun.

Genus *Coomansinema* Ahmad & Jairajpuri, 1989
109. **Coomansinema dimorphicauda* Ahmad & Jairajpuri, 1989

1989. *Coomansinema dimorphicauda* Ahmad & Jairajpuri, *Nematologica*, 35 : 144.

Dimensions : Female : L = 1.25 mm; a = 25 b = 3.8; c = 43; V = 56; $G_2 = 13$; odontostyle = 22 μm ; odontophore = 24 μm ; esophagus = 328-330 μm ; Prerectum = 71 μm ; rectum = 36 μm ; tail = 29 μm ; ABD = 27-30 μm .

Male : L = 1.36-1.41 mm; a = 27-29; b = 4.2; c = 61-67; T = 48-50; odontostyle = 21-22 μm ; odontophore = 24 μm ; esophagus = 328-330 μm ; spicules = 48 μm ; lateral guiding pieces = 14-15; ventromedian supplements = 12-15; prerectum = 69-102 μm ; tail = 21-23 μm ; ABD = 30 μm .

Description : Female : Body curved ventrally upon fixation. Odontostyle massive, thick-walled, more at tip, 1.6 lip region widths long, its aperture 6 μm or about $1/4^{\text{th}}$ of its length. Guiding ring 12 μm or 0.8 lip width from anterior end. Vestibular walls not sclerotized. Odontophore simple rod-like, slightly longer than the odontostyle. Expanded part of esophagus occupying about 46% of pharyngeal length. Reproductive system amphidelphic. Tail short, conoid with apical projection at tip, about one anal body width long. A pair of caudal pores on both sides of tail.

Male : similar to female in general morphology, except for more pronounced ventral curvature in posterior region. Spicules dorylaimoid, 1.4-1.5 anal body widths long. Lateral guiding pieces about $1/3^{\text{rd}}$ of spicule length. Supplements and adanal pair and 12-15 ventromedians arranged in a series. Tail short, convex-conoid with rounded terminus, 0.6-0.7 anal body widths long with a pair of caudal pores on each side.

Distribution : India : Uttar Pradesh, Uttarakhand.

Habitat & Locality : Soil around roots of grasses from Govindghat, district Chamoli.

Remarks : This species was reported and described by Ahmad & Jairajpuri (1989) from district Chamoli.

Family QUDSIANEMATIDAE
Subfamily QUDSIANEMATINAE

Genus *Bagriella* Ahmad & Jairajpuri, 1988
110. **Bagriella kaiserii* Ahmad & Jairajpuri, 1988

1988. *Bagriella kaiserii* Ahmad & Jairajpuri, *Indian J. Nematol.*, 18 : 27-29.

Dimensions : Female : L = 0.74-0.77 mm; a = 22-23; b = 3.3-3.5; c = 18-20; c' = 2.3-3.0; V = 49-52; G₁ = 10; G₂ = 10-11; odontostyle = 12.0-12.5; odontophore = 17-18; esophagus = 213-233 µm; prerectum = 35 µm; rectum = 19 µm; tail = 38-42 µm; ABD = 14-16 µm.

Description : Female : Body slightly curved ventrally upon fixation and tapering more towards posterior extremity. Odontostyle attenuated, about one lip region width long with aperture about 1/4th of its length. Guiding ring 5 µm or 0.4-0.5-lip region width from oral aperture. Odontophore rod-like, 1.4-1.5 times odontostyle length. Expanded part of esophagus 41-44 % of pharyngeal length. Three rounded cardiac glands present at esophago-intestinal junction. Reproductive system amphidelphic. Tail elongate-conoid, dorsally bent, 2.3-3.0 anal body widths long with a pair of caudal pores on each side.

Distribution : India : Uttar Pradesh, Uttarakhand.

Habitat & Locality : Soil around roots of wild bushes from Mussourie hills, district Dehradun

Remarks : This species was reported and described by Ahmad & Jairajpuri (1988) from Dehradun.

Genus *Ecumenicus* Thorne, 1974

111. **Ecumenicus monohystera* (de Man, 1880) Thorne, 1974

1880. *Dorylaimus monohystera* de Man, *Tijds. Nedeland. Dierk. Vereen.*, 5 : 13.

1974. *Ecumenicus monohystera* Thorne, *S. Dakota State. Univ. Agr. Exp. Sta. Tech. Bull.*, 41 : 105.

Dimensions : Female : L = 1.06-1.16 mm; a = 35-39; b = 4.9-51; c = 30-34; V = 35-36; G₂ = 13-15; odontostyle = 11-12; odontophore = 16-17; esophagus = 215-230 µm; prerectum = 35-51 µm; rectum = 20-23 µm; tail = 33-35 µm; ABD = 20-23 µm.

Distribution : India : Uttar Pradesh, Bihar and Uttarakhand.

Elsewhere : U.S.A.

Habitat & Locality : Soil around roots of paddy, *Oryza sativa* L. from Rishikesh, district Dehradun.

Remarks : This species was recorded from district Dehradun by Ahmad & Jairajpuri (1982).

Genus *Labronema* Thorne, 1974

112. **Labronema pararapax* Ahmad & Jairajpuri, 1982

1982. *Labronema pararapax* Ahmad & Jairajpuri, *Nematologica*, 28 : 42.

Dimensions : Female : L = 1.54-1.72 mm; a = 27-30; b = 4.0-4.5; c = 43-45; V = 56-59; G₁ = 17-23; G₂ = 16-23; odontostyle = 37-38; odontophore = 26-27; esophagus = 378-381 µm; prerectum = 75-101 µm; rectum = 45-46 µm; tail = 36-38 µm; ABD = 33-37 µm.

Male : L = 1.81-1.85 mm; a = 27-32; b = 4.6-4.8; c = 50-52; T = 60-61; odontostyle = 26-27; odontophore = 38; esophagus = 380-393 µm; spicules = 60-657 µm; lateral guiding pieces = 18 µm, ventromedian supplements = 19-20; prerectum = 150-159 µm; tail = 33-36 µm; ABD = 36-40 µm.

Description : Female : Body slightly curved ventrally upon fixation and tapering towards both extremity. Odontophore simple rod-like, 1.3-1.4 times the odontostyle length. Nerve ring 138-166 µm from anterior end. Expanded part of esophagus 42-48% of pharyngeal length. Cardia a narrow disc with a conoid portion extending into the intestine. Reproductive system amphidelphic. Tail short, digitate about one anal body widths long with a pair of caudal pores on each side.

Male : Supplements and adanal pair and 15-20 regularly spaced ventromedians. Spicules 1.5-1.8 anal body-widths long; lateral guiding pieces simple rod-like. Tail digitate, about one anal body widths long with a pair of caudal pores on each side.

Distribution : India : Uttar Pradesh, Nepal, Uttarakhand.

Elsewhere : U.S.A.

Habitat & Locality : Soil around roots of unidentified wild growing plants from Mussourie, district Dehradun and from grasses and mosses from Govindghat, district Chamoli.

Remarks : This species was reported and described by Ahmad & Jairajpuri (1982) from districts Dehradun and Chamoli.

Genus *Eudorylaimus* Andrassy, 1959

113. **Eudorylaimus himalus* Jairajpuri & Ahmad, 1982

1982. *Eudorylaimus himalus* Jairajpuri & Ahmad, *Nematologica*, 28 : 432.

Dimensions : Female : L = 1.22-1.31 mm; a = 29-31; b = 3.6-3.9; c = 53-57; c' = 0.9-1.0; V = 51-55; G1 = 13-14; G2 = 10-13; odontostyle = 21-23; odontophore = 34-39; esophagus = 308-363 µm; prerectum = 54-67 µm; rectum = 23-25 µm; tail = 22-24 µm; ABD = 24-26 µm.

Description : Female : Body curved, more strongly in posterior half upon fixation and tapering only slightly towards extremity. Odontostyle attenuated, 1.2-1.3 lip widths long, its aperture about 1/3rd of its length. Guiding ring single, 9-10 µm from anterior end. Odontophore simple rod-like, 1.4-1.6 times the odontostyle length. Nerve ring 115-132 µm from anterior end. Expanded part of esophagus 42-49% of pharyngeal length. Cardia short and rounded, 10-13 µm long. A thin cardiac disc present. Reproductive system amphidelphic. Tail short, conoid, provided with 'saccate bodies' on the ventral side and a pair of caudal pores on each side.

Distribution : India : Uttar Pradesh, Nepal, Uttarakhand.

Habitat & Locality : Soil around roots of teak, *Tectona grandis* L. from Ghangaria, district Chamoli.

Remarks : This species was reported and described by Jairajpuri & Ahmad (1982) from district Chamoli.

Subfamily DISCOLAIMINAE

Genus *Discolaimus* Cobb, 1913

114. *Discolaimus laksii* Khan & Laha, 1982

1982. *Discolaimus laksii* Khan & Laha, *Ind. J. Nematol.*, 12 : 240.

Material examined : 2 ♀s, Mohand Rao, Dehradun, 7.xii.05, Reg. No. IV. 325, coll. H.S. Mehta & Party.

Dimensions : Female : L = 0.7-1.08 mm; a = 34-35; b = 3.2-4.1; c = 39-48; V = 48-49.

Description : Female : Body ventrally arcuate upon fixation. Lip region distinctly set off from

body, expanded and discoid. Odontostyle 15 µm long, aperture about 1/3 of odontostyle length. Odontophore slightly longer than Odontostyle. Reproductive system amphidelphic. Tail dorsally convex, conoid, about one anal body width long.

Male : Not found.

Distribution : India : Delhi and Uttarakhand.

Habitat and Locality : Soil around roots of Sugarcane, Mohand Rao, dist. Dehradun.

Remarks : This species was recorded for the first time from WDS by Rizvi (2007).

Family NORDIIDAE

Subfamily PUNGENTINAE

Genus *Enchodelus* Thorne, 1939

115. **Enchodelus (Enchodelus) microdoroides* Baqri & Jairajpuri, 1974

1974. *Enchodelus (Enchodelus) microdoroides* Baqri & Jairajpuri, *Nematologica*, 20 : 135.

Dimensions : Female : L = 0.94-1.26 mm; a = 19-27; b = 3.5-5.6; c = 47-73; V = 43-55, odontostyle = 37-42 µm.

Male : L = 1.24-1.28 mm; a = 26-27; b = 4.6-4.8; c = 52-54; T = 60, odontostyle = 38-40 µm; spicule = 45-50 µm.

Description : Female : Body ventrally curved upon fixation. Odontostyle 38-42 µm, its aperture about 1/6th of its length. Guiding ring 2.0-2.5 head-widths from anterior end. Odontophore nearly equal to odontostyle length with very prominent flanges at its base. Maximum width of flanges 7-8 µm. Basal expanded part of esophagus occupying about 1/3rd of neck length. Gonads amphidelphic. Tail 0.6-0.8 anal body-width long, convex-conoid with well developed anal muscle and two caudal pores on each side. 10-30 pairs of saccate bodies present on both sides of the tail.

Male : Supplements an adanal pair and 10 ventromedians, the latter spaced at irregular intervals extending to about 7 tail lengths. Spicules 45-50 µm along median axis. Well developed lateral guiding pieces present. Copulatory muscle bands occupying the area up to the last ventromedians supplements.

Distribution : Uttar Pradesh, Himachal Pradesh and Uttarakhand.

Habitat & Locality : Soil around roots of grasses from Mussourie, dist. Dehradun *Marchantia* sp from Nainital and Mosses from Pauri.

Remarks : This species was described by Ahmad & Jairajpuri (1980) from Dehradun, Nainital & Pauri districts.

116. **Enchodelus (Rotundus) parateres* Baqri & Jairajpuri, 1974

1974. *Enchodelus (Rotundus) parateres* Baqri & Jairajpuri, *Nematologica*, 20 : 140.

Dimensions : Female : L = 1.13-1.34 mm; a = 23-28; b = 4.5-5.0; c = 46-56; V = 51-53.

Male : L = 1.16-1.46 mm; a = 26-30; b = 4.9-5.2; c = 51-56; T = 63-74; spicule = 46-48 μ m.

Description : Female : Body ventrally curved upon fixation, tapering slightly towards extremities, curvature more pronounced in posterior part of body. Odontostyle 20-23 μ m, its aperture about 1/8th of its length. Guiding ring 1.0-1.2 head-widths from anterior end. Odontophore 22-26 μ m or 1.1-1.3 times the odontostyle length with very small swellings at its base. Maximum width of swellings 3-4 μ m. Basal expanded part of esophagus occupies 37-40% of neck length.

Gonads amphidelphic. Tail 0.6-1.2 anal body-width long, bluntly conoid or hemispherical with two caudal pores on each side.

Male : Supplements an adanal pair and 9- 10 ventromedians, the latter irregular spaced. Spicules 1.7-1.8 anal body widths along median axis. Well developed lateral guiding pieces present. Copulatory muscle bands occupying the area up to the last ventromedians supplements.

Distribution : Uttar Pradesh, Himachal Pradesh and Uttarakhand.

Habitat & Locality : Soil around roots of wild fruit trees from Lansdowne, Pauri.

Remarks : This species was described by Ahmad & Jairajpuri (1980) from district Pauri.

117. **Enchodelus (Paraenchodelus) constrictus* Jairajpuri & Loof, 1968

1968. *Enchodelus (Paraenchodelus) constrictus* Jairajpuri & Loof, *Nematologica*, 13 : 505.

Dimensions : Female : L = 1.40 mm; a = 24; b = 5.2; c = 36; c' = 1.5 V = 51; G1 = 26; G2 = 30.

Male : L = 1.19 mm; a = 23; b = 5.1; c = 32; c' = 1.6; T = 51; spicule = 46-48 μ m.

Description : Female : Body ventrally curved upon fixation, more strongly in posterior half. Odontostyle 25 μ m or 2.7 head-widths long. Guiding ring 1.5 head-widths from anterior end, wall of stoma anterior to guiding ring thickened. Odontophore linear, not flanged, 29 μ m or 3.2 head-widths long. Basal expanded part of esophagus occupies 41 of neck length. Gonads amphidelphic. A well developed sphincter present between uterus and oviduct. Ovaries reflexed, oocytes arranged in a single row. Tail 1.5 anal body-width long, conoid, ventrally curved with two caudal pores on each side.

Male : Supplements an adanal pair and 5 ventromedians. The posterior three closer together than the others, Spicules 40 μ m or 1.7 anal body widths along median axis. Well developed lateral guiding pieces present. Prerectum begins after the last ventromedian supplements.

Distribution : Uttar Pradesh, Himachal Pradesh and Uttarakhand.

Elsewhere : U.K.

Habitat & Locality : Soil around roots of ferns from Nainital.

Remarks : This species was described by Ahmad & Jairajpuri (1980) from Nainital district.

118. **Enchodelus (Paraenchodelus) longidens* Jairajpuri & Loof, 502

1968. *Enchodelus (Paraenchodelus) longidens* Jairajpuri & Loof, *Nematologica*, 13 : 502.

Dimensions : Female : L = 1.59-1.75 mm; a = 35; b = 4.5-5.3; c = 32-35; c' = 1.6-1.8 V = 48-51; G1 = 18; G2 = 20.

Male : L = 1.64 mm; a = 33; b = 5.2; c = 29; c' = 1.8; T = 65.

Description : Female : Body ventrally curved to C-shaped upon fixation, tapering gradually in neck region. Odontostyle 43-38 μ m or 3.7-4.9 head-widths long, its aperture 1/21-1/16th of its length. Guiding ring 1.6-1.8 head-widths from anterior end, Odontophore linear, without flanged,

nearly as long as Odontostyle. Basal expanded part of esophagus occupying 29-31% of neck length. Nerve ring surrounding anterior slender part of esophagus at 45-50% of neck length from anterior end of body. Gonads amphidelphic. Tail 1.5-1.7 anal body-width long, conoid, provided with two caudal pores on each side.

Male : Supplements an adanal pair and 7 ventromedians, spaced almost at regular intervals. Spicules 48 μm or 1.5 anal body widths along median axis. Well developed lateral guiding pieces present. Copulatory muscle bands occupying the area upto the last ventromedian supplements.

Distribution : Uttar Pradesh, Himachal Pradesh and Uttarakhand.

Elsewhere : U.K.

Habitat & Locality : Soil around roots of unidentified grasses from Nainital.

Remarks : This species was described by Ahmad & Jairajpuri (1980) from district Nainital.

119. **Enchodelus (Paraenchodelus) satendri*
Baqri & Jairajpuri, 1974

1974. *Enchodelus (Paraenchodelus) satendri* Baqri & Jairajpuri, *Nematologica*, 20 : 140.

Dimensions : Female : L = 1.21-1.58 mm; a = 23-35; b = 4.3-5.9; c = 23-35; V = 49-58; G1 = 16-27; G2 = 12-20.

Male : L = 1.14-1.52 mm; a = 23-30; b = 4.1-6.1; c = 23-32; T = 45-80.

Description : Female : Body ventrally curved upon fixation, more strongly in anterior half. Odontostyle 24-27 μm or 1.9-2.1 head-widths long. Guiding ring 1.2-1.3 head-widths from anterior end. Odontophore linear with small swellings at its base, 29-33 μm or 1.2 of Odontostyle length. Maximum width of swellings 3-4 μm . Basal expanded part of esophagus occupying 33-45 % of neck length. Gonads amphidelphic. Uterus divided into proximal glandular and distal muscular part. Tail 1.4-1.6 anal body-width long, conoid with rounded terminus, slightly ventrally curved with two caudal pores on each side.

Male : Supplements an adanal pair and 5-6 ventromedians, spaced almost at regular intervals. Spicules 42-53 μm or about two anal body widths

along median axis. Well developed lateral guiding pieces present. Copulatory muscle bands occupying the area up to the last ventromedian supplement.

Distribution : Uttar Pradesh, Himachal Pradesh and Uttarakhand.

Habitat & Locality : Soil around roots of grasses from Mussourie, roots of *Marchantia* sp from Tallital, Tiphinitop, Jeolikot from the district Nainital; roots of mosses from Lansdowne, district Pauri.

Remarks : This species was described by Ahmad & Jairajpuri (1980) from district Nainital and Pauri.

Subfamily ACTINOLAIMOIDINAE

Genus *Oriverutus* Siddiqi, 1971

120. **Oriverutus labiatus* Ahmad & Jairajpuri, 1987

1987. *Oriverutus labiatus* Ahmad & Jairajpuri, *Nematologica*, 33 : 15.

Dimensions : Female : L = 0.87-1.0 mm; a = 31-37; b = 3.4-3.6; c = 21-24; c' = 2.3-2.6; V = 52-60; G2 = 13-16; odontostyle = 15-16 μm ; odontophore = 19-20 μm ; esophagus = 253-278 μm ; prerectum = 39-44 μm ; rectum = 24-27 μm ; tail = 41-45 μm ; ABD = 17 μm .

Description : Female : Body slightly curved ventrally upon fixation, tapering towards both extremities. Odontostyle attenuated, 1.2-1.4 lip region widths long, its aperture 2-3 μm or about 1/5-1/6th of its length. Guiding ring 6-8 μm long or about 0.6-0.7 lip region widths from anterior end, 1.2-1.3 of odontostyle length. Tail elongate conoid, dorsally bent, 2.3-2.6 anal body-width long with two caudal pores on each side.

Distribution : Uttar Pradesh, Himachal Pradesh and Uttarakhand.

Habitat & Locality : Soil around roots of grasses from district Chamoli.

Remarks : This species was reported and described by Ahmad & Jairajpuri (1987) from district Chamoli.

121. **Oriverutus paragus* Ahmad & Jairajpuri, 1987

1987. *Oriverutus paragus* Ahmad & Jairajpuri, *Nematologica*, 33 : 15.

Dimensions : Female : L = 0.99-1.21 mm; a = 26-28; b = 3.2-3.9; c = 20-22; c' = 2.2-2.6; V = 48-52; G1 = 17-19; G2 = 16-21; odontostyle = 17-18 µm; odontophore = 22-24 µm; esophagus = 309-311 µm; prerectum = 55-66 µm; rectum = 21-22 µm; tail = 50-56 µm; ABD = 21-23 µm.

Males : L = 1.11-1.14 mm; a = 31-32; b = 3.6; c = 22-26; c' = 1.7-1.8; T = 51-55; odontostyle = 18-19 µm; odontophore = 23-24 µm; esophagus = 306-313 µm; prerectum = 90-93 µm; spicule = 36-40 µm; lateral guiding piece = 9-10 µm; ventromedians supplements = 8-9; tail = 44-52 µm; ABD = 26-28 µm.

Description : Female : Body slightly curved ventrally upon fixation, tapering towards both extremities. Odontostyle attenuated 1.3-1.4 lip region widths long, its aperture 4-5 µm or about one fourth of its length. Guiding ring 7-8 µm long or about 0.5-0.6 lip region widths from anterior end. Odontophore about 1.3 odontostyle lengths. Tail elongate conoid, ventrally curved, 2.2-2.6 anal body-width long with two caudal pores on each side.

Male : Supplements an adanal pair and 8-9 spaced ventromedians. Spicules dorylaimoid 1.4 anal body widths along median axis. Well developed lateral guiding pieces present. Copulatory muscle bands occupying the area up to the last ventromedian supplement. Tail similar to female, 1.7-1.8 anal body widths long with two distinct pores on each side.

Distribution : Uttar Pradesh, Himachal Pradesh and. Uttarakhand.

Habitat & Locality : Soil around roots of unidentified jungle trees from district Pauri.

Remarks : This species was reported and described by Ahmad & Jairajpuri (1987) from district Pauri.

122. **Oriverutus asaccatus* (Dhanachand & Jairajpuri, 1980) Ahmad & Jairajpuri, 1987

1980. *Enchodelium asaccatum* Dhanachand & Jairajpuri, *Indian J. Nematol.*, **10** : 155.

1987. *Oriverutus asaccatus* Ahmad & Jairajpuri, *Nematologica*, **33** : 16.

Dimensions : Female : L = 0.83-0.91 mm; a = 29-30; b = 3.8-4.0; c = 14-15; c' = 3.1-3.4; V =

38-40; G2 = 8-10; odontostyle = 17-18 µm; odontophore = 18-19 µm; esophagus = 217-225 µm; prerectum = 37-40 µm; tail = 59-62 µm; ABD = 17-18 µm.

Distribution : Uttar Pradesh, Manipur and Uttarakhand.

Habitat & Locality : Soil around roots grasses and mosses from district Garhwal.

Remarks : This species was recorded by Ahmad & Jairajpuri (1987) from district Garhwal.

Family APORCELAIMIDAE

Subfamily APORCELAIMINAE

Genus *Aporcelaimellus* Heyns, 1965

123. *Aporcelaimellus maitai* Yeates, 1967

1967. *Aporcelaimellus maitai* Yeates, *N.Z. J. Sci.*, **10** : 757.

Dimensions : Female : L = 1.1 mm; a = 23; b = 3.4; c = 36; V = 52; stylet = 20 µm; stylet aperture = 55%.

Distribution : India : Uttarakhand.

Elsewhere : Japan, New Zealand and Belgium.

Habitat & Locality : Soil around roots of Tea Plantations of Dehradun, (U.A).

Remarks : This species was recorded by Khera & Chaturvedi (1977) from Dehradun.

124. *Aporcelaimellus obscurus* (Thorne & Swanger, 1936) Heyns, 1965

1936. *Dorylaimus obscurus* Thorne & Swanger, *Capita. Zool.*, **6** : 115.

1965. *Aporcelaimellus obscurus* Heyns, *Entomol. Mem. S. Africa*, **10** : 25.

Dimensions : Female : L = 2.63-2.87 mm; a = 28-35; b = 3.8-4.1; c = 61-67; V = 51-57; G1 = 1-13; G2 = 11-17; odontostyle = 24-26 µm; odontophore = 42-46 µm; esophagus = 657-684 µm; prerectum = 120-139 µm; rectum = 57-60 µm; tail = 42-45 µm; ABD = 48-53 µm.

Distribution : India : Uttarakhand and Uttar Pradesh,

Elsewhere : South Africa and U.S.A.

Habitat & Locality : Soil around roots of wheat, *Triticum vulgare* L., from Mussourie, district Dehradun.

Remarks : This species was recorded by Ahmad & Jairajpuri (1982) from Dehradun.

125. *Aporcelaimellus baqrii* Ahmad & Jairajpuri, 1982

1982. *Aporcelaimellus baqrii* Ahmad & Jairajpuri, *Nematologica*, 28 : 45.

Dimensions : Female: L = 1.81-2.05 mm; a = 28-32; b = 3.4-3.8; c = 63-67; V = 53-37; G1 = 7-8; G2 = 8-9; odontostyle = 42-26; odontophore = 38-41; esophagus = 507-544 µm; prerectum = 45-67 µm; rectum = 41-45 µm; tail = 27-30 µm; ABD = 32-36 µm.

Male : L = 1.86 mm; a = 29; b = 3.4; c = 58; T = 45; odontostyle = 24; odontophore = 39; esophagus = 540 µm; spicules = 63µm; lateral guiding pieces = 16 µm, ventromedian supplements = 12; prerectum = 65 µm; tail = 32 µm; ABD = 38 µm.

Description : Female : Body slightly ventrally arcuate upon fixation and tapering anterior to base of esophagus. Odontostyle, 1.2-1.4 lip widths long, its aperture 9-11µm or 40-41% of its length. Guiding ring at 9-11 µm or about half lip width from anterior end. Odontophore 1.5-1.7 times the odontostyle length. Expanded part of esophagus 49-55% of pharyngeal length. Reproductive system amphidelphic. Tail short, hemispheroid, 0.8-0.9 anal body widths long with one or two caudal pores on each side.

Male : Supplements an adanal pair and 12 irregularly spaced ventromedians. Spicules 1.6 anal body-widths long; lateral guiding about one-fourth of spicule length. Tail short, conoid about 0.8 anal body widths long with a pair of caudal pores on each side.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat & Locality : Soil around roots of ferns and mosses from Ramgarh, district Nainital.

Remarks : This species was reported and described by Ahmad & Jairajpuri (1982) from district Nainital.

Genus *Aporcelaimus* Thorne & Swanger, 1936
126. **Aporcelaimus litchi* Srivastava *et al.*, 2000

2000. *Aporcelaimus litchi* Srivastava *et al.*, *Indian J. Nematol.*, 30 : 50.

Dimension : Female : L = 4.9-5.0 mm; a = 49.0-50.9.; b = 5.3-5.6; c = 78-86; c' = 1-2; V = 46-49; odontostyle = 46-50 µm; odontophore = 37-40 µm; esophagus = 885-937 µm; prerectum = 69-97 µm; rectum = 34.0-35.5 µm; tail = 58-64 µm.

Male : L = 4.6 mm; a = 51.8; b = 4.9; c = 83.5; c' = 1; odontostyle = 50 µm; odontophore = 45 µm; esophagus = 950 µm; spicule = 155 µm; tail = 55 µm.

Description : Female : Body curved upon fixation, more towards posterior region. Cuticle marked by criss-cross fibers and 5-7 µm thick at midbody. Odontostyle wide, long and aperture occupying three-fourth of the odontostyle length. Odontophore long slender and rod-like. Guiding ring located at 6-8 µm from anterior region. Esophagus narrow, with expanded basal region. Female reproductive system amphidelphic. Tail convex-conoid with two caudal pores on each side.

Male : Body similar to female. Ventro-median supplements situated at the end of the spicule. Spicules three times of anal-body diameter. Tail convex-conoid with three caudal pores.

Distribution : India : Uttarakhand.

Habitat & Locality : Soil around roots of litchi, *Litchi chinensis* from Herbetpur, district Dehradun.

Remarks : This species was reported and described by Srivastava *et al.* (2000) from district Dehradun.

Superfamily LONGIDOROIDEA

Family LONGIDORIDAE

Subfamily LONGIDORINAE

Genus *Longidorus* Micoletzky, 1922

127. **Longidorus brevicaudatus* (Schuurmans Stekhoven, 1951) Khan, 1987

1951. *Neolongidorus brevicaudatus* Sch. Stekhoven, *Mem. Inst. Sci. nat. Belg. ser.*, 2 : 50.

1987. *Longidorus brevicaudatus* Khan, *Indian J. Nematol.*, 16 : 190.

Dimensions : Female : L = 3.5-3.8 mm, a = 125-138; b = 11.314.7; c = 87.5-107.4; V = 49-53.

Description : Female : Body tapering towards both extremities. Lip region knob-like. Odontostyle

and odontophore 68 μm long. Guiding ring situated at about one head-width from anterior end. Reproductive system amphidelphic. Vulva a transverse slit. Prerectum about 8 % of total body length. Tail cylindrical with rounded terminus, more than two anal body-widths long, with three caudal pores on each side.

Male : Not known.

Distribution : India : Uttar Pradesh, Uttarakhand, Rajasthan and Delhi.

Elsewhere : Belgium.

Habitat and Locality : Soil around roots of *Atropa belladonna* from Almora district.

Remarks : This species was recorded by Khan & Khan (1972) from Almora district.

128. **Longidorus conicaudatus* Khan, 1987

1987. *Longidorus conicaudatus* Khan, *Indian J. Nematol.*, **16** : 192.

Dimensions : Female : L = 5.0-6.0mm, a = 81.5-93.0; b = 11.4-13.4; c = 92-117; V = 49.6-53.7; odontostyle = 80-100 μm ; odontophore = 65-80 μm .

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat and Locality : Soil around the roots of *Thuja* sp from district Nainital.

Remarks : This species was reported by Khan (1986) from district Nainital.

Genus *Neolongidorus* Khan, 1986

129. **Neolongidorus doonensis* Singh & Khan, 1996

1996. *Neolongidorus doonensis* Singh & Khan, *Indian J. Nematol.*, **26** : 168.

Dimensions : Female : L = 3.47-4.31mm, a = 7.5-9.3; b = 12.6-17.7; c = 126-177; V = 45.2-50.4; spear = 100-121 μm ; odontophore = 60-70 μm ; guiding ring = 62-76 μm .

Description : Female : Body assumes close c-shape when killed by gentle heat. Guiding ring single located at more than 5 lip width from anterior end of body, lateral hypodermal chords arises as thin band at level with the middle of the spear. Dorsal pharyngeal gland and its orifice

located at 14 and 17 μm ; right first subventral gland and its orifice are at 34 and 36 μm , left first subventral glands and its orifice are at 36 and 40 μm while the opening of second pair of subventral glands are at 56 and 59 μm respectively from anterior end of bulb. Tail dorsally convex, conoid, rounded, less than one anal body width in length. Subcuticle with fine transverse striations. Two pairs of caudal pores present.

Distribution : India : Uttarakhand.

Habitat and Locality : Soil around the roots of apricot, *Prunus armeniaca* L. at Dehradun.

Remarks : This species was reported by Singh & Khan (1996) from Dehradun.

Genus *Paralongidorus* Siddiqi *et al.*, 1963

130. **Paralongidorus sali* Siddiqi *et al.*, 1963

1963. *Paralongidorus sali* Siddiqi, Hooper & Khan *Nematologica*, **9** : 10.

Dimensions : Female : L = 2.25-2.85mm, a = 60-71; b = 5.2-7.4; c = 107-129; V = 50-54; stylet = 98-107 μm ; stylet extension = 52-62 μm ; guiding ring = 30-32 μm .

Description : Female : Body has a slight ventral curvature upon fixation. Stylet attenuated stylet extension just over half the stylet length with a slightly swollen base that is not rounded or flanged. Anterior slender portion of the esophagus 150 μm long with a mucro located in the pharyngeal wall about 80 μm behind stylet extension base. Posterior pharyngeal bulb 96 μm long, 20 μm wide ending in a roundly conoid pharyngeal intestinal valve. Tail rounded, about two thirds the anal-body-widths long, cuticle at the terminus thickened appearing in two layers, the inner being radially striated. Two lateral pores are present on both sides of the tail.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat & Locality : Soil roots of Teak and Sal from the FRI forest of Dehradun.

Remarks : This species was recorded from Dehradun by Thapa (1990)

Family XIPHINEMATIDAE
Subfamily XIPHINEMATINAE

Genus *Xiphinema* Cobb, 1913

131. *Xiphinema americanum* Cobb, 1913

1913. *Xiphinema americanum* Cobb, *Jour. Wash. Acad. Sci.*, **3** : 440.

Material examined : 1 ♀, CTR, Nainital, 26.ii.05, Reg. No. IV. 256, coll. A. N. Rizvi and Party; 2 ♀ ♀, CTR, Nainital, 26.ii.05, Reg. No. IV. 257, coll. A. N. Rizvi and Party.

Dimensions : Female : L = 0.9-1.5mm, a = 37-40; b = 5.1-6.6; c = 56-57; V = 55-56

Description : Female : Body assumes open spiral on fixation. Lateral chords one-fourth body width, with pore arranged in two lines. Spear 120-140 µm long, the flanged portion occupying about two-fifths of the total length. Cardia bluntly conoid. Vulva a transverse slit. Ovaries reflexed. Tail dorsally convex to a bluntly rounded terminus

Male : Not found.

Distribution : India : Uttarakhand, Himachal Pradesh, Uttar Pradesh, Rajasthan and West Bengal.

Elsewhere : Poland, Portuguese and Ireland.

Habitat and Locality : Soil around roots of Teak, Sal from CTR; soil around the roots of *Brassica oleracea botrytis*, *Prunus bokharensis* and *P. persica* from Nainital. *Citrus sinensis*, *Pyrus malus*, *P. communis* and *Glycine max* from Almora; Deodar from Chakrata, Dehradun.

Remarks : Teak, sal and deodar are new habitat records for this species.

132. **Xiphinema pruni* Singh & Khan, 1997

1997. *Xiphinema pruni* Singh & Khan, *Indian J. Nematol.*, 27 : 95.

Dimensions : Female : L = 2.6-3.5 mm, a = 61.9-80.2; b = 6.6-8.7; c = 66.0-87.5; V = 51.5-52.6; spear = 110-132 µm; odontophore = 48-66 µm; guiding ring = 80-112 µm.

Description : Female : Body assumes open c-shape when killed by gentle heat. Spear typical of the genus. Female gonads didelphic, amphidelphic, equally developed, ovary reflexed. Vulva a transverse slit. Tail dorsally conoid, convex with straight digitate terminus. Protoplasmic core extending up to half of the tail length. Tail 40 µm long, two pairs of caudal pores visible.

Distribution : India : Uttarakhand.

Habitat and Locality : Soil around the roots of apricot (*Prunus armeniaca*) at Dehradun.

Remarks : This species was recorded and described by Singh & Khan (1997) from Dehradun.

133. **Xiphinema opisthohysterum* Siddiqi, 1961

1961. *Xiphinema opisthohysterum* Siddiqi, *Z. Parasitkde.*, 20 : 458.

Dimensions : Females : L = 1.66-1.84 mm, a = 66-77; b = 6.4-6.7; c = 55-59; c' = 1.4-1.8; V = 58-62; G1 = 10-14; G2 = 10-14; odontostyle = 64-70 µm; odontophore = 37-40 µm; guiding ring = 51-55 µm; DO = 12.5; DN = 14.0; RS₁N = 48-53; LS₁N = 48-51; S₂O = 71-75.

Male : L = 1.68 mm, a = 76; b = 6.5; c = 48; odontostyle = 64 µm; odontophore = 46 µm; guiding ring = 52 µm; DO = 13.5; DN = 14.0; RS₁N = 50; LS₁N = 50; S₂O = 70; spicule = 26 µm.

Description : Females : Body 'C' shaped upon fixation, long and attenuated with tapering extremities. Odontostyle 7.0-7.5 labial-widths long, Odontophore nearly 1/1.7-1/1.9th of the odontostyle length. The fixed guiding ring is at 6 labial-widths from the oral aperture. Gonads amphidelphic. Tail elongate-conoid, about twice the anal-body-width long and provided with 2-3 papillae on each side.

Males : Similar to females in morphology. Genital tract monorchic with single reflexed testis. The monorchic condition is considered as an abnormality rather than a rule. Spicules about 1.5 anal body-widths long. Lateral guiding pieces small and finger-like. Supplements consist of an adanal pair and 2 ventromedians. Tail more pointed than in females about twice the anal body-width long and provided with two papillae.

Distribution : India : Uttar Pradesh and Uttarakhand.

Elsewhere : Bulgaria.

Habitat and Locality : Soil around the roots of Wild plants (unidentified) from Nainital.

Remarks : This species was recorded from Nainital by Bajaj & Jairajpuri (1979).

134. **Xiphinema inaequale*, Khan & Ahmad, 1975

1975. *Xiphinema inaequale*, Khan & Ahmad, *Nematol. Medit.*, 3 : 24.

Dimensions : Females : L = 1.7-2.0 mm, a = 35-39; b = 5.6-5.9; c = 61-64; c' = 1.1-1.4; V =

50-53; $G_1 = 10-15$; $G_2 = 10-15$; odontostyle = 92-101 μm ; odontophore = 53-55 μm ; guiding ring = 70-81 μm ; DO = 9-12; DN = 10-15; $RS_1N = 48-51$; $LS_1N = 48-53$; $S_2O = 71-80$.

Male : L = 1.7 mm, a = 37; b = 5.2; c = 63; odontostyle = 97 μm ; odontophore = 55 μm ; guiding ring = 86 μm ; DO = 12; DN = 15; $RS_1N = 51$; $LS_1N = 51$; $S_2O = 75$; spicule = 43 μm .

Description : Females : Body 'C' shaped upon fixation, long and attenuated with tapering extremities. Odontophore nearly $1/1.8^{\text{th}}$ of the odontostyle length. The fixed guiding ring is at 6.5-8.0 labial-widths from the oral aperture. Gonads amphidelphic. Tail short and conoid, 1.1-1.5 the anal body-width long and provided with 2 papillae on each side.

Males : Similar to females in morphology. Genital tract triorchic with two anteriorly directed and one reflexed testis. The triorchic condition is considered as an abnormality rather than a rule. Spicules about 1.5 anal body-widths long. Supplements consist of an adanal pair and a series of 4 ventromedians. Tail short and conoid about one anal body-width long and provided with two papillae.

Distribution : India : Uttar Pradesh, Himachal Pradesh and Uttarakhand.

Habitat and Locality : Soil around the roots of grasses (unidentified) from Almora and wild plant (unidentified) from Mussourie, Dehradun.

Remarks : This species was recorded by Bajaj & Jairajpuri (1979) from Almora and Dehradun districts.

135. **Xiphinema lambertii* Bajaj & Jairajpuri, 1976
1976. *Xiphinema lambertii* Bajaj & Jairajpuri, *Nematol. Medit.*, 4 : 195.

Dimensions : Females : L = 1.31-1.41 mm, a = 47-51; b = 5.2-5.7; c = 37-46; V = 49-52; $G_1 = 10-13$; $G_2 = 10-13$; odontostyle = 55-63 μm ; odontophore = 39 μm ; guiding ring = 48-54 μm ; DO = 12-15; DN = 13-15; $RS_1N = 55-60$; $LS_1N = 55-60$; $S_2O = 75-80$.

Description : Females : Body 'C' shaped upon fixation, tapering towards extremities. Odontostyle 6-7 labial-widths long, odontophore nearly $2/3^{\text{rd}}$ of the odontostyle length. The fixed guiding ring is at

5-6 labial-widths from the anterior extremity. Basal bulb of esophagus 2.4 times of the corresponding body-width and about 24 % of neck length long. Gonads amphidelphic. Tail narrow, elongate-conoid, 1.6-2.0 times of the anal-body-width long and provided with 2 papillae on each side.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat and Locality : Soil around the roots of *Cajanus cajan* from Rajpur, Dehradun.

Remarks : This species was recorded by Bajaj & Jairajpuri (1979) from district Dehradun.

136. **Xiphinema arcum* Khan, 1964
1964. *Xiphinema arcum* Khan, *Nematologica*, 10 : 316.

Dimensions : Females : L = 2.2 mm, a = 50; b = 5.4; c = 76; V = 35.6; $G_1 = 9.2$; $G_2 = 15$; odontostyle = 110 μm ; odontophore = 70 μm ; guiding ring = 90 μm ; DO = 12.5; DN = 12.5; $RS_1N = 52$; $LS_1N = 52$; $S_2O = 83$.

Description : Females : Body long and slender with tapering anterior end and rounded posterior extremity. Odontostyle 9 labial-widths long, odontophore nearly $1/1.5^{\text{th}}$ of the odontostyle length. The fixed guiding ring is at 7.5 labial-widths from the anterior extremity. Gonads amphidelphic. Tail short, hemispheroid, about one anal-body-width long and provided with 2 papillae on each side.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat and Locality : Soil around the roots of *Aegle marmelos* from Ranikhet, district, Almora.

Remarks : This species was recorded by Bajaj & Jairajpuri (1979) from district Almora.

137. **Xiphinema insigne* Loos, 1949
1949. *Xiphinema insigne* Loos, *J. zool. Soc. India*, 1 : 25.
1959. *Xiphinema indicum* Siddiqi, *Proc. Helminth. Soc. Wash.*, 26 : 152.

Dimensions : Females : L = 1.9-2.5 mm, a = 50-70; b = 5.2-8.1; c = 15-35; V = 28-36; c' = 3.0-8.5; odontostyle = 80-111 μm ; odontophore = 55-64 μm ; guiding ring = 80-110 μm .

Males : L = 2.1-2.3 mm, a = 52-65; b = 5.3-6.3; c = 47-54; c' = 1.4-1.7 odontostyle = 93-104 μ m; odontophore = 51-61 μ m; guiding ring = 87-98 μ m; spicule = 53-58 μ m. DO = 7.5-13; DN = 7.5-13; RS₁N = 53-58; LS₁N = 53-59; S₂O = 80-91.

Description : Females : Body long and slender with rounded anterior and elongate-conoid posterior extremity. Odontostyle 7.3-10.0 labial-widths long, odontophore nearly 2/3rd of the odontostyle length. The fixed guiding ring is at 7.3-10.0 labial-widths from the anterior extremity. Basal bulb of esophagus 1.7-2.9 times the corresponding body-width and about 20% of neck length long. Tail narrow, conoid-elongate filiform, 3.0-8.5 times of the anal-body-width long and provided with 3-4 papillae on each side.

Male : Similar to females except for stronger curvature at hinder end. Spicules well developed and sharply ventrally curved. Lateral guiding pieces finger-like, 16 μ m long. Supplements consist of an adanal pair and a series of 3-5 ventromedians. Tail conoid, ending in a digitate terminus. It is 1.4-1.7 times of anal body-width long and provided with 2 papillae on each side.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat and Locality : Soil around the roots of *Citrus sinensis*, *Pyrus malus* and *P. communis* from Almora; *Prunus bokharensis*, *P. persica* and *P. persica* from Nainital.

Remarks : Rashid *et al.* (1973) recorded this species from districts Almora and Nainital.

Superfamily TYLENCHOLAIMOIDEA

Family TYLENCHOLAIMIDAE

Subfamily TYLENCHOLAIMINAE

Genus *Tylencholaimus* de Man, 1876

138. *Tylencholaimus rumjhumi* Khan & Laha, 1982

1982. *Tylencholaimus rumjhumi* Khan & Laha, *Ind. J. Nematol.*, **12** : 240.

Material examined : 4 ♀s, Mohand Rao, Dehradun, 7.xii.05, Reg. No. IV. 326, coll. H.S. Mehta & Party.

Dimensions : Female : L = 0.57-0.65 mm; a = 26-28; b = 2.6-3.1; c = 38-40.7; V = 68-70.

Description : Female : Body slightly curved ventrally upon fixation. Cuticle finely striated. Lip region set off, slightly wider than body. Odontostyle 6-7 μ m long with thin lumen, aperture about 1/4th of Odontostyle length. Odontophore with distinct basal knobs. Reproductive system monodelphic. Posterior uterine sac absent. Tail dorsally bent with obtusely rounded terminus.

Male : Not known.

Distribution : India : Delhi and Uttarakhand.

Habitat and Locality : Soil around roots of Sugarcane, Mohand Rao, Dehradun.

Remarks : This species was recorded for the first time from WDS by Rizvi (2007).

Subfamily MUMTAZIINAE

Genus *Promuntazium* Siddiqi, 1982

139. **Promuntazium elongatum* Ahmad & Jairajpuri, 1983

1983. *Promuntazium elongatum* Ahmad & Jairajpuri, *Nematologica*, **29** : 370.

Dimensions : Female : L = 1.25-1.44 mm; a = 31-40; b = 4.9-5.0; c = 49-60; c' = 0.8-0.9; V = 55-61; G1 = 15-21; G2 = 14-17; odontostyle = 7-8; odontophore = 11-12; esophagus = 242-260 μ m; prerectum = 23-30 μ m; rectum = 23-25 μ m; tail = 21-26 μ m; ABD = 23-32 μ m.

Male : L = 1.38 mm; a = 43; b = 5.8; c = 60; c' = 1.0; T = 46; odontostyle = 8 μ m; odontophore = 11 μ m; esophagus = 237 μ m; spicules = 30 μ m; lateral guiding pieces = 7 μ m, ventromedian supplements = 3; prerectum = 58 μ m; tail = 3 μ m; ABD = 23 μ m.

Description : Female : Body curved ventrally upon fixation. Odontostyle fusiform, with thin wall which tends to be dorsally arcuate and forms a wider lumen 0.6-0.7 lip-width long, its aperture about 1/3rd of its length. Guiding ring single, 4-5 μ m or about half lip width from anterior end. Odontophore rod-like, 1.4-1.6 times the odontostyle length. Expanded part of esophagus 37-40% of pharyngeal length. Cardia short, conoid with rounded tip. Reproductive system amphidelphic. Tail bluntly conoid with rounded terminus, 0.8-0.9 anal body widths long with a distinct terminal caudal pore.

Male : Supplements an adanal pair and three well-placed ventromedians. Spicules ventrally curved 1.3 anal body-widths long; Tail bluntly conoid about one anal body widths long with a distinct terminal caudal pore.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat & Locality : Soil around roots of mosses and grasses from Govindghat district Chamoli.

Remarks : This species was reported by Ahmad & Jairajpuri (1983) from district Chamoli.

Family MYDONOMIDAE

Subfamily MYDONOMINAE

Genus *Morasia* Baqri & Jairajpuri, 1969

140. **Morasia parva* Ahmad & Jairajpuri, 1983

1983. *Morasia parva* Ahmad & Jairajpuri, *Nematologica*, 29 : 372.

Dimensions : Female : L = 1.14-1.34 mm; a = 33-41; b = 5.9-6.5; c = 23-25; c' = 0.8-0.9; V = 42-46; G1 = 9-13; G2 = 10-13; odontophore = 12-14; esophagus = 186-218 µm; prerectum = 151-179 µm; rectum = 21-26 µm; tail = 48-53 µm; ABD = 20-27 µm.

Male : L = 1.10-1.28 mm; a = 33-39; b = 6.2-6.6; c = 43-45; c'=1.0; T = 52-56; odontophore = 13-14 µm; esophagus = 176-194 µm; spicules = 35-36 µm; lateral guiding pieces = 5 µm, ventromedian supplements = 5-7; prerectum = 155-172 µm; tail = 24-30 µm; ABD = 24-26 µm.

Description : Female : Body curved ventrally upon fixation, to assume a C-shape, tapering towards extremities. Odontostyle measures 4-5 µm ventrally and 7-8 µm dorsally, its aperture 3 µm long. Guiding ring single, at 6-8 µm from anterior end. Odontophore arcuate, about, 1.3 times the odontostyle length. Nerve ring at 93-98 µm from anterior end. Expanded part of esophagus 27-29% of pharyngeal length. Reproductive system amphidelphic. Tail elongate-conoid with acute terminus, 2-3 anal body widths long with two caudal pores on each side.

Male : Supplements an adanal pair and 5-7 regularly placed ventromedians. Spicules 1.3-1.4 anal body-widths long. Pre-rectum 6-7 anal body widths long Tail bluntly conoid about one anal body widths long with two caudal pores on each side.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat & Locality : Soil around roots of wild tree from Govindghat district Chamoli.

Remarks : This species was reported and described by Ahmad & Jairajpuri (1983) from district Chamoli.

Genus *Dorylaimoides* Thorne & Swanger, 1936

141. **Dorylaimoides chamoliensis* Ahmad & Jairajpuri, 1983

1983. *Dorylaimoides chamoliensis* Ahmad & Jairajpuri, *Revue Nematol.*, 6 : 65.

Dimensions : Female : L = 1.41 mm; a = 29; b = 5.7; c = 39; V = 45; G1 = 16; G2 = 16; odontostyle = 10 µm; odontophore = 16 µm; esophagus = 246 µm; prerectum = 147 µm; rectum = 36 µm; tail = 36 µm; ABD = 34 µm.

Male : L = 1.52 mm; a = 32; b = 6.2; c = 45; T = 54; odontostyle = 10 µm; odontophore = 16 µm; esophagus = 245 µm; spicules = 49 µm; lateral guiding piece s = 10 µm, ventromedian supplements = 6; prerectum = 216 µm; tail = 34 µm; ABD = 36 µm.

Description : Female : Body curved ventrally upon fixation, tapering slightly towards extremities. Odontostyle about one lip-width long, its apertures nearly one-third of its length. Guiding ring single, at 9 µm from anterior end. Odontophore arcuate, sclerotized, about 1.5 times the odontostyle length. Reproductive system amphidelphic. Tail short rounded with digitate terminus giving it a mammillate appearance, slightly more than one anal body widths long with two caudal pores on each side.

Male : Supplements an adanal pair and six regularly placed ventromedians. Spicules 1.4 anal body-widths long. Lateral guiding pieces about of one-fifth of spicule length. Tail short rounded with digitate terminus about one anal body widths long with two caudal pores on each side.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat & Locality : Soil around roots of *Pinus* sp. from Ghangharia, district Chamoli.

Remarks : This species was reported and described by Ahmad & Jairajpuri (1983) from district Chamoli.

Superfamily ACTINOLAIMOIDEA THORNE, 1939

Family ACTINOLAIMIDAE THORNE, 1939

Genus *Carcharolaimus* Thorne, 1939

142. **Carcharolaimus denticus* Srivastava *et al.*, 2000

2000. *Carcharolaimus denticus* Srivastava *et al.* *Indian J. Nematol.*, 30 : 48.

Dimension : Female : L = 1.61-1.94 mm; a = 41-46.; b = 3.6-4.3; c = 81-100; c' = 1.2-1.4; V = 43-57; odontostyle = 12-17 µm; odontophore = 17-22 µm; esophagus = 435-466 µm; guiding ring = 14-18 µm; prerectum = 113-129 µm; rectum = 27-34 µm; tail = 22-29 µm.

Description : Female : Body ventrally curved upon fixation. Odontostyle long, slender, one-half of the labial width and aperture one-third of the odontostyle length. Odontophore long slender slightly longer than odontostyle. Anterior part of esophagus narrows with basal expanded part 66 % of the total length of the esophagus. Female reproductive system amphidelphic. Tail short, convex-conoid rounded.

Distribution : India : Uttarakhand.

Habitat & Locality : Soil around roots of litchi, *Litchi chinensis* from Raiwala, district Dehradun.

Remarks : Srivastava *et al.* (2000) reported this species from Dehradun.

Suborder NYGOLAIMINA

Superfamily NYGOLAIMINA

Family NYGOLAIMIDAE

Subfamily NYGOLAIMINAE

Genus *Laevides* Heyns, 1968

143. *Laevides laevis* (Thorne, 1939) Thorne, 1974

1939. *Nygolaimus laevis* Thorne, *Capita zool.*, 8 : 250.

1974. *Laevides laevis* Thorne, *Dakota State Univ. Agr. Exp. Sta. Tech. Bul.*, 41 : 115.

Material examined : 2 ♀♀, Selaqui, Dehradun, 5.i.06, Reg. No. IV. 327, coll. S.J.S. Hattar & Party.

Dimensions : Female : L = 1.2-1.3 mm; a = 38-39; b = 3.5-3.7; c = 60-65; V = 46-50; Tooth = 8-10 µm.

Description : Female : Body almost straight upon fixation, tapering anterior to base of esophagus. Lateral chords about one-fourth to one-third body width near middle of body. Lip region continuous with body contour. Amphids stirrup shaped. Tooth dorylaimoid, 8-10 µm long, dorsal aperture visible, about one-fourth of its length. Expanded part of esophagus occupying 45-48 % pharyngeal length, enclosed in a conspicuous sheath forming basal pockets. Cardiac glands rounded. Cardia small, hemispherical. Location of pharyngeal gland nuclei and their orifices as follows: DO = 49-52; DN = 55-57; DO-DN = 5.0-6.5; S₁N = 69-73; S₁O = 69-73; S₂N = 82-85; S₂O = 82-84.

Vulva a transverse slit. Reproductive system amphidelphic, ovaries reflexed. A distinct sphincter present at oviduct-uterus junction. Tail hemispherical to convex-conoid, slightly valvate.

Male : Not found.

Distribution : India : Uttar Pradesh, Himachal Pradesh and Uttarakhand.

Habitat and Locality : Soil around roots of Sugarcane, Selaqui, Dehradun, and around wheat from Pittoragarh (Ahmad & Jairajpuri, 1982).

Remarks : Soil around roots of Sugarcane is a new habitat record for this species.

Genus *Clavicaudoides* Heyns, 1968

144. *Clavicaudoides clavicaudatus* (Altherr, 1953) Ahmad & Jairajpuri, 1982

1953. *Nygolaimus clavicaudatus* Altherr, *Bull. Soc. Vaud. Sci. nat.*, 66 : 450.

1982. *Clavicaudoides clavicaudatus* Ahmad & Jairajpuri, *Rec. zool. Surv. India. Misc. Publ. Occ. Paper*, 34 : 55.

Material examined : 1 ♀, Selaqui, Dehradun, 5.i.06, Reg. No. IV. 328, coll. S.J.S. Hattar & Party; 2 ♀♀, Sahiya, Dehradun, 24.v.06, Reg. No. IV. 329, coll. H.S. Mehta & Party.

Dimensions : Female : L = 0.8-0.9 mm; a = 34-36; b = 3.5-3.7; c = 45-49; V = 42-45; Tooth = 8-10 µm.

Description : Female : Body curved ventrally upon fixation. Cuticle thin at midbody and marked with fine transverse striae. Lip region continuous with body contour. Amphidial apertures slit-like.

Tooth deltoid, almost equal to lip-width. Expanded part of esophagus occupying about 50% of pharyngeal length, enclosed in an inconspicuous sheath of muscles. Cardiac glands well developed elongate-ovoid. Nerve ring surrounding anterior slender part of esophagus at 85-100 μ m from anterior end. Location of pharyngeal gland nuclei and their orifices as follows: DO = 57-59; DN = 63-65; DO-DN = 4.0-5.5; S₁N = 75-78; S₁O = 74-78; S₂N = 84-87; S₂O = 83-85.

Vulva a transverse slit. Reproductive system amphidelphic. Ovaries short and reflexed. A distinct sphincter present at oviduct-uterus junction. Tail hemispherical, clavate. Two caudal pores present on each side of tail.

Male : Not found.

Distribution : India : Uttar Pradesh, Himachal Pradesh and Uttarakhand.

Habitat and Locality : Soil around roots of Sugarcane from Selaqui and Rice from Sahiya, Dehradun and grasses from Pauri Garhwal.

Remarks : This species was recorded by Ahmad & Jairajpuri (1982) from Pauri Garhwal Sugarcane and rice are new habitat records for this species from Uttarakhand.

145. **Clavicaudoides longidens* Ahmad & Jairajpuri, 1980

1980. *Clavicaudoides longidens* Ahmad & Jairajpuri, *Revue Nematol.*, 3 : 45.

Dimensions : Females : L = 0.93-0.99 mm; a = 35-39; b = 33.6-3.9; c = 70-75; V = 43-47; tooth = 8-12 μ m; G₁ = 5-6; G₂ = 5-7; esophagus = 252-276 μ m; rectum = 13-15 μ m; prerectum = 26-33 μ m; tail = 3-14 μ m; ABD = 16 μ m.

Description : Female : Body slightly ventrally curved, tapering anterior to base of esophagus. Cuticle 1.5 μ m thick at midbody, 2-3 μ m on tail and marked with fine transverse striations. Tooth deltoid, 10-12 μ m or slightly longer than lip-width. Expanded part of esophagus occupying about 48-55% of pharyngeal length. Reproductive system amphidelphic. Tail short, hemispherical, clavate, less than one anal body-width long. Two caudal pores present on each side of tail.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat and Locality : Soil around roots of wild grasses (unidentified) from district Pittoragarh.

Remarks : This species was recorded from Pittoragarh district by Ahmad & Jairajpuri (1982).

Subfamily SOLIDIDENTINAE

Genus *Solididens* Heyns, 1968

146. **Solididens vulgaris* (Thorne, 1930)
Thorne, 1974

1930. *Nygolaimus vulgaris* Thorne, *J. agric. Res. U.S.D.A.*, 41 : 450.

1974. *Solididens vulgaris* Thorne, *S. Dakota State Univ. Agr. Exp. Sta. Tech. Bull.*, 41 : 118.

Dimensions : Females : L = 1.20-1.53 mm; a = 33-41; b = 3.0-3.4; c = 49-59; V = 49-56; tooth = 9-10 μ m; G₁ = 5-6; G₂ = 4-6; esophagus = 390-445 μ m; rectum = 16-20 μ m; prerectum = 20-27 μ m; tail = 24-27 μ m; ABD = 20-22 μ m.

Description : Female : Body ventrally curved forming 'C' or 'S' shape upon fixation. Tooth solid, posterior third hollow, 8-10 μ m or about one lip-width long. Expanded part of esophagus occupying about 63-66% of pharyngeal length. Reproductive system amphidelphic. Tail elongate-conoid or convex-conoid with blunt terminus, 22-32 μ m short, or about 1.0-1.6 one anal body-widths long with 2-3 caudal pores present on each side of tail.

Distribution : India : Uttar Pradesh, Uttarakhand, Himachal Pradesh and Manipur.

Elsewhere : U.S.A.

Habitat and Locality : Soil around roots of apricot, *Prunus armeniaca* L. from district Pittoragarh.

Remarks : This species was recorded from Pittoragarh district by Ahmad & Jairajpuri (1982).

147. **Solididens australis* (Heyns, 1968)
Ahmad & Jairajpuri, 1982

1968. *Nygolaimus australis* Heyns, *Ent. Mem.*, 19, Pl. Protect. Res. Inst. Pretoria. S. Afr., 1 : 35.

1982. *Solididens australis* Ahmad & Jairajpuri, *Rec.zool. Surv. India. Misc. Publ. Occ. Paper*, 34 : 60.

Dimensions : Females : L = 1.34-1.67 mm; a = 37-43; b = 3.0-3.6; c = 41-51; V = 53-59; tooth = 10-12 μ m; G₁ = 6-8; G₂ = 6-8; esophagus = 420-475 μ m; rectum = 19-23 μ m; prerectum = 26-30 μ m; tail = 23-36 μ m; ABD = 18-22 μ m.

Male : L = 1.53 mm; a = 39; b = 3.2; c = 53; T = 46; tooth = 10 μ m; esophagus = 475 μ m; rectum = 23 μ m; prerectum = 30 μ m; tail = 29 μ m; ABD = 23 μ m; spicule = 30 μ m.

Description : Female : Body ventrally curved forming 'C' shape upon fixation, tapering on both extremities. Tooth solid, 9-11 μ m. Expanded part of esophagus occupying about 55-60% of pharyngeal length. Reproductive system amphidelphic. Tail elongate-conoid or bluntly rounded, 23-36 μ m or about 1.3-1.6 one anal body-widths long with two caudal pores present on each side of tail.

Male : Supplements consists of an adanal pair and 2-3 poorly developed ventromedians. Spicules straight, 30-36 μ m along median axis. Lateral guiding pieces 5 μ m long. Gubernaculum absent.

Distribution : India : Uttar Pradesh, Uttarakhand and Himachal Pradesh.

Habitat and Locality : Soil around roots of mosses, apricot, *Prunus armeniaca* L. and wild fruit trees from district Pittoragarh.

Remarks : This species was recorded from Pittoragarh and Pauri districts by Ahmad & Jairajpuri (1982).

Suborder CAMPYDORINA
Superfamily CAMPYDOROIDEA
Family CAMPYDORIDAE
Subfamily CAMPYDORIDINAE
Genus *Campydora* Cobb, 1920

148. **Campydora demonstrans* Cobb, 1920

1920. *Campydora demonstrans* Cobb, *Contrib. Sci. Nematol.*, 9 : 230.

Dimensions : Female : L = 0.48-0.58 mm; a = 23-25; b = 2.7-2.9; c = 6-7; V = 55-59; G1 = 5-10; G2 = 6-11; tooth = 4.5-5.0 μ m; esophagus = 175-200 μ m; tail = 80-100 μ m.

Description : Female : Body almost straight to slightly curved ventrally upon fixation, tapering towards tail region. Mural tooth small, hollow, 4-5 μ m or about equal to lips height. Basal bulb of esophagus with a well developed thick-walled triquetrous chamber occupying about 14-15% of pharyngeal length, measuring 25-32 x 17-24 μ m. Reproductive system amphidelphic. Tail elongate conoid, 80-100 μ m or about 4.7-6.4 anal body-

width long, with acute terminus and prominent caudal glands near its middle.

Distribution : India : Uttar Pradesh, Uttarakhand, Jammu & Kashmir.

Habitat and Locality : Soil around roots of apple from Ranikhet, district Almora.

Remarks : This species was recorded from Almora district by Ahmad & Jairajpuri (1982).

Order ALAIMIDA
Family ALAIMIDAE

Genus *Alaimus* de Man, 1880

149. *Alaimus jaulasali* Siddiqi & Husain, 1967

1967. *Alaimus jaulasali*, Siddiqi & Husain, *Proc. Helm. Soc. Wash.*, 34 : 159.

Material Examined : 3 ♀♀, CTR, Nainital, 26.ii.05, Reg. No IV 261, coll. A. N. Rizvi and Party.

Dimensions : Female : L = 1.1-1.2 mm; a = 60-62; b = 4.1-4.3; c = 7.9-8.3; V = 41-42.

Description : Female : Body tapering at both ends, assumes 'C' form after fixation. Cuticle with fine transverse striations. Head rounded, not off set. Lip region continuous with body contour. Stoma reduced. Esophagus narrow, tubular and posterior expended in to a small bulb. Vulva a transverse slit. Ovary single, posteriorly reflexed. Tail elongate, tapering to a pointed terminus.

Male : Not found.

Distribution : India : Uttar Pradesh, and Uttarakhand.

Elsewhere : Czech Republic and Italy.

Habitat and Locality : Soil around roots of Sal, from CTR, dist. Nainital and Tea plantations from Dehradun (Khera & Chaturvedi, 1977).

Remarks : Recovered from its original habitat, sal after 3 decades.

150. *Alaimus primitivus* de Man, 1880

1880. *Alaimus primitivus* de Man, *Tijds. Nederland Dierk. Vereen.*, 5 : 10.

Material examined : 4 ♀♀, Mohand Rao, Dehradun, 7.xii.05, Reg. No IV 330, coll. H.S. Mehta & Party; 9 ♀♀, FRI, Dehradun, 5.vii.06, Reg. No IV 331, coll. A.N. Rizvi & Party; 9 ♀♀,

Doiwala, Dehradun, 19.xii.2006, Reg. No IV 332, coll. S.J.S. Hattar & Party.

Dimensions : Female : L = 0.8-1.2 mm; a = 42-58; b = 3.7-4.3; c = 7.1-8.4; V = 39-55.

Description : Female : Body, tapering uniformly at both extremities. Cuticle smooth. Lip region rounded. Esophagus in two parts, anterior narrow tubular and posterior slowly expanding to form an elongated basal swelling. Vulva a transverse slit. Ovary reflexed about half way to vulva. Gonad mono-opisthodelphic. Tail long and narrow.

Male : Not found.

Distribution : India : Uttar Pradesh, Sikkim and Uttarakhand.

Elsewhere : U.S.A. South Africa, Germany, Belgium, Hungary, Poland, Sweden and Australia.

Habitat and Locality : Soil around roots of Sugarcane, Mohand Rao, Doiwala and Pine from FRI, Dehradun.

Remarks : This species is being recorded for the first time from Uttarakhand. Sugarcane fields and Pine plantations are new habitat records.

151. **Alaimus hamulus* Siddiqi & Husain, 1967

1967. *Alaimus hamulus*, Siddiqi & Husain, *Proc. Helm. Soc. Wash.*, 34 : 163.

Dimensions : Female : L = 0.95-1.20 mm; a = 54-64; b = 4.2-4.8; c = 11-15; V = 42-46.

Male : L = 1.0-1.2 mm; a = 58-62; b = 4.3-4.6; c = 10-11; T = 40-48.

Description : Female : Body ventrally arcuate, more so in posterior region, slightly spiral. Esophagus enlarging in its posterior fifth to become as wide as body. Nerves ring a little posterior to middle of neck. Anterior branch of reproductive system absent. Tail ventrally hooked, tapering except at terminus where it abruptly narrows to a sharp point, 7-8 anal body widths long.

Male : Esophagus enlarging in its last quarter. Spicules strongly cephalated, 10 µm long, a longitudinal partition wall dividing its lumen in to two equal chambers. Supplementary papillae five, anteriormost lying 75 µm and the posteriormost 7 µm in front of cloaca. Tail cuticle in ventrolateral

region swollen to give an impression of a bursa. Tail ventrally arcuate, about eight times anal body width long, terminus abruptly narrows to a pointed end.

Distribution : India : Uttar Pradesh, Punjab and Uttarakhand.

Habitat and Locality : Soil around roots of apricot from Dehradun.

Remarks : This species was recorded and described by Siddiqi & Husain (1967) from Dehradun.

Genus *Amphidelus* Thorne, 1939

152. **Amphidelus dolichurus* (de Man, 1876)
Thorne, 1939

1876. *Monhystera dolichurus* de Man, *Tijds. Nederland Dierek. Vereen*, 2 : 100.

1880. *Alaimus dolichurus* de Man, *Tijds. Nederland Dierek. Vereen*, 5 : 3.

1939. *Amphidelus dolichurus* Thorne, *Capita. zool.*, 85 : 175.

Dimensions : Female : L = 0.87-1.01 mm; a = 56-57; b = 4.0-4.5; c = 3.8-8.0; V = 35-41.

Male : L = 1.03-1.17 mm; a = 65-71; b = 3.0-3.9; c = 7.0-7.9; spicules = 11-13 µm.

Distribution : India; Uttar Pradesh and Uttarakhand.

Elsewhere : U.S.A.

Remarks : This species was reported by Khara & Chaturvedi (1977) from Dehradun.

Habitat and Locality : Soil around roots of Tea plantations from Dehradun.

153. **Amphidelus loofi* Khara & Chaturvedi, 1977

1977. *Amphidelus loofi* Khara & Chaturvedi, *Rec. zool. Surv. India*, 72 : 144-146.

Dimensions : Female : L = 1.03-1.04 mm; a = 67-74; b = 8.9-11.3; c = 3.8-8.0; V = 35-41. V = 65-67.

Description : Body long, slender, tapering towards either end, more so posteriorly, curved ventrally or a loose spiral. Head not offset, lip region rounded, wide about 1/4 the neck base. Stoma much reduced and inconspicuous. Esophagus narrow and tubular, expanding in posterior fourth. Tail elongates 116-119 µm long, tapering gradually to filiform.

Distribution : India : Uttarakhand.

Habitat & Locality : Soil around roots of Tea Plantations of Dehradun.

Remarks : This species was recorded by Khera & Chaturvedi (1977) from Dehradun.

Order MONONCHIDA

Superfamily MONONCHOIDEA

Family MONONCHIDAE

Subfamily MONONCHINA CHITWOOD, 1937

Genus *Mononchus* Bastian, 1865

154. **Mononchus aquaticus* Coetzee, 1968

1968. *Mononchus aquaticus* Coetzee, *Nematologica*, 14 : 64.

Dimensions : Female : L = 1.3-1.6 mm; a = 33-36; b = 3.9-4.2; c = 8.5-10.0; V = 52-54.

Description : Female : Lip region 18-22 µm wide, 6-8 µm high. Buccal cavity 29-38 µm long, 14-17 µm wide. Dorsal tooth of medium size, situated in anterior half of buccal cavity, its apex 20-29 µm or 77-81% of the length of buccal cavity from base. Subventral walls without any denticles but with an indentation opposite dorsal tooth apex. Reproductive system amphidelphic. Sphincter present at oviduct-uterus junction. Tail elongate conoid and clavate at tip, 148-156 µm long. Caudal glands well developed, terminal opening present.

Distribution : India : Uttar Pradesh, Uttarakhand, Jammu and Kashmir.

Elsewhere : Costa Rica, Germany, Italy Romania and South Africa.

Habitat & Locality : Soil around roots of *Hooptelea integrifolia*, Uttarkashi; *Mentha viridis*, Rishikesh, Dehradun and *Marchantia* sp from Srinagar, Pauri Garhwal.

Remarks : This species was recorded by Rawat & Ahmad (2000) from districts Uttarkashi, Dehradun and Pauri Garhwal.

155. **Mononchus truncatus* Bastian, 1865

1865. *Mononchus truncatus* Bastian, *Trans. Linn. Soc. London*, 25 : 162.

Dimensions : Female : L = 1.5-1.7 mm; a = 31-42; b = 3.5-3.8; c = 7.9-9.1; V = 54-56; buccal cavity = 37-38 x 16-18 µm; position of dorsal tooth from the base of buccal cavity = 29-33 µm; tail = 172-212 µm.

Description : Female : Body tapering slightly anteriorly, but more considerably posteriorly. Head truncate; no papillae. Esophagus about 1/4th of total length. Vulva slightly posterior to middle of body. Lateral canals broad, very indistinct, only recognizable behind intestine; no cells apparently a few light-coloured scattered granules.

Distribution : India : Uttarakhand.

Elsewhere : Costa Rica, Germany, Italy, Romania, South Africa and United Kingdom.

Habitat & Locality : Soil around roots of *Cynodon dactylon* from Nakuri, district Uttarkashi.

Remarks : This species was recorded by Rawat & Ahmad (2000) from district Uttarkashi and also for the first time from India.

156. **Mononchus himalayensis* Rawat & Ahmad, 2000

2000. *Mononchus himalayensis* Rawat & Ahmad, *Indian J. Nematol.*, 30 : 64.

Dimensions : Female : L = 1.6-1.9 mm; a = 33-38; b = 3.6-3.7; c = 5.4-6.5; V = 48-54; buccal cavity = 40-46 x 17-19 µm; tail = 225-305 µm.

Description : Female : Body generally straight with the distal part of the tail highly curved 48-52 µm wide at the middle. Lip region 23-26 µm wide, 6-9 µm high. Buccal cavity 40-46 µm long, 17-19 µm wide. Dorsal tooth of medium size, situated in anterior half of buccal cavity, its apex 30-33 µm or 68-72% from the base of buccal cavity and 10-14 µm or 25-31 from the anterior end of buccal cavity. Buccal cavity strongly sclerotized with conspicuously arched near tooth. Subventral walls without any denticles. Reproductive system amphidelphic. Tail long, cylindrical and highly curved ventrally and 8.8-10.0 anal body-widths long. Caudal glands well developed, terminal opening present.

Distribution : India : Uttarakhand.

Habitat & Locality : Soil around roots of *Pinus roxburghii* from Purola, Uttarkashi.

Remarks : This species was recorded by Rawat & Ahmad (2000) from district Uttarkashi.

Subfamily PRIONCHULINAE

Genus *Clarkus* Jairajpuri, 1970157. *Clarkus papillatus* (Bastian, 1865)
Jairajpuri, 1970

1865. *Mononchus papillatus* Bastian, *Linn. Soc. Lond. Trans.*, 25 : 78.

1970. *Clarkus papillatus* Jairajpuri, *Nematologica*, 16 : 215.

Material Examined : 2 ♀♀, CTR, Nainital, 23.ii.05, Reg. No IV 258, coll. A. N. Rizvi and Party; 2 ♀♀, CTR, Nainital, 24.ii.05, Reg. No IV 259, coll. A. N. Rizvi and Party; 1 ♀, Chakrata, Dehradun, 24.v.06, Reg. No IV 333, coll. H.S. Mehta & Party.

Dimensions : Female : L = 0.9-1.7 mm; a = 16-24; b = 3.1-3.3; c = 15-19; V = 61-66.

Description : Female : Body slightly curved upon fixation. Lip region angular, 23-29 µm wide, 7-11 µm high. Amphidial aperture 3-5 µm wide, located at 10-13 from anterior end of body and 22-27 µm from base of buccal cavity. Buccal cavity straight 24-32 µm long, 11-15 µm wide. Dorsal tooth of medium size, situated in anterior half of buccal cavity, its apex 19-26 µm or 82-87% of the length of buccal cavity from base. Sub ventral walls with non-denticulate ridge. Nerve ring at 115-154 µm from anterior end of body. Reproductive system amphidelphic. Sphincter at oviduct-uterus absent. Tail conoid, ventrally curved. Caudal gland and terminal opening absent.

Male : Not found.

Distribution : India : Uttar Pradesh, Uttarakhand, Jammu & Kashmir, Himachal Pradesh and West Bengal.

Elsewhere : South Africa, Germany, Hungary, Poland, Sweden.

Habitat & Locality : Soil around roots of Sal from CTR, Nainital, and Silver Oak trees at Chakrata, Dehradun.

Remarks : This species was recorded for the first time in Uttarakhand from CTR (Rizvi, 2008). Silver oak is a new habitat record for the species.

158. *Clarkus elongatus* Jairajpuri & Khan, 1977

1977. *Clarkus elongatus* Jairajpuri & Khan, *Nematologica*, 23 : 92.

Material examined : 3 ♀♀, Kalsi, Dehradun, 4.v.06, Reg. No IV 334, coll. H.S. Mehta & Party.

Dimensions : Female : L = 1.9-2.2 mm; a = 24-30; b = 3.3-4.6; c = 16-18; V = 60-61.

Description : Female : Body slightly curved upon fixation. Lip region 36-42 µm wide, 10-12 µm high. Amphidial apertures 3-4 µm wide, located at 15-17 µm from anterior end of body and 38-48 µm from base of buccal cavity. Buccal cavity 45-46 µm long and 20-23 µm wide. Dorsal tooth of medium size situated in anterior half of buccal cavity, its apex 33-36 µm. Subventral walls with non-denticulate ridge. Reproductive system amphidelphic. Sphincter not present at oviduct-uterus junction. Tail elongate-conoid, 140-160 µm or 3-4 anal body-widths long, ventrally curved. Caudal glands absent.

Male : Not found.

Distribution : India : Uttar Pradesh, Uttarakhand, Sikkim, West Bengal and Punjab.

Elsewhere : Europe.

Habitat & Locality : Soil around roots of Litchi and Mango, at Kalsi Dist. Dehradun and grasses from Nainital.

Remarks : Soil around roots of Litchi is a new habitat record for the species.

159. **Clarkus sheri* (Mulvey, 1967) Jairajpuri, 1970

1967. *Mononchus sheri* Mulvey, *Can. J. Zool.*, 45 : 935.

1970. *Clarkus sheri* Jairajpuri, *Nematologica*, 16 : 213.

Dimensions : Female : L = 1.9-2.2 mm; a = 23-27; b = 3.9-4.6; c = 14-17; V = 58-61.

Description : Female : Body slightly curved upon fixation. Lip region 32-35 µm wide, 10-15 µm high. Buccal cavity straight, 34-38 µm long and 16-18 µm wide. Dorsal tooth of medium size, situated in anterior half of buccal cavity, its apex 24-28 µm or 70-73% of the length of buccal cavity from base. Sub ventral walls with non-denticulate ridge. Reproductive system amphidelphic. Sphincter at oviduct-uterus absent. Tail conoid, ventrally arcuate, 100-110 µm or 2.0-3.0 anal body-widths long. Caudal gland and terminal opening absent.

Distribution : India : Uttar Pradesh, Uttarakhand and Himachal Pradesh.

Elsewhere : South Africa and Europe.

Habitat & Locality : Soil around roots of grasses from district Pauri Garhwal.

Remarks : This species was recorded by Jairajpuri & Khan (1982) from district Pauri Garhwal.

160. **Clarkus parvus* (de Man, 1880)
Jairajpuri, 1970

1880. *Mononchus parvus* de Man, *Tijds. Nederland Dierek. Vereen*, 5 : 19.

1970. *Clarkus parvus* Jairajpuri, *Nematologica*, 16 : 218.

Dimensions : Female : L = 0.81-0.91 mm; a = 18-20; b = 2.9-3.2; c = 13-14; V = 66-68.

Description : Female : Body 'C' shaped upon fixation, tapering slightly towards both ends. Cuticle 3-5 µm thick. Buccal cavity 24-26 µm long and 14-16 µm wide. Dorsal tooth of medium size, situated in anterior half of buccal cavity, its apex 14-16 µm from base of stoma. Rectum 16-21 µm, about one anal body-width long. Reproductive system amphidelphic. Tail conoid, ventrally arcuate, 56-70 µm or 2.0-3.0 anal body-widths long. Caudal glands rudimentary, spinneret absent.

Distribution : India : Uttar Pradesh, Uttarakhand and Kashmir.

Elsewhere : Netherlands.

Habitat & Locality : Soil around roots of grasses from district Nainital.

Remarks : Jairajpuri & Khan (1982) recorded this species from district Nainital.

Genus *Prionchulus* (Cobbb, 1916) Wu & Hoeppli, 1929

161. **Prionchulus muscorum* (Dujardin, 1845)
Wu & Hoeppli, 1929

1845. *Oncholaimus muscorum* Dujardin, *Histoire nat. des helm. vers. intestinaux Paris*, 515.

1929. *Prionchulus muscorum* Wu & Hoeppli, *Arch. Schiff's-u Tropenhyg.*, 33 : 38.

Dimensions : Female : L = 1.45-3.00 mm; a = 21-33; b = 3.0-5.0; c = 11-28; V = 66-68.

Male : L = 2.81 mm; a = 32; b = 4.1; c = 29; T = 45.

Description : Female : Lip region 32-56 µm wide, 10-22 µm high. Buccal cavity 39-64 µm long, 18-35 µm wide. Dorsal tooth of medium size, situated in anterior half of buccal cavity, its apex 28-48 µm or 68-83% of the length of buccal cavity from base. Subventral walls with two longitudinal denticulate ridges. Reproductive system amphidelphic. Sphincter at oviduct-uterus junction weakly developed or absent. Tail conoid, arcuate ventrally, 96-185 µm or 2.0-3.5 anal body-widths long. Caudal glands and terminal opening absent.

Male : Spicules 107 µm long medially. Gubernaculum 30 µm long, accessory pieces poorly developed. Supplements 20. Tail conoid, 96 µm or two anal body-widths long.

Distribution : India : Uttar Pradesh, Uttarakhand, West Bengal and Kashmir.

Elsewhere : South Africa, Belgium, Germany, Poland, Italy, Sweden, Australia.

Habitat & Locality : Soil around roots of grasses from district Nainital, jungle tree from Almora, ornamental plants from Mussourie, Dehradun and grasses from Pauri Garhwal.

Remarks : This species was recorded by Jairajpuri (1970) from district Nainital Almora, Dehradun & Pauri Garhwal.

Genus *Coomansus* Jairajpuri & Khan, 1977

162. **Coomansus parvus* (de Man, 1880)
Jairajpuri & Khan, 1977

1880. *Mononchus parvus* de Man, *Tijds. Nederland Dierek. Vereen*, 5 : 52.

1977. *Coomansus parvus* Jairajpuri & Khan, *Nematologica*, 23 : 94.

Dimensions : Female : L = 0.81-1.1 mm; a = 16-24; b = 2.8-3.8; c = 12-17; V = 58-68.

Description : Female : Lip region 19-42 µm wide, 6-10 µm high. Buccal cavity 21-26 µm long, 10-14 µm wide. Dorsal tooth of medium size, situated in anterior half of buccal cavity, its apex 13-18 µm or 58-68% of the length of buccal cavity from base. Subventral walls without denticles or ridges. Reproductive system amphidelphic. Sphincter at oviduct-uterus junction absent. Uterine eggs measuring 96-106 x 38-45 µm. Tail conoid, arcuate ventrally, 56-75 µm or 2.0-3.0 anal body-widths long. Caudal glands and terminal opening absent.

Distribution : India : Uttar Pradesh, Uttarakhand, Himachal Pradesh and Kashmir.

Elsewhere : Germany, Hungary, Italy and Poland.

Habitat & Locality : Soil around roots of *Marchantia* sp from district Nainital, ornamental plant from Mussourie, Dehradun, mosses from Uttarkashi, *Cynodon dactylon* from Chamoli, *Quercus floribanda* from Pauri, *Berberis asiatica* from Tehri Garhwal.

Remarks : This species was recorded by Jairajpuri & Khan (1982) from districts Nainital and Dehradun. Rawat *et al.* (1999) recorded it from Uttarkashi, Chamoli, Pauri and Tehri Garhwal.

163. **Coomansus indicus* Jairajpuri & Khan, 1977
1977. *Coomansus indicus* Jairajpuri & Khan, *Nematologica*, **23** : 92.

Dimensions : Female : L = 1.1-1.4 mm; a = 18-24; b = 3.0-3.3; c = 15-19; V = 70-72.

Description : Female : Lip region 33-37 µm wide, 12-15 µm high. Buccal cavity 35-40 µm long, 19-23 µm wide. Dorsal tooth of medium size, situated in anterior half of buccal cavity, its apex 19-22 µm or 52-55 % of the length of buccal cavity from base. Subventral walls without denticles or ridges. Reproductive system amphidelphic. Sphincter not present at oviduct-uterus junction. Tail conoid, arcuate ventrally, 65-80 µm or 2.0-2.6 anal body-widths long. Caudal glands and terminal opening absent.

Distribution : India : Uttar Pradesh, Uttarakhand, Himachal Pradesh and Kashmir.

Habitat & Locality : Soil around roots of grasses from Mussourie, Dehradun and ferns from district Pauri.

Remarks : This species was recorded by Jairajpuri & Khan (1982) from district Dehradun and by Rawat *et al.* (1999) from district Pauri.

164. **Coomansus campbelli* (Allgen, 1929)
Jairajpuri & Khan, 1977

1929. *Mononchus campbelli* Allgen, *Nyt. Mag. Naturv. Idensk.*, **67** : 216.

1977. *Coomansus campbelli* Jairajpuri & Khan, *Nematologica*, **23** : 89-96.

Dimensions : Female : L = 2.1-2.4 mm; a = 31-33; b = 4.0-4.2; c = 13-15; c' = 3.3-3.7; V = 59-62.

Description : Female : Buccal cavity 41-43 µm long, 22-23 µm wide. Dorsal tooth of medium size situated in anterior half of buccal cavity, its apex 30-31 µm. Subventral walls without denticles or ridges. Reproductive system amphidelphic. Sphincter not present at oviduct-uterus junction. Tail conoid arcuate ventrally, 145-165 µm long. Caudal glands and terminal opening absent.

Distribution : India : Uttar Pradesh and Uttarakhand.

Elsewhere : Germany.

Habitat & Locality : Soil around roots of *Cynodon dactylon* from district Pauri.

Remarks : This species was recorded by Rawat *et al.* (1999) from Pauri.

165. **Coomansus minor* Rawat, Srivastava & Ahmad, 1999

1999. *Coomansus minor*, Rawat, Srivastava & Ahmad, *Indian J. Nematol.*, **29** : 127.

Dimensions : Female : L = 0.5-0.6 mm; a = 15-16; b = 3.1-3.2; c = 10-12; c' = 2.2-2.3; V = 62-64; tail = 47-52 µm; ABD = 22-23 µm.

Description : Female : Body very small, ventrally curved upon fixation, tapering posteriorly, and 35-36 µm wide at the middle. Lip region rounded, 18-22 µm wide, 6-9 µm high. Buccal cavity 21 µm long and 12-13 µm wide. Dorsal tooth of medium size and situated in anterior half of buccal cavity, its apex 12-13 µm or 57-62% of the length of buccal cavity from base. Subventral walls without denticles or ridges. Esophago-intestinal junction non-tuberculate. Reproductive system amphidelphic, both gonads equal in size and each 1.8-2.0 times as long as body diameter. Tail conoid curved ventrally, tip bluntly rounded and 2.2-2.3 anal body-widths long. Caudal glands rudimentary and terminal opening absent.

Distribution : India : Uttar Pradesh, Uttarakhand.

Habitat & Locality : Soil around roots of wild grasses from Uttarkashi.

Remarks : This species was reported by Rawat *et al.* (1999) from Uttarkashi.

166. ***Coomansus garhwalicus** Rawat,
Srivastava & Ahmad, 1999

1999. *Coomansus garhwalicus* Rawat, Srivastava & Ahmad,
Indian J. Nematol., **29** : 130.

Dimensions : Female: L = 0.98-1.25 mm; a = 24-26; b = 3.1-3.2; c = 12-13; c' = 2.8-3.0; V = 66-69; tail = 77-90 µm; ABD = 25-31 µm.

Description : Female : Body ventrally curved upon fixation, 30-50 µm wide at the middle. Lip region, 21-33 µm wide, 9-12 µm high and moderately protruding. Buccal cavity 20-25 µm long and 15-34 µm wide. Dorsal tooth of small in size, situated in anterior half of buccal cavity, its apex 15-20 µm or 57-60% of the length of buccal cavity from base. Subventral walls without denticles or ridges. Reproductive system amphidelphic. Tail conoid, curved ventrally, tip bluntly rounded and 2.8-3.0 anal body-widths long. Caudal glands rudimentary and terminal opening absent.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat & Locality : Soil around roots of mosses and grasses from Uttarkashi.

Remarks : This species was reported and described by Rawat *et al.* (1999) from Uttarkashi.

Family MYLONCHULIDAE

Subfamily MYLONCHULINAE

Genus *Mylonchulus* (Cobb, 1916) Altherr, 1953

167. ***Mylonchulus brachyuris*** (Butschli, 1873)
Altherr, 1954

1873. *Mononchus brachyuris* Butschli, *Nova. Acta. Acad. Nat. Curios.*, **36** : 82.

1954. *Mylonchulus brachyuris* Altherr, *Bull. Soc. vaud. Sci. nat.*, **66** : 52.

Material examined : 3 ♀♀, Chakrata, Dehradun, 24.v.06, Reg. No IV 335, coll. H.S. Mehta & Party.

Dimensions : Female : L = 0.8-1.1 mm; a = 27-30; b = 3.1-3.5; c = 30-34; V = 63-64.

Description : Female : Body ventrally arcuate upon fixation, tapering slightly towards extremities.

Cuticle smooth. Lip region 20-24 µm wide and 7-8 µm high. Buccal cavity 21-26 µm long and 12-24 µm wide. Dorsal tooth massive, its apex at 16-20 µm from base of buccal cavity. Subventral walls bearing six transverse rows of denticles. Submedian teeth present. Reproductive system amphidelphic. Sphincter not present at oviduct-uterus junction. Tail conoid with blunt terminus. Caudal glands grouped. Spinneret subterminal.

Distribution : India : Uttar Pradesh, Uttarakhand, Kashmir, Himachal Pradesh and West Bengal.

Elsewhere : Malaysia, Austria, Belgium and Germany.

Habitat and Locality : Soil around roots of Deodar from Chakrata, Dehradun.

Remarks : Deodar is a new habitat record for the species.

168. ***Mylonchulus minor*** (Cobb, 1893)
Andrassy, 1958

1893. *Mononchus minor* Cobb, *Dept. Agr. N. S. Wales Misc. Publ.*, **13**.

1958. *Mylonchulus minor* Andrassy, *Annl. hist. nat. mus. Hung.*, **50** : 151.

Material examined : 4 ♀♀, Haridwar, 19.xii.2006, Reg. No IV 336, coll. S.J.S. Hattar & party.

Dimensions : Female : L = 0.82-1.40 mm; a = 18-32; b = 3.0-3.8; c = 32-47; V = 54-67.

Description : Female : Body slightly to strongly ventrally arcuate upon fixation, tapering gradually to base of esophagus but sharply behind vulva. Cuticle smooth, 2-3 µm thick. Lateral chords about 1/3rd body-width wide near middle. Lip region 20-25 µm wide, 7-10 µm high. Buccal cavity 21-26 µm long, 12-15 µm wide. Dorsal tooth massive, its apex at 15-19 µm from base of buccal cavity. Subventral walls bearing five or six transverse rows of denticles. Submedian teeth present. Reproductive system amphidelphic. Sphincter not present at oviduct-uterus junction. Tail arcuate conoid with blunt terminus. Caudal glands tandem. Spinneret terminal.

Distribution : India : Uttar Pradesh, Uttarakhand, Maharashtra, Andhra Pradesh, Kerala and Sikkim.

Elsewhere : South Africa, Malaysia, Hungary, U.S.A. and Slovenia.

Habitat and Locality : Soil around roots of grasses and *Citrus* sp. from Nainital; Jamun, from Haridwar.

Remarks : Jamun is new habitat record for the species and it is recorded for the first time from district Haridwar.

169. *Mylonchulus hawaiiensis* (Cassidy, 1931) Andrassy, 1958

1931. *Mononchus hawaiiensis* Cassidy, *Hawaii Plrs. Rec.*, **34** : 381.

1958. *Mylonchulus hawaiiensis* Andrassy, *Annls. hist. nat. mus. Hung.*, **50** : 155.

Material examined : 1 ♀, Doiwala, Dehradun, 19.xii.2006, Reg. No IV 337, coll. S.J.S. Hattar & party.

Dimensions : Female : L = 0.87-0.98 mm; a = 22-26; b = 3.2-3.6; c = 27-31; V = 58-60.

Description : Female : Body ventrally arcuate upon fixation, tapering towards extremities. Cuticle smooth, 2-3 µm thick. Lateral chords about 1/3rd body-width wide near middle. Lip region 20-25 µm wide, 7-10 µm high. Buccal cavity 22-25 µm long, 14-17 µm wide. Dorsal tooth massive, its apex at 14-18 µm from base of buccal cavity. Subventral walls bearing six transverse rows of denticles. Submedian teeth present. Nerve ring 85-98 µm from anterior end body. Reproductive system amphidelphic. Sphincter not present at oviduct-uterus junction. Tail 30-40 µm long, elongate with slightly clavate terminus. Caudal glands tandem. Spinneret terminal.

Male : Not found.

Distribution : India : Uttar Pradesh, Uttarakhand, Himachal Pradesh, Jammu & Kashmir, Car nicobar Islands and Sikkim.

Elsewhere : Hungary and Hawaii.

Habitat and Locality : Soil around roots of mango, *Mangifera indica* L., from Nainital; grasses from Pauri, Guava, *Psidium guayava* L., Ornamental plants and *Cicer arietinum* L., and *Saccharum officinarum* from Dehradun.

Remarks : This species was recorded from district Nainital by Jairajpuri (1970); Jairajpuri & Khan (1982) recorded this species from districts Dehradun & Pauri Garhwal. Sugarcane field is a new habitat record.

170. *Mylonchulus lacustris* (N.A. Cobb In M.V. Cobb, 1915) Andrassy, 1958

1931. *Mononchus lacustris* Cobb, *Trans. Amer. Micr. Soc.*, **34** : 25.

1958. *Mylonchulus lacustris* Andrassy, *Annls. hist. nat. mus. Hung.*, **50** : 156.

Material examined : 3 ♀ ♀, FRI Dehradun, 5.vii.06, Reg. No IV 338, coll. A.N. Rizvi & Party.

Dimensions : Female : L = 1.06-1.67 mm; a = 25-40; b = 3.8-4.1; c = 24-31; V = 60-66.

Description : Female : Body slightly to strongly ventrally arcuate upon fixation, tapering gradually towards base of esophagus but sharply behind vulva. Cuticle smooth, 2-4 µm thick. Lateral chords about 1/3rd body-width wide near middle. Lip region 24-29 µm wide, 10-13 µm high. Buccal cavity 25-32 µm long, 15-20 µm wide. Apex of dorsal tooth 16-21 µm from base of stoma. Subventral walls bearing seven transverse rows of denticles; submedian teeth present. Nerve ring at 110-125 µm from anterior end of body. Reproductive system amphidelphic. Rectum 24-30 µm, less than one anal body diameter. Tail 42-59 µm arcuate and conoid. Caudal glands in tandem. Spinneret terminal.

Male : Not found.

Distribution : India : Uttar Pradesh, Uttarakhand, West Bengal and Bihar.

Elsewhere : Hungary, Poland, South Africa.

Habitat and Locality : Soil around roots of guava, *Psidium guayava* L. and *Citrus* sp. from Nainital; sugarcane, *Saccharum officinarum* L., and pine, *Pinus* sp from Dehradun.

Remarks : This species was recorded from district Nainital by Jairajpuri (1970); Jairajpuri & Khan (1982) recorded this species from district Dehradun. Recorded for the first time from pine plantations.

171. **Mylonchulus nainitalensis* Jairajpuri, 1970
1970. *Mylonchulus nainitalensis* Jairajpuri, *Nematologica*, 16 : 449.

Dimensions : Female : L = 0.80-0.88 mm; a = 27-30; b = 3.2; c = 40-46; V = 63.

Male : L = 0.87 mm; a = 25; b = 3.4; c = 40.

Description : Female : Body strongly arcuate ventrally in half of its length upon fixation, tapering slightly towards extremities. Cuticle smooth, 2-4 µm thick. Buccal cavity 20-21 µm long, 13-15 µm wide. Apex of dorsal tooth 17-18 µm from base of stoma. Six transverse rows of denticles present. Submedian teeth present. Reproductive system amphidelphic. Tail 19-20 µm long, about one anal widths long, bluntly-conoid; caudal glands in tandem; spinneret terminal.

Male : Spicules 35µm long medially, gubernaculums 13 µm and lateral accessory piece 9 µm. Supplements 12. Rectum 25 µm, over one anal body-width long. Tail 32 µm, about one anal body-width long.

Distribution : India : Uttar Pradesh, Uttarakhand and Himachal Pradesh.

Habitat and Locality : Soil around roots of mango, *Mangifera indica* L. from Nainital.

Remarks : This species was reported from district Nainital by Jairajpuri (1970).

172. **Mylonchulus dentatus* Jairajpuri, 1970

1970. *Mylonchulus dentatus* Jairajpuri, *Nematologica*, 16 : 446.

Dimensions : Female : L = 1.00-1.50 mm; a = 30-37; b = 3.0-3.5; c = 30-33; V = 61-65.

Description : Female : Body slightly arcuate ventrally upon fixation, tapering slightly towards extremities. Lip region 25-32 µm wide, 9-12 µm high. Buccal cavity 25-30 µm long, 16-20 µm wide. Apex of dorsal tooth 19-22 µm from base of stoma. Multiple transverse rows of denticles in subventral walls, not arranged in definite rows. Prominent submedian teeth. Reproductive system amphidelphic. Vulval papillae present, pre-vulval 0-3, post-vulval 0-1. Tail 39-45 µm about 1.5 anal widths long, elongate-conoid and tapering. Caudal glands grouped. Spinneret terminal.

Distribution : India : Uttar Pradesh, Uttarakhand, Andhra Pradesh and Gujarat.

Habitat and Locality : Soil around roots of mango, *Mangifera indica* L. and guava, *Psidium guayava* L. from Nainital.

Remarks : This species was reported from district Nainital by Jairajpuri (1970).

173. *Mylonchulus muradi* Jairajpuri, 1970

1970. *Mylonchulus muradi* Jairajpuri, *Nematologica*, 16 : 450.

Material examined : 7 ♀♀, Tantapur, Haridwar, 18.i.2007, Reg. No IV 339, coll. P.T. Bhutia & Party.

Dimensions : Female : L = 1.04-1.24 mm; a = 24-26; b = 3.1-3.2; c = 39-45; V = 60-63.

Description : Female : Body strongly curved in posterior half of its length upon fixation, tapering slightly towards extremities. Cuticle smooth, 2-4 µm thick. Lateral chords about 1/2.5 body-width wide near middle. Lip region 24-27 µm wide, 8-10 µm high. Amphids 3 µm wide, apertures situated at 14-15 µm from anterior end. Buccal cavity 22-27 µm long, 15-18 µm wide. Apex of dorsal tooth 17-21 µm from base of stoma. Six transverse rows of denticles. Submedian teeth present. Nerve ring at 105-110 µm from anterior end of body. Rectum 24-28 µm about one anal body-width long. Reproductive system amphidelphic. Ovaries reflexed, with 15-24 oocytes. Cuticularized pieces at vagina-vulva junction. Tail 25-28 µm long, about one anal width long, obtusely rounded. Caudal glands large, grouped; spinneret terminal.

Male : Not found.

Distribution : India : Uttar Pradesh, Uttarakhand, Andhra Pradesh and Gujarat.

Habitat and Locality : Soil around roots of unidentified grass from Nainital; sugarcane from Haridwar.

Remarks : This species was reported from district Nainital by Jairajpuri (1970). Sugarcane field is a new habitat record.

174. **Mylonchulus contractus* Jairajpuri, 1970

1970. *Mylonchulus contractus* Jairajpuri, *Nematologica*, 16 : 453.

Dimensions : Female : L = 0.55-1.08 mm; a = 19-34; b = 2.5-3.5; c = 30-44; V = 55-64 Male: L = 0.97 mm; a = 33; b = 3.3; c = 28; T = 44.

Description : Female : Body small, stout and ventrally arcuate upon fixation, tapering slightly towards extremities. Lip region 14-20 μm wide, 5-7 μm high. Buccal cavity 14-21 μm long, 8-13 μm wide. Medium sized dorsal tooth, apex of dorsal tooth 11-16 or 70-85% of the length of buccal cavity from base. Subventral walls bearing five transverse rows of denticles; submedian teeth present. Reproductive system amphidelphic. Tail, 20-40 μm or 1-1.5 anal widths long, conoid with blunt terminus. Caudal glands, grouped. Spinneret subterminal dorsally.

Male : Spicules 35 μm long medially. Gubernaculum 12 μm long, accessory piece absent. Supplements 9. Tail conoid, 35 μm or one anal body-width long.

Distribution : India : Uttar Pradesh, Uttarakhand, Kerala, Assam, Himachal Pradesh and Maharashtra.

Habitat and Locality : Soil around roots of groundnut, *Arachis hypogaea* L., *Ricinus communis* L., from Rishikesh, district Dehradun; unidentified jungle plants from Nainital

Remarks : This species was reported from district Nainital by Jairajpuri (1970).

175. **Mylonchulus sigmaturus* (Cobb, 1917)
Altherr, 1953

1917. *Mononchus sigmaturus* Cobb, *Soil Sci.*, 3 : 433.

1953. *Mylonchulus sigmaturus* Altherr *Bull. Soc. vand. Sci. nat.*, 65 : 451.

Dimensions : Female : L = 1.25-1.53 mm; a = 28-34; b = 3.4-3.8; c = 39-44; V = 63-66.

Description : Female : Body ventrally arcuate upon fixation, tapering towards extremities. Lip region 24 μm wide, 10 μm high. Buccal cavity 25-30 μm long, 12-15 μm wide. Dorsal tooth of medium size, its apex at 20-22 μm or 80-84 % from base of buccal cavity. Subventral walls bearing six transverse rows of denticles. Submedian teeth present. Nerve ring at 93 μm from anterior end body. Reproductive system amphidelphic. Sphincter not present at oviduct-uterus junction. Tail 40-45 μm long, conoid with clavate terminus. Caudal glands grouped. Spinneret terminal.

Distribution : India : Uttar Pradesh, Uttarakhand and Manipur.

Elsewhere : Germany, Hungary, Italy, Poland, Sweden, Austria and U.S.A.

Habitat and Locality : Soil around roots of ferns from Mussourie, Dehradun.

Remarks : This species was recorded from district Dehradun by Jairajpuri & Khan (1982).

176. *Mylonchulus amurus* Khan & Jairajpuri, 1979
1979. *Mylonchulus amurus* Khan & Jairajpuri, *Nematologica*, 25 : 406.

Material examined : 7 ♀♀, Tantapur, Haridwar, 18.i.2007, Reg. No IV 340, coll. P.T. Bhutia & Party.

Dimensions : Female : L = 0.81-1.15 mm; a = 17-34; b = 2.8-3.3; c = 28-42; V = 58-66.

Male : L = 0.85 mm; a = 25; b = 3.0; c = 42; T = 47.

Description : Female : Body ventrally arcuate upon fixation, tapering towards extremities. Lip region 21-36 μm wide, 8-10 μm high. Amphidial apertures 3-4 μm wide, located at 9-12 μm from anterior end of body and 16-19 μm from base of buccal cavity. Buccal cavity 22-25 μm long, 11-15 μm wide. Dorsal tooth of medium size, its apex at 17-19 μm or 70-80% from base of buccal cavity. Subventral walls bearing five transverse rows of denticles. Submedian teeth present. Nerve ring 88-120 μm from anterior end body. Reproductive system amphidelphic. Sphincter not present at oviduct-uterus junction. Tail 30-44 μm long, conoid with clavate terminus. Caudal glands well developed and grouped. Spinneret terminal.

Male : Spicules 25 μm long medially. Gubernaculum 8 μm long, accessory pieces 5 μm long. Supplements 13. Rectal glands three. Tail 35 μm or about one anal body-width long.

Distribution : India : Uttar Pradesh, Uttarakhand, Himachal Pradesh and Sikkim.

Habitat and Locality : Soil around roots of *Marchantia* sp., from Nainital; Sugarcane from Haridwar.

Remarks : This species was recorded from district Nainital by Jairajpuri & Khan (1982). Sugarcane field is a new habitat record for the species.

177. *Mylonchulus subsimilis* (Cobb, 1917)
Meyl, 1957

1917. *Mononchus subsimilis* Cobb, *Soil Sci.* 3 : 431.

1957. *Mylonchulus subsimilis* Meyl, *Inst. Roy. Sci. Nat. Belg.*, 3 : 29.

Material Examined : 2 ♀ ♀, Ghangharia, Chamoli, 20.viii.06, Reg. No IV 341, coll. D. Bisht & Party.

Dimensions : Female : L = 1.10-1.14 mm; a = 28-30; b = 3.0-3.1; c = 46-49; V = 66-70.

Description : Female : Body ventrally arcuate upon fixation, tapering towards extremities. Lip region 20-22 µm wide, 6-7 µm high. Amphidial apertures 3 µm wide, located at 8-9 µm from anterior end of body and 16-19 µm from base of buccal cavity. Buccal cavity 19-20 µm long and 9-10 µm wide. Medium sized dorsal tooth, its apex at 16-18 µm or 83-85% from base of buccal cavity. Subventral walls bearing six transverse rows of denticles. Submedian teeth present. Nerve ring at 84-86 µm from anterior end body. Reproductive system amphidelphic. Sphincter not present at oviduct-uterus junction. Tail 22-23 µm long, conoid with bluntly rounded tip. Caudal glands and terminal opening absent.

Distribution : India : Uttar Pradesh, Uttarakhand, Himachal Pradesh and Sikkim.

Habitat and Locality : Soil around roots of silver oak from Ghangharia, district Chamoli.

Remarks : This species is being recorded for the first time from district Chamoli, Uttarakhand and at an altitude of 10,000ft. Soil around roots of silver oak is a new habitat record.

Genus *Paramylonchulus* Jairajpuri & Khan 1982

178. *Paramylonchulus mulveyi* (Jairajpuri, 1970) Jairajpuri & Khan 1982

1970. *Mylonchulus mulveyi* Jairajpuri, *Nematologica*, 16 : 444.

1982. *Paramylonchulus mulveyi* Jairajpuri & Khan, *Assoc. Publ. Co N. Delhi, India*, 118.

Material examined : 4 ♀ ♀, Tantapur, Haridwar, 18.i.2007, Reg. No IV 388. coll. P.T. Bhutia & Party.

Dimensions : Female : L = 0.83-1.12; a = 21-40; b = 2.8-3.4; c = 20-28; V = 76-83.

Male : L = 0.89 mm; a = 26; b = 2.9; c = 22.

Description : Female : Body slightly to strongly arcuate upon fixation, tapering towards extremities. Cuticle smooth, 2-3 µm thick. Lateral chords about 1/3rd body-width wide near middle. Lip region 16-20 µm wide, 7-9 µm high. Amphids 2-3 µm wide, apertures situated at 9-11 µm from anterior end. Buccal cavity 15-19 µm long, 10-13 µm wide. Apex of dorsal tooth 12-15 µm from base of stoma. Subventral walls bearing four transverse rows of denticles; submedian teeth absent. Nerve ring at 87-102 µm from anterior end of body. Reproductive system mono prodelphic, posterior uterine sac absent. Ovary reflexed with 6-10 oocytes. Proximal part of oviduct with large glandular cells. Small cuticularized pieces present at vagina-vulva junction. Rectum 15-21 µm, less than one anal body diameter. Tail 39-48 µm about two anal widths long. Caudal glands large and grouped. Spinneret terminal.

Male : Spicules 36 µm long; gubernaculum 13 µm and accessory pieces 5 µm long. Five Ventromedian supplements present.

Distribution : India : Uttar Pradesh, Uttarakhand and Himachal Pradesh.

Habitat and Locality : Soil around roots of Mango, *Mangifera indica* L. from Nainital.

Remarks : This species was recorded from district Nainital by Jairajpuri & Khan (1982). Sugarcane field is a new habitat record for the species.

179. **Paramylonchulus mashoodi* (Khan & Jairajpuri, 1979) Jairajpuri & Khan 1982

1979. *Mylonchulus mashoodi* Khan & Jairajpuri, *Nematologica*, 25 : 408.

1982. *Paramylonchulus mashoodi* Jairajpuri & Khan, *Assoc. Publ. Co. N. Delhi, India*, 120.

Dimensions : Female : L = 0.84-1.16; a = 24-31; b = 2.8-4.4; c = 24-33; V = 68-74.

Description : Female : Lip region 18-24 µm wide, 6-9 µm high. Buccal cavity 19-24 µm long and 10-14 µm wide. Apex of dorsal tooth 15-20 µm or 69-80% of the length of buccal cavity from base. Subventral walls bearing three or four transverse rows of denticles; submedian teeth absent. Reproductive system mono prodelphic,

posterior uterine sac absent. Sphincter not present at oviduct-uterus junction. Tail markedly conoid, tapering sharply in posterior half, with a slightly rounded tip. Tail 32-42 μm about 1.5 anal widths long. Caudal glands grouped. Spinneret terminal.

Distribution : India : Uttar Pradesh, Uttarakhand and Bihar.

Habitat and Locality : Soil around roots of Mango, *Mangifera indica* L. from Haridwar, sugarcane, *Saccharum officinarum* L.; Guava, *Psidium guayava* L. and *Citrus sinensis* from Nainital.

Remarks : This species was recorded from districts Nainital and Haridwar by Jairajpuri & Khan (1982).

180. **Paramylonchulus index* (Cobb, 1906)
Jairajpuri & Khan, 1981

1906. *Mononchus index* Cobb, *Exptl. Sta. Div. Pathol. Physiol. Bull.*, 5 : 105.

1958. *Myelonchulus index* Andrassy, *Ann. Hist. Nat. Mus. Hung.*, 50 : 151.

1982. *Paramylonchulus index* Jairajpuri & Khan, *Assoc. Publ. Co. N. Delhi, India*, 122.

Dimensions : Female : L = 0.63-0.80 mm; a = 23-28; b = 2.9-3.4; c = 12-23; V = 70-73.

Description : Female : Body ventrally arcuate upon fixation, tapering towards base of esophagus and the tail end. Lip region 15-18 μm wide, 6-7 μm high. Buccal cavity 17-20 μm long, 10-12 μm wide. Apex of dorsal tooth 12-15 μm from base of stoma. Subventral walls bearing five transverse rows of denticles submedian teeth absent. Nerve ring 65-80 μm from anterior end of body. Reproductive system mono-prodelphic, posterior uterine sac absent, anterior uterus with sperms. Tail 26-32 μm long, hemispheroid with a ventral finger like projection. Caudal glands large, grouped. Spinneret terminal.

Male : Not found.

Distribution : India : Uttar Pradesh, Uttarakhand, Andamans, West Bengal and Manipur.

Elsewhere : Hawaii, Hungary and U.S.A.

Habitat and Locality : Soil around roots of Tea Plantations from Dehradun.

Remarks : This species was recorded from district Dehradun by Khera & Chaturvedi (1977).

Subfamily SPORONCHULINAE

Genus *Sporonchulus* (Cobb, 1917) Andrassy, 1958
181. **Sporonchulus vagabundus* Jairajpuri, 1971

1971. *Sporonchulus vagabundus* Jairajpuri, *Nematologica*, 17 : 409.

Dimensions : Female : L = 1.2-1.8 mm; a = 22-32; b = 3.7-4.8; c = 21-27; V = 51-63.

Description : Female : Lip region 15-18 μm wide, 6-9 μm high. Buccal cavity 22-27 μm long, 10-14 μm wide. Dorsal tooth of medium size, its apex at 16-19 μm or 66-75% of the length of buccal cavity from base. Subventral walls with 2-4 rows of irregularly arranged denticles. Nerve ring at 101-128 μm from anterior end of body. Reproductive system amphidelphic. Tail elongate conoid, 50-79 μm or 2.0-2.5 anal body-widths long. Caudal glands and terminal opening present.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat and Locality : Soil around roots of guava, *Psidium guayava* L. and *Citrus sinensis* L. from Dehradun.

Remarks : This species was recorded from district Dehradun by Jairajpuri (1971).

Family IOTONCHIDAE

Subfamily IOTONCHINAE

Genus *Iotonchus* (Cobb, 1916) Altherr, 1950

182. **Iotonchus trichurus* (Cobb, 1917)
Altherr, 1958

1917. *Mononchus trichurus* Cobb, *Soil Sci.*, 3 : 435.

1958. *Iotonchus trichurus* Altherr, *Mem. Soc. Vaudoise Sci. Nat.*, 12 : 47.

Dimensions : Female : L = 1.4-1.8; a = 30-45; b = 3.5-4.7; c = 3-5; V = 54-65.

Description : Female : Lip region 24-30 μm wide, 7-12 μm high. Buccal cavity 26-33 μm long, 16-19 μm wide. Dorsal tooth small and basal, its apex 5-8 μm from base of buccal cavity. Nerve ring at 88-110 μm from anterior end of body. Reproductive system mono prodelphic. Sphincter not present at oviduct-uterus junction. Tail long, whip-like, 370-430 μm or 14-18 anal widths long. Caudal glands present; terminal opening present.

Distribution : India : Uttar Pradesh, Uttarakhand, Sikkim, West Bengal, Assam, Andhra Pradesh and Andaman.

Elsewhere : Malaysia and U.S.A.

Habitat and Locality : Soil around roots of *Cajanus cajan* L. from Nainital.

Remarks : This species was recorded from district Nainital by Jairajpuri & Khan (1982).

183. **Iotonchus shafii* Khan & Jairajpuri, 1980

1980. *Iotonchus shafii* Khan & Jairajpuri, *Nematologica*, 26 : 7.

Dimensions : Female : L = 2.3-2.6; a = 27-30; b = 4.0-4.6; c = 10-12; V = 65-70.

Male : L = 2.3-2.7; a = 30-37; b = 4.1-4.7; c = 10-13; T = 38-46.

Description : Female : Lip region 47-56 µm wide, 17-24 µm high. Buccal cavity 51-56 µm long, 32-36 µm wide. Dorsal tooth small and basal. Reproductive system amphidelphic. Tail long conoid, slightly flattened at tip, 225-300 µm or 4-6 anal widths long. Caudal glands present, opening terminal.

Male : Spicules 112-131 µm long medially, gubernaculum 29-33 µm long, accessory pieces 18-22 µm long. Supplements 12-17 µm. Tail 180-272 µm or 3.5-4.5 anal body-widths long.

Distribution : India : Uttar Pradesh and Uttarakhand.

Habitat and Locality : Soil around roots of *Ricinus communis* L., *Mangifera indica* L., and jungle plants from and near Haldwani, district Nainital.

Remarks : This species was recorded from district Nainital by Jairajpuri & Khan (1982).

184. **Iotonchus basidontus* Clark, 1960

1960. *Iotonchus basidontus*, Clark, *Nematologica*, 5 : 260-270.

Dimensions : Female : L = 2.29; a = 36; b = 4.0; c = 9; V = 60.

Description : Female : Lip region 48 µm wide, 24 µm high. Buccal cavity 48 µm long, 30 µm wide. Dorsal tooth small and basal. Reproductive system amphidelphic. Sphincter well developed at oviduct-uterus junction. Tail conoid then cylindroid, 220 µm or 5 anal widths long. Caudal glands present, opening terminal.

Distribution : India : Uttar Pradesh and Uttarakhand.

Elsewhere : Malaysia and U.S.A.

Habitat and Locality : Soil around roots of ornamental plants from Dehradun.

Remarks : This species was recorded from district Dehradun by Jairajpuri & Khan (1982).

185. **Iotonchus parabasidontus* Mulvey & Jensen, 1967

1967. *Iotonchus parabasidontus* Mulvey & Jensen, *Can. J. Zool.*, 45 : 680.

Dimensions : Female : L = 2.04-2.73; a = 27-35; b = 4.0-4.5; c = 5-9; V = 57-90.

Male : L = 2.25; a = 27; b = 4.2; c = 9; T = 40.

Description : Female : Lip region 40-50 µm wide, 18-20 µm high. Buccal cavity, 44-54 µm long, 30-36 µm wide. Dorsal tooth minute and basal, its apex 10-16 µm from base of buccal cavity. Reproductive system amphidelphic. Sphincter present at oviduct-uterus junction. Vulval papillae present, two pre-and one post-vulval. Tail conoid then cylindroid, 330-420 µm or 8-9 anal widths long. Caudal glands present; opening terminal.

Male : Spicules 100 µm long, medially, gubernaculum 30 µm long, accessory pieces 23 µm long. Supplements 12. Tail conoid, 250 µm or 5 anal body-widths long.

Distribution : India : Uttar Pradesh, Himachal Pradesh and Uttarakhand.

Elsewhere : U.S.A.

Habitat and Locality : Soil around roots of *M. paradisiaca* L. from Nainital.

Remarks : This species was recorded from district Nainital by Jairajpuri & Khan (1982).

186. **Iotonchus risoceiae* (Carvalho, 1955) Andrassy, 1958

1955. *Mononchus risoceiae* Carvalho, *Rev. Inst. Adolfo Lutz.*, 15 : 130.

1958. *Iotonchus risoceiae* Andrassy, *Annl. hist. nat. mus. Hung.*, 50 : 168.

Dimensions : Female : L = 2.7-3.4; a = 34-37; b = 4.5-4.7; c = 8-10; V = 60-64.

Description : Female : Lip region 47-59 μm wide, 16-24 μm high. Buccal cavity 53-64 μm long and 32-40 μm wide. Dorsal tooth nearly basal. Reproductive system amphidelphic. Sphincter present at oviduct-uterus junction, spindle-shaped sperms observed in distal part of uterus. Tail conoid then cylindroid, 310-408 μm or 6-8 anal widths long. Caudal glands present; opening terminal.

Distribution : India : Uttar Pradesh, Himachal Pradesh and Uttarakhand.

Elsewhere : Hawaii and U.S.A.

Habitat and Locality : Soil around roots of banana, *M. paradisiaca* L. from Nainital.

Remarks : This species was recorded from district Nainital by Jairajpuri & Khan (1982).

187. *Iotonchus indicus* Jairajpuri, 1969

1969. *Iotonchus indicus* Jairajpuri, *Nematologica*, **15** : 557.

Material examined : 7 ♀♀, FRI Dehradun, 5.vii.06, Reg. No IV 342, coll. A.N. Rizvi & Party.

Dimensions : Female : L = 1.54-1.97; a = 21-32; b = 4.0-4.8; c = 5-8; V = 57-65.

Description : Female : Lip region 37-44 μm wide, 14-16 μm high. Amphidial apertures 5-7 μm wide, located at 12-16 μm from anterior end of body and 35-42 μm from base of buccal cavity. Buccal cavity 40-47 μm long and 28-32 μm wide. Dorsal tooth small and basal, its apex 9-12 μm from base of buccal cavity. Nerve ring at 130-140 μm from anterior end of body. Excretory system not observed. Reproductive system amphidelphic. Sphincter not present at oviduct-uterus junction. Tail elongate, conoid and tapering regularly, 200-360 μm or 6-9 anal widths long. Caudal glands poorly developed, opening subterminal dorsally.

Male : Not found.

Distribution : India : Uttar Pradesh, Uttarakhand, Sikkim and Kerala.

Elsewhere : Hawaii, Malaysia and U.S.A.

Habitat and Locality : Soil around roots of *Ricinus communis* L. and *Pinus* sp from Dehradun.

Remarks : This species was recorded from district Dehradun by Jairajpuri & Khan (1982).

Genus *Parahadronchus* Mulvey, 1978.

188. **Parahadronchus shakili* (Jairajpuri, 1969) Mulvey, 1978

1969. *Iotonchus shakili* Jairajpuri, *Nematologica*, **15** : 559.

1978. *Parahadronchus shakili* Mulvey, *Can. J. Zool.*, **56** : 1847.

Dimensions : Female : L = 2.22-3.30; a = 32-42; b = 4.2-4.9; c = 7-11; V = 60-70.

Male : L = 2.04-2.80; a = 28-42; b = 3.4-4.6; c = 9-11; T = 42-51.

Description : Female : Lip region 42-60 μm wide, 16-23 μm high. Amphidial apertures 5-6 μm wide, located at 18-21 μm from anterior end of body and 45-63 μm from base of buccal cavity. Buccal cavity 46-65 μm long and 30-40 μm wide. Dorsal tooth large and suprabasal, its apex 21-32 μm or 40-45% of the length of buccal cavity from base. Subventral walls bear 3-6 teeth. Nerve ring at 151-193 μm from anterior end of body. Excretory system not observed. Reproductive system amphidelphic. Well developed sphincter present at oviduct-uterus junction. Vulval papillae present, 0-3 pre and 0-3 post-vulval. Tail elongate, conoid, tapering sharply, 260-569 μm or 6-11 anal widths long. Caudal glands well developed, opening terminal.

Male : Spicules 84-93 μm long medially, gubernaculum 18-23 μm long, accessory pieces 12-18 μm . Supplements 11-13. Tail, 200-496 μm or 4-7 anal body-widths long.

Distribution : India : Uttar Pradesh Uttarakhand and Sikkim.

Elsewhere : U.S.A.

Habitat and Locality : Soil around roots of *Citrus sinensis* (L.) and maize, *Zea mays* L. from Nainital and *Mangifera indica* L. from Haridwar.

Remarks : This species was recorded from district Nainital by Jairajpuri & Khan (1982).

Suborder BATHYODONTINA

Superfamily BATHYODONTOIDEA

Family BATHYODONTIDAE

Genus *Bathyodontus* Fielding, 1950

189. **Bathyodontus cylindricus* Fielding, 1950

1950. *Bathyodontus cylindricus* Fielding, *The Great Basin Naturalist*, **10** : 47.

Dimensions : Female : L = 0.79-0.92; a = 13-19; b = 3.0-3.3; c = 50-54; V = 58-60.

Description : Female : Lip region 13-16 μ m wide, 6-9 μ m high, slightly set off, lips conoid with amalgamated bases. Anterior wider part of buccal cavity 16-19 μ m long, 5-6 μ m wide. Ventro-sublateral denticles small, but distinctly visible. Reproductive system amphidelphic. Tail 14-16 μ m, rounded, less than one anal width long. Spinneret terminal.

Male : Not found.

Distribution : India : Uttar Pradesh and Uttarakhand.

Elsewhere : U.S.A.

Habitat and Locality : Soil around roots of grasses from Nainital.

Remarks : This species was recorded from district Nainital by Jairajpuri & Khan (1982).

190. **Bathyodontus mirus* (Andrassy, 1956)
Andrassy in Hooper & Cairns, 1959

1956. *Mirolaimus mirus* Andrassy, *Acta Zool. Acad. Scient. Hung.*, 2 : 310.

1959. *Bathyodontus mirus* Andrassy, *Opus. Zool. Bpest.*, 3 : 10.

Dimensions : Female : L = 1.20-1.45; a = 20-23; b = 3.2-3.6; c = 52-59; V = 54-57.

Description : Female : Lip region 20-22 μ m wide, 6-7 μ m high, set off by a deep constriction, lips rounded clearly demarcated. Anterior wider part of buccal cavity 20-22 μ m long, 6-8 μ m wide. Ventro-sublateral denticles very minute and rather inconspicuous. Reproductive system amphidelphic. Tail 23-25 μ m, rounded, less than one anal width long. Caudal gland present; spinneret terminal.

Male : Not found.

Distribution : India : Uttar Pradesh and Uttarakhand.

Elsewhere : U.S.A.

Habitat and Locality : Soil around roots of jungle plants from Nainital.

Remarks : This species was recorded from district Nainital by Jairajpuri & Khan (1982).

Superfamily MONONCHULOIDEA

Family MONONCHULIDAE

Genus *Oionchus* Cobb, 1913

191. **Oionchus obtuses* Cobb, 1913

1913. *Oionchus obtuses* Cobb, *J. Wash. Acad. Sci.*, 3 : 442.

Dimensions : Female : L = 0.67-1.2; a = 25-34; b = 4.0-4.2; c = 10-11; V = 61-64.

Description : Female : Lip region 12-14 μ m wide, 6-8 μ m high. Amphidial apertures 2 μ m wide, located at 6-8 μ m from anterior end of body. Anterior wider part of buccal cavity 11-13 μ m long, 6-8 μ m wide. Mural tooth large, subventral walls bearing two transverse rows of denticles. Nerve ring at 70-80 μ m from anterior end of body. Reproductive system mono-prodelphic, post-uterine sac 6-8 μ m or less than one vulval body-width long. Sphincter not present at oviduct-uterus junction. Tail hemispheroid, 18-22 μ m or less than one anal-width long. Spinneret subterminal dorsally.

Male : Not found.

Distribution : India : Uttar Pradesh Uttarakhand and Punjab.

Elsewhere : U.S.A.

Habitat and Locality : Soil around roots of paddy, *Oryza sativa* L. from districts Dehradun and Nainital.

Remarks : This species was recorded from district Nainital and Dehradun by Jairajpuri & Khan (1982).

Order TRIPLONCHIDA

Superfamily TRICHODOROIDEA

Family TRICHODORIDAE

Genus *Trichodorus* Cobb, 1913

192. *Trichodorus pakistanensis* Siddiqi, 1962

1962. *Trichodorus pakistanensis* Siddiqi, *Nematologica*, 8 : 193.

Material examined : 4 ♀♀, 3 ♂♂, Kalsi, Dehradun, 4.v.06, Reg. No IV 343, coll. H.S. Mehta & Party; 3 ♀♀, Kalsi, Dehradun, 24.v.06, Reg. No IV 343, coll. H.S. Mehta & Party.

Dimensions : Female : L = 0.72-0.91 mm; a = 21-25; b = 5.6-6.2; V = 52-53; Spear length = 40-45 μ m.

Male : L = 0.7-0.9 mm; a = 24-26; b = 5.6-6.2; T = 46-65; Spear length = 40-57 μ m.

Description : Female : Body straight to slightly curved ventrally upon fixation. Body cuticle thick, apparently double layered, marked by fine uninterrupted transverse striae, slightly separated from the body except at the head and cloacal region. Lip region slightly sclerotized, bluntly rounded anteriorly, distinctly set off from the body. Stoma, tubular with distinct sclerotization at front end, ending posteriorly to form a spear guiding ring. Onchiostyle slender. Esophagus cylindrical tube. Pharyngeal bulb set off from the intestine. Female reproductive system didelphic- amphidelphic with an oval shaped spermatheca. Vulva a transverse slit.

Males : Similar to females in general characters. Three ventromedian cervical papillae, two anterior and one posterior. Testis single, outstretched, lying on the right side of the intestine. Spicules paired, similar with a rounded cephalated proximal and appointed distal end. They are cylindrical with irregular thickenings giving a striated appearance to the surface. Gubernaculum linear with thickened distal portion. With the three ventromedian precloacal supplements, only the posterior supplement clearly within the region of the retracted Spicules. Tail obtusely rounded, terminal cuticle not thickened.

Distribution : India : Uttar Pradesh and Uttarakhand.

Elsewhere : Pakistan, Florida and China.

Habitat & Locality : Soil around roots of Litchi and Mango, at Kalsi, Dehradun.

Remarks : Mango orchard is a new habitat records for this species. Rathaur *et al.* (2006) recorded it from soybean, litchi and pumpkin.

Genus *Paratrichodorus* Siddiqi, 1974

193. *Paratrichodorus porosus* (Allen, 1957)
Siddiqi, 1974

1957. *Trichodorus porosus* Allen, *Nematologica*, 2 : 32.

1974. *Paratrichodorus porosus* Siddiqi, *Nematologica*, 19 : 270.

Material examined : 8 ♀ ♀, 1 ♂ ♂, Kalsi, Dehradun, 4.v.06, Reg. No IV 344, coll. H.S. Mehta & Party; 5 ♀ ♀, Kalsi, Dehradun, 24.v.06, Reg. No IV 345, coll. H.S. Mehta & Party.

Dimensions : Female : L = 0.42-0.57 mm; a = 13.6-16.6; b = 4.5; V = 54-58; spear length = 39-47 µm.

Description : Cuticle finely striated. Lip region slightly offset from body. Stoma, 18-20 µm. Pharyngeal bulb large with a distinct dorsal and two large sub-ventral pharyngeal gland nuclei. A small rounded valve present at esophago-intestinal junction. Vagina trapezoid in lateral view. Two pairs of ventral body pores near vulva; the anterior one always close to vulva. Lateral hypodermal body pores absent. Tail hemispherical with two terminal caudal pores.

Male : Not found.

Distribution : India : Uttar Pradesh and Uttarakhand.

Elsewhere : Pakistan and U.S.A.

Habitat & Locality : Soil around roots of pear, *Pyrus communis* L. from Ranikhet, Almora; mango, litchi from Dehradun.

Remarks : Mango and litchi orchards are new habitat records for this species; besides, this species was also recorded from district Almora by Siddiqi (1962).

194. *Paratrichodorus minor* (Colbran, 1956)
Siddiqi, 1974

1956. *Trichodorus minor* Colbran, *Qd. J. agric. Sci.*, 13 : 123.

1974. *Paratrichodorus minor* Siddiqi, *Nematologica*, 19 : 272.

Material examined : 13 ♀ ♀, 10 ♂ ♂, Tipperpur, Dehradun, 8.v. 07, Reg. No IV 346, coll. A.N. Rizvi & Party.

Dimensions : Female : L = 0.48-0.55 mm; a = 16.5-22.5; b = 4.5-5.8; V = 52-57; spear length = 26-30 µm.

Description : Body Cuticle finely striated. Head continuous with body contour. Stoma, 12-14 µm. Pharyngeal bulb large with slightly ventrally lobes base. A minute valve present at esophago-intestinal junction. Dorsal and ventral hypodermal chords distinct, one-fourth as wide as body. Excretory pore near base of esophagus. Vagina trapezoid in lateral view. Vulva a small transverse slit. Lateral and ventral body pores absent. Tail subterminal, conoid-rounded. Caudal pores absent.

Male : Not found.

Distribution : India : Uttar Pradesh, Tamil Nadu and Uttarakhand.

Elsewhere : Pakistan and U.S.A.

Habitat & Locality : Soil around roots of pear, *Pyrus communis* L., *Lycopersicon lycopersicum*, *Sauria rapa*, *Citrus acida*, *Morus alba*, *Prunus domestica*, *P. persica*, *P. armeniaca* and *Pyrus pyriflora* from Ranikhet, Almora; *Pyrus pyriflora* from Nainital; rice from Dehradun.

Remarks : Rice field is a new habitat record for the species. This species was also recorded by Siddiqi (1962) from district Almora and by Rashid *et al.* (1973) from Almora and Nainital.

195. **Paratrichodorus mirzai* (Siddiqi, 1960)
Siddiqi, 1974

1960. *Trichodorus mirzai* Siddiqi, *Proc. Helm. Soc. Wash.*, 27 : 22.

1974. *Paratrichodorus minor* Siddiqi, *Nematologica*, 19 : 276.

Dimensions : Female : L = 0.52-0.60 mm; a = 18-20; b = 5.5-9.0; V = 54-58; spear length = 33-37 μ m.

Male : L = 0.45-0.63 mm; a = 17-20; b = 4.8-5.8; c = 46-60; T = 56-70; spear length = 33-36 μ m; spicules = 32-34 μ m; gubernaculum = 11-13 μ m.

Description : Female : Head offset from body; stoma about the length of spear tip. Ventral side of basal portion of esophagus slightly extending over anterior portion of intestine. Excretory pore slightly behind nerve ring. Hypodermal body pores absent. Tail subterminal; caudal pore almost terminal.

Male : Head offset from body; stoma about the length of spear tip. Ventral side of basal portion of esophagus slightly extending over anterior portion of intestine. Ventro-median pharyngeal papillae three, not very distinct; one located slightly behind spear base, and the other two a little behind nerve ring. Spicules almost straight, cylindrical, irregularly thickened giving transversely striated appearance. Caudal pores terminal.

Distribution : India : Uttar Pradesh, Tamil Nadu and Uttarakhand.

Elsewhere : Pakistan and U.S.A.

Habitat & Locality : Soil around roots of pear, *Lycopersicon lycopersicum* and *Sauria rapa* from Almora.

Remarks : This species was recorded from district Almora (Rashid *et al.* 1973).

Superfamily DIPHTHEROPHOROIDEA

Family DIPHTHEROPHORIDAE

Genus *Diphtherophora* de Man, 1880

196. **Diphtherophora communis* de Man, 1880

1880. *Diphtherophora communis* de Man, *Tijds. Nederland Dierk. Vereen.*, 5 : 63.

1893. *Chaolaimus pellucidus* Cobb, *Agric. Gazl. N. S.W.*, 4 : 44.

Dimensions : Female : L = 0.42 mm; a = 16-17; b = 3.3-3.7; c = 15-18; V = 56-63; stylet = 15-16 μ m.

Description : Female : Amphid aperture ellipsoidal, 4 μ m wide, just below the conical elevations of the cephalic papillae at 4 μ m from anterior end. Excretory pore, 90-97 μ m from anterior end. Tail 22-27 μ m long, being 1.5 times the anal body diameter, conoid with a stumpy, slightly digitate, blunt terminus.

Distribution : India : Uttarakhand and Sikkim.

Habitat & Locality : Soil around roots of Tea Plantations of Dehradun.

Remarks : This species was recorded from district Dehradun by Khera & Chaturvedi (1977).

SUMMARY

The present paper reports 196 species, which have been reported from Uttarakhand till date. These 196 species have been found to occur in 93 genera and 37 families of 11 orders namely, Tylenchida (72 species), Aphelenchida (02 species), Rhabditida (11 species), Araeolaimida, (04 species), Monhysterida (01 species), Chromadorida (02 species), Enoplida (05 species), Dorylaimida (51 species), Alaimida (05 species), Mononchida (38 species) and Triplonchida (05 species). Out of these 196, two species are new records from India (Rizvi & Bhandari, 2008), 17 species are new distributional records for the state, of which 8 species were recorded from Western

Doon Shivalik region (Rizvi, 2007), 2 species from Corbett Tiger reserve (CTR), district Nainital (Rizvi, 2008), 4 species from Dehradun and 1 species from district Chamoli (Rizvi & Bhutia, 2009), other two new records from the state are reported herein. Besides, two new combinations are also proposed and several new hosts / habitats are recorded for these nematodes.

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Table 1 : District wise Distribution of Nematode Species in Uttarakhand

Districts : 1= Almora, 2 =Bageshwar, 3 = Chamoli, 4 = Champawat, 5 = Dehradun, 6 = Haridwar, 7 = Nainital, 8 = Pauri , 9 = Pithoragarh, 10 = Rudrapur, 11 = Tehri, 12 = UdhamSinghNagar, 13 = Uttarkashi

S.N	Nematode Species	1	2	3	4	5	6	7	8	9	10	11	12	13
I	Order: Tylenchida													
1.	<i>Tylenchus filiformis</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
2.	<i>Tylenchus arcuatus</i>	+	-	-	-	-	-	+	-	-	-	-	-	-
3.	<i>Tylenchus indicus</i>	+	-	-	-	-	-	+	-	-	-	-	-	-
4.	<i>Ottolenchus parvus</i>	+	-	-	-	-	-	+	-	-	-	-	-	-
5.	<i>Lelenchus magnus</i>	+	-	-	-	-	-	-	-	-	-	-	-	-
6.	<i>Aglenchus lycopersicus</i>	+	-	-	-	-	-	-	-	-	-	-	-	-
7.	<i>Aglenchus andrassyi</i>	+	-	-	-	+	-	-	-	-	-	-	-	-
8.	<i>Boleodorus typicus</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
9.	<i>Boleodorus atypicus</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
10.	<i>Boleodorus longistylus</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
11.	<i>Boleodorus constrictus</i>	+	-	-	-	-	-	-	-	-	-	-	-	-
12.	<i>Psilenchus dunensis</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
13.	<i>Psilenchus hilarus</i>	+	-	-	-	-	-	+	-	-	-	-	-	-
14.	<i>Psilenchus minor</i>	-	-	-	-	-	-	+	-	-	-	-	-	-
15.	<i>Neopsilenchus citri</i>	-	-	-	-	-	-	+	-	-	-	-	-	-
16.	<i>Basiria beryllus</i>	+	-	-	-	-	-	-	-	-	-	-	-	-
17.	<i>Basiria elegans</i>	+	-	-	-	-	-	-	-	-	-	-	-	-
18.	<i>Ditylenchus brassicae</i>	+	-	-	-	-	-	-	-	-	-	-	-	-
19.	<i>Tylenchorhynchus annulatus</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
20.	<i>Tylenchorhynchus mashoodi</i>	+	-	-	-	-	-	+	-	-	-	-	-	-
21.	<i>Tylenchorhynchus elegans</i>	+	-	-	-	+	-	+	-	-	-	-	-	-
22.	<i>Bitylenchus brevilineatus</i>	-	-	-	+	-	-	-	-	-	-	+	-	-

S.N	Nematode Species	1	2	3	4	5	6	7	8	9	10	11	12	13
23.	<i>Quinisulcius capitatus</i>	-	-	-	+	-	-	-	-	-	-	-	-	-
24.	<i>Neotylenchus latus</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
25.	<i>Hoploliemus indicus</i>	-	-	-	-	-	-	-	-	-	-	+	-	-
26.	<i>Hoplolaimus seinhorsti</i>	-	-	-	+	-	-	-	-	-	-	-	-	-
27.	<i>Rotylenchus citri</i>	+	-	-	-	-	-	-	-	-	-	-	-	-
28.	<i>Rotylenchus pruni</i>	-	-	-	-	-	-	+	-	-	-	-	-	-
29.	<i>Helicotylenchus dihystra</i>	-	-	-	+	+	+	-	-	-	-	-	-	-
30.	<i>Helicotylenchus indicus</i>	-	-	-	-	-	-	+	+	-	-	+	-	-
31.	<i>Helicotylenchus silvaticus</i>	-	-	-	-	-	-	-	+	-	-	-	-	-
32.	<i>Helicotylenchus pseudorobustus</i>	-	-	-	+	-	-	-	+	-	-	-	-	-
33.	<i>Helicotylenchus digonicus</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
34.	<i>Helicotylenchus erythrinae</i>	+	-	-	-	-	-	+	-	-	-	-	-	-
35.	<i>Helicotylenchus multicinctus</i>	+	-	-	-	+	-	+	-	-	-	-	-	-
36.	<i>Helicotylenchus retusus</i>	+	-	-	-	-	-	+	-	-	-	-	-	-
37.	<i>Helicotylenchus neoformis</i>	+	-	-	-	-	-	+	-	-	-	-	-	-
38.	<i>Rotylenchulus reniformis</i>	-	-	-	+	-	-	-	-	-	-	-	-	-
39.	<i>Pratylenchus penetrans</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
40.	<i>Pratylenchus kumaonensis</i>	-	-	-	-	-	-	+	-	-	-	-	-	-
41.	<i>Pratylenchus neglectus</i>	-	-	-	-	-	+	-	-	-	-	-	-	-
42.	<i>Pratylenchus vulnus</i>	-	-	-	-	-	-	+	-	-	-	-	-	-
43.	<i>Pratylenchus coffeae</i>	+	-	-	-	-	+	+	-	-	-	-	-	-
44.	<i>Pratylenchus crenatus</i>	+	-	-	-	-	-	+	-	-	-	-	-	-
45.	<i>Pratylenchus pratensis</i>	+	-	-	-	-	-	+	-	-	-	-	-	-
46.	<i>Pratylenchus typicus</i>	-	-	-	-	+	-	+	-	-	-	-	-	-
47.	<i>Meloidogyne arenaria</i>	+	-	+	-	+	-	+	+	+	-	+	-	+
48.	<i>Meloidogyne hapla</i>	+	-	+	-	+	-	+	+	+	-	+	-	+

S.N	Nematode Species	1	2	3	4	5	6	7	8	9	10	11	12	13
49.	<i>Meloidogyne incognita</i>	+	-	+	-	+	-	+	+	+	-	+	-	+
50.	<i>Meloidogyne javanica</i>	+	-	+	-	+	-	+	+	+	-	+	-	+
51.	<i>Hemicriconemoides mangifera</i>	+	-	-	+	+	+	+	-	-	-	-	-	-
52.	<i>Hemicriconemoides cocophilus</i>	+	-	-	-	+	-	+	-	-	-	-	-	-
53.	<i>Hemicriconemoides doonensis</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
54.	<i>Criconemella curvata</i>	-	-	-	-	-	-	+	-	-	-	-	-	-
55.	<i>Criconemella xenoplax</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
56.	<i>Criconemella citricola</i>	+	-	-	-	-	-	+	-	-	-	-	-	-
57.	<i>Criconemella insignis</i>	+	-	-	-	-	-	+	-	-	-	-	-	-
58.	<i>Criconema aberrans</i>	-	-	+	-	-	-	+	-	-	-	-	-	-
59.	<i>Criconema rishikiensis</i> n.comb.	-	-	-	-	+	-	-	-	-	-	-	-	-
60.	<i>Criconema bhowaliensis</i> n.comb.	-	-	-	-	-	-	+	-	-	-	-	-	-
61.	<i>Ogma regularis</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
62.	<i>Ogma serratum</i>	+	-	-	-	-	-	-	-	-	-	-	-	-
63.	<i>Ogma parvum</i>	-	-	+	-	-	-	-	-	-	-	-	-	-
64.	<i>Ogma octangulare</i>	+	-	-	-	+	-	-	-	-	-	-	-	-
65.	<i>Ogma tenuicaudatum</i>	-	-	+	-	-	-	-	-	-	-	-	-	-
66.	<i>Hemicycliophora dhirendi</i>	+	-	-	-	-	-	+	-	-	-	-	-	-
67.	<i>Hemicycliophora tarjani</i>	+	-	-	-	-	-	+	-	-	-	-	-	-
68.	<i>Paratylenchus tenuicaudatus</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
69.	<i>Paratylenchus nainianus</i>	+	-	-	-	-	-	+	-	-	-	-	-	-
70.	<i>Paratylenchus curvatus</i>	-	-	-	+	-	-	-	-	-	-	-	-	-
71.	<i>Paratylenchus projectus</i>	+	-	-	-	-	-	-	-	-	-	-	-	-
72.	<i>Tylenchulus semipenetrans</i>	+	-	-	-	-	-	-	-	-	-	-	-	-
II	Order: Aphelenchida													
73.	<i>Aphelenchus avenae</i>	-	-	+	-	+	-	-	-	-	-	-	-	-

S.N	Nematode Species	1	2	3	4	5	6	7	8	9	10	11	12	13
74.	<i>Aphelenchoides saprophilus</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
III	Order: Rhabditida													
75.	<i>Mesorhabditis cranganorensis</i>	-	-	-	-	+	-	+	-	-	-	-	-	-
76.	<i>Bursilla vernalis</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
77.	<i>Caenorhabditis elegans</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
78.	<i>Cephalobus persegnis</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
79.	<i>Eucephalobus oxyuroides</i>	-	-	-	-	+	-	+	-	-	-	-	-	-
80.	<i>Pseudacrobilus eurystoma</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
81.	<i>Acrobeles timmi</i>	-	-	+	-	+	+	+	-	-	-	-	-	-
82.	<i>Acrobiloides buetschlii</i>	-	-	+	-	+	-	+	-	-	-	-	-	-
83.	<i>Chiloplacus subtenuis</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
84.	<i>Zeldia punctata</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
85.	<i>Trilabiatulus lignicolus</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
IV	Order: Araeolaimida													
86.	<i>Plectus cirratus</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
87.	<i>P. thornei</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
88.	<i>Chiloplectus indicus</i>	-	-	+	-	-	-	-	-	-	-	-	-	-
89.	<i>Paraphanolaimus micoletzky</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
V	Order: Monhysterida													
90.	<i>Prismatolaimus andrassyi</i>	-	-	-	-	+	-	+	-	-	-	-	-	-
VI	Order: Chromadorida													
91.	<i>Acromadora ruricola</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
92.	<i>Odontolaimus aquaticus</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
VII	Order: Enoplida													
93.	<i>Ironus longicaudatus</i>	-	-	-	-	+	+	+	-	-	-	-	-	-
94.	<i>Ironus ignavus</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
95.	<i>Crptonchus abnormis</i>	-	-	-	-	+	-	-	-	-	-	-	-	-

S.N	Nematode Species	1	2	3	4	5	6	7	8	9	10	11	12	13
96.	<i>Onchulus longicauda</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
97.	<i>Tripyla affinis</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
VIII	Order: Dorylaimida													
98.	<i>Amphidorylaimus infecundus</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
99.	<i>Prodorylaimus obesus</i>	-	-	-	-	-	-	+	-	-	-	-	-	-
100.	<i>Prodorylaimium brigdammense</i>	-	-	+	-	-	-	-	-	-	-	-	-	-
101.	<i>Mesodorylaimus chamoliensis</i>	-	-	+	-	-	-	-	-	-	-	-	-	-
102.	<i>Afrodorylaimus geniculatus</i>	-	-	+	-	-	-	-	-	-	-	-	-	-
103.	<i>Thornenema cavalcantii</i>	-	-	+	-	+	-	-	-	-	-	-	-	-
104.	<i>Thornenema mauritianum</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
105.	<i>Thornenema baldum</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
106.	<i>Thornenema garhwalicum</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
107.	<i>Opisthodorylaimus chamoliensis</i>	-	-	+	-	-	-	-	-	-	-	-	-	-
108.	<i>Opisthodorylaimus caudatus</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
109.	<i>Coomansinema dimorphicauda</i>	-	-	+	-	-	-	-	-	-	-	-	-	-
110.	<i>Baqriella qaiserii</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
111.	<i>Ecumenicus monohystera</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
112.	<i>Labronema pararapax</i>	-	-	+	-	+	-	-	-	-	-	-	-	-
113.	<i>Eudorylaimus himalus</i>	-	-	+	-	-	-	-	-	-	-	-	-	-
114.	<i>Discoliamus laksi</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
115.	<i>Enchodelus microdoroides</i>	-	-	-	-	+	-	+	+	-	-	-	-	-
116.	<i>Enchodelus parateres</i>	-	-	-	-	-	-	-	+	-	-	-	-	-
117.	<i>Enchodelus constrictus</i>	-	-	-	-	-	-	+	-	-	-	-	-	-
118.	<i>Enchodelus longidens</i>	-	-	-	-	-	-	+	-	-	-	-	-	-
119.	<i>Enchodelus satendri</i>	-	-	-	-	+	-	+	+	-	-	-	-	-
120.	<i>Oriverutus labiatus</i>	-	-	+	-	-	-	-	-	-	-	-	-	-

S.N	Nematode Species	1	2	3	4	5	6	7	8	9	10	11	12	13
121.	<i>Oriverutus paragus</i>	-	-	-	-	-	-	-	+	-	-	-	-	-
122.	<i>Oriverutus asaccatus</i>	-	-	-	-	-	-	-	+	-	-	-	-	-
123.	<i>Aporcelaimellus maitai</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
124.	<i>Aporcelaimellus obscurus</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
125.	<i>Aporcelaimellus baqrii</i>	-	-	-	-	-	-	+	-	-	-	-	-	-
126.	<i>Aporcelaimus litchi</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
127.	<i>Longidorus brevicaudatus</i>	+	-	-	-	-	-	-	-	-	-	-	-	-
128.	<i>Longidorus conicaudatus</i>	-	-	-	-	-	-	+	-	-	-	-	-	-
129.	<i>Neolongidorus doonensis</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
130.	<i>Paralongidorus sali</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
131.	<i>Xiphinema americanum</i>	+	-	-	-	+	-	+	-	-	-	-	-	-
132.	<i>Xiphinema pruni</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
133.	<i>Xiphinema opisthohysterum</i>	-	-	-	-	-	-	+	-	-	-	-	-	-
134.	<i>Xiphinema inaequale</i>	+	-	-	-	+	-	-	-	-	-	-	-	-
135.	<i>Xiphinema lambertii</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
136.	<i>Xiphinema arcum</i>	+	-	-	-	-	-	-	-	-	-	-	-	-
137.	<i>Xiphinema insigne</i>	+	-	-	-	-	-	+	-	-	-	-	-	-
138.	<i>Tylencholaimus rumjhumii</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
139.	<i>Promuntazium elongatum</i>	-	-	+	-	-	-	-	-	-	-	-	-	-
140.	<i>Morasia parva</i>	-	-	+	-	-	-	-	-	-	-	-	-	-
141.	<i>Dorylaimoides chamoliensis</i>	-	-	+	-	-	-	-	-	-	-	-	-	-
142.	<i>Carcharolaimus denticus</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
143.	<i>Laevides laevis</i>	-	-	-	-	+	-	-	-	+	-	-	-	-
144.	<i>Clavicaudoides clavicaudatus</i>	-	-	-	-	+	-	-	+	-	-	-	-	-
145.	<i>Clavicaudoides longidens</i>	-	-	-	-	-	-	-	-	+	-	-	-	-
146.	<i>Solididens vulgaris</i>	-	-	-	-	-	-	-	-	+	-	-	-	-

S.N	Nematode Species	1	2	3	4	5	6	7	8	9	10	11	12	13
147.	<i>Solididens australis</i>	-	-	-	-	-	-	-	-	+	-	-	-	-
148.	<i>Campydora demonstrans</i>	+	-	-	-	-	-	-	-	-	-	-	-	-
IX	Order: Alaimida													
149.	<i>Aliamus jaulasali</i>	-	-	-	-	+	-	+	-	-	-	-	-	-
150.	<i>Aliamus primitivus</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
151.	<i>Alaimus hamulus</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
152.	<i>Amphidelus dolichurus</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
153.	<i>Amphidelus loofi</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
X	Order: Mononchida													
154.	<i>Mononchus aquaticus</i>	-	-	-	-	+	-	-	+	-	-	-	-	+
155.	<i>Mononchus truncatus</i>	-	-	-	-	-	-	-	-	-	-	-	-	+
156.	<i>Mononchus himalayensis</i>	-	-	-	-	-	-	-	-	-	-	-	-	+
157.	<i>Clarkus papillatus</i>	-	-	-	-	+	-	+	-	-	-	-	-	-
158.	<i>Clarkus elongatus</i>	-	-	-	-	+	-	+	-	-	-	-	-	-
159.	<i>Clarkus sheri</i>	-	-	-	-	-	-	-	+	-	-	-	-	-
160.	<i>Clarkus parvus</i>	-	-	-	-	-	-	+	-	-	-	-	-	-
161.	<i>Prionchulus muscorum</i>	+	-	-	-	+	-	+	+	-	-	-	-	-
162.	<i>Coomansus parvus</i>	-	-	-	+	+	-	+	+	-	-	+	-	+
163.	<i>Coomansus indicus</i>	-	-	-	-	+	-	-	+	-	-	-	-	-
164.	<i>Coomansus campbelli</i>	-	-	-	-	-	-	-	+	-	-	-	-	-
165.	<i>Coomansus minor</i>	-	-	-	-	-	-	-	-	-	-	-	-	+
166.	<i>Coomansus garhwalicus</i>	-	-	-	-	-	-	-	-	-	-	-	-	+
167.	<i>Mylonchulus brachyuris</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
168.	<i>Mylonchulus minor</i>	-	-	-	-	-	+	+	-	-	-	-	-	-
169.	<i>Mylonchulus hawaiiensis</i>	-	-	-	-	+	-	+	+	-	-	-	-	-
170.	<i>Mylonchulus lacustris</i>	-	-	-	-	+	-	+	-	-	-	-	-	-

S.N	Nematode Species	1	2	3	4	5	6	7	8	9	10	11	12	13
171.	<i>Mylonchulus nainitalensis</i>	-	-	-	-	-	-	+	-	-	-	-	-	-
172.	<i>Mylonchulus dentatus</i>	-	-	-	-	-	-	+	-	-	-	-	-	-
173.	<i>Mylonchulus muradi</i>	-	-	-	-	-	-	+	-	-	-	-	-	-
174.	<i>Mylonchulus conractus</i>	-	-	-	-	+	-	+	-	-	-	-	-	-
175.	<i>Mylonchulus sigmaturus</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
176.	<i>Mylonchulus amurus</i>	-	-	-	-	-	-	+	-	-	-	-	-	-
177.	<i>Mylonchulus subsimilis</i>	-	-	-	+	-	-	-	-	-	-	-	-	-
178.	<i>Paramylonchulus mulveyi</i>	-	-	-	-	-	-	+	-	-	-	-	-	-
179.	<i>Paramylonchulus mashoodi</i>	-	-	-	-	-	+	+	-	-	-	-	-	-
180.	<i>Paramylonchulus index</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
181.	<i>Sporonchulus vagabundus</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
182.	<i>Iotonchus trichurus</i>	-	-	-	-	-	-	+	-	-	-	-	-	-
183.	<i>Iotonchus shafii</i>	-	-	-	-	-	-	+	-	-	-	-	-	-
184.	<i>Iotonchus basidontus</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
185.	<i>Iotonchus parabasidontus</i>	-	-	-	-	-	-	+	-	-	-	-	-	-
186.	<i>Iotonchus risoceiae</i>	-	-	-	-	-	-	+	-	-	-	-	-	-
187.	<i>Iotonchus indicus</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
188.	<i>Parahadronchus shakili</i>	-	-	-	-	-	+	+	-	-	-	-	-	-
189.	<i>Bathyodontus cylindricus</i>	-	-	-	-	-	-	+	-	-	-	-	-	-
190.	<i>Bathyodontus mirus</i>	-	-	-	-	-	-	+	-	-	-	-	-	-
191.	<i>Oionchus obtuses</i>	-	-	-	-	+	-	+	-	-	-	-	-	-
XI	Order: Triplonchida													
192.	<i>Trichodorus pakistanensis</i>	-	-	-	-	+	-	-	-	-	-	-	-	-
193.	<i>Paratrichodorus porosus</i>	+	-	-	-	+	-	-	-	-	-	-	-	-
194.	<i>Paratrichodorus minor</i>	+	-	-	-	+	-	+	-	-	-	-	-	-
195.	<i>Paratrichodorus mirzai</i>	+	-	-	-	-	-	-	-	-	-	-	-	-
196.	<i>Diphtherophora communis</i>	-	-	-	-	+	-	-	-	-	-	-	-	-

ANNELID FAUNA OF SOME SELECTED WETLANDS

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INTRODUCTION

Annelids of Uttarakhand comprise the class oligochaeta and the class Hirudinea. Oligochaetes are divided into two convenient groups : Microdrili and Megadrili. Microdiles are small and mostly freshwater forms while megadriles, the earthworms, are larger and mostly terrestrial with some of their aquatic representatives. The worms belonging to the class Hirudinea are the leeches and they are mostly the inhabitants of freshwater environment though some are terrestrial and a few marine.

Earthworms play an important role in enhancing soil fertility. Freshwater oligochaetes are capable of improving the quality of detritus accumulated in the bottom of freshwater bodies, while some are indicators of organic pollution. The non-venomous leeches may be used as remedies in throat and inflammatory swellings and in blood pressure due to the presence of their property of sucking blood in excess. Moreover, like other faunal and floral components in the food chain of the aquatic ecosystem freshwater oligochaetes, earthworms and leeches are of great importance in maintaining ecological balance.

Our knowledge on the Taxonomy of annelid fauna of Uttarakhand is confined to the contributions of Michaelsen (1909). Stephenson (1916, 1923) and Julka (1995) on freshwater oligochaetes; Bourne (1889), Fearb (1898), Michaelsen (1907, 1909), Stephenson (1914, 1916, 1922, 1923), Gates (1945 a & b), 1947, 1951, 1956, 1960, 1972), Soota (1970), Soota & Halder (1980) and Julka (1988, 1995) on earthworms; Harding & Moore (1927), Bhatt & Bhatia (1958), Bhatt (1960, 1961), Bhatia & Bora (1973) and Chandra (1983, 1991) on leeches and Halder & Ghosh (1996) on earthworms and leeches.

The present report is based on the wetland survey collections of earthworms and leeches made from Asan Barrage, Dhalipur, Dehra Dun District and Bhimgoda Barrage, Hardwar District of Uttarakhand by the Northern Regional Station, Zoological Survey of India, Dehra Dun. The material comprises nine species of earthworms and three species of leeches including one of each group determined up to generic level. It is expected to have the material of freshwater oligochaetes unrepresented in the present collections along with more of earthworms and leeches from the wetlands of Uttar Pradesh for better knowledge of their diversity.

SYSTEMATIC ACCOUNT

Class	OLIGOCHAETA
Order	HAPLOTAXIDE
Suborder	LUMBRICINA
Superfamily	MEGASCOLECOIDEA
Family	MEGASCOLECIDAE
1. <i>Amyntas diffringens</i> (Baird)	

1869. *Megascolex diffringens* Baird, *Proc. Zool. Soc. London*, 1869 : 40.

1887. *Perichaeta mirabilis* Bourne, *Proc. Zool. Soc. London*, 1886 : 668.

1909. *Pheretima heterochaeta* : Michaelsen, *Mem. Indian Mus.*, 1 : 189.

1912. *Pheretima divergens* ver. *Yunnanensis* Stephenson, *Rec. Indian Mus.*, 7 : 274.

1917. *Amyntas diffringens* : Sims & Easton, *Biol. J. Linn. Soc.*, 4(3) : 235.

Material Examined : India : U.A, Dehra Dun dist., Asan Barrage, Dhalipur, 1 ex., 9.xi.1995, coll. A. Husain & party.

Distribution : India : Uttarakhand (Bhimtal, Landsdown and Nainital), Present record from

Asan Barrage, Dhalipur; Arunachal Pradesh; Assam; Himachal Pradesh; Jammu & Kashmir; Karnataka; Manipur; Meghalaya; Sikkim; Tamil Nadu; West Bengal.

Elsewhere : Widely distributed, cosmopolitan species.

Remarks : This is a peregrine species originated from China and has successfully colonized in the Himalayas and other high altitude regions of India.

2. *Metaphire birmanica* (Rosa)

1888. *Perichaeta birmanica* Rosa, *Annali Mus Civ Stor nat. Giacomo Doria*, 6 : 164.

1900. *Pheretima birmanica* : Michaelsen, *Tierreich.*, 10 : 225.

1972. *Metaphire birmanica* : Sims & Easton, *Biol. J Linn Soc.*, 4(3) : 238.

1955. *Metaphire birmanica* : Julka, *Himalayan Ecosystem Series : Fauna of Western Himalaya, Part-1 Uttar Pradesh* : 21.

Material Examined : India : U.A, Dehra Dun dist., Asan Barrage, Dhalipur, 3 exs., 15.vii.1994, coll. A. Husain & party.

Distribution : India : Uttarakhand (Almora, Chamoli, Dehra Dun, Naini Tal, Pauri, Timli), Present record from Asan Barrage, Dhalipur.

Elsewhere : Myanmar.

Remarks : This peregrine species is very rare in India and is so far known to occur in the Western Himalayan region of U.P.

3. *Metaphire houlleti* (perrier)

1872. *Perichaeta houlleti* Perrier, *Nouv Archs, Mus, Hist. nat. Paris*, 8 : 99.

19972. *Pheretima houlleti* Gates, *Trans. Am. phil. Soc.*, 62 : 190

1972. *Metaphire houlleti houlleti. h. rugosa; campanulata campanulata, c. meridiane, c. penetralis; wimbralayana* : Sims & Easton, *Biol. J Linn Soc.*, 4(3) : 238.

1982. *Metaphire houlleti* : Julka, *Rec. zool. Surv. India*, 80 : 14.

1995. *Metaphire houlleti* : Julka, *Himalayan Ecosystem Series : Fauna of Western Himalayas, Part 1 : Uttar Pradesh* : 21.

Remarks : Gates (1972) recognized seven morphs within *houlleti* complex. The specimens of *houlleti* recorded here from Asan Barrage, Dehra Dun dist U. P. belong to smaller Hp morph.

4. *Metaphire houlleti* smaller Hp morph

1972. *Pheretima houlleti* smaller Hp morph : Gates, *Trans. Am. phil. Soc.*, 62(7) : 194.

1982. *Metaphire houlleti* : smaller Hp morph : Julka, *Rec. zool. Surv. India*, 80(1-2) : 143.

Material Examined : India : U.A, Dehra Dun dist., Asan Barrage, Dhalipur, 3 exs., 9.viii.1994, coll. N. K. Sinha & party.

Distribution : India : Uttarakhand (Bhimtal, Dehra Dun), Present record from Asan Barrage, Dhalipur; Andaman Islands; Meghalaya.

Elsewhere : Sri Lanka, Myanmar, Thailand, Malay Peninsula, Java, Philippines, Fiji Island; U. S. A.; South America.

Remarks : This peregrine species originated from Southeast Asia, is rare in India.

5. *Perionyx simlaensis* (Michaelsen)

1900. *Perionychella simlaensis* Michaelsen, : *Mt. Mus. Hamburg*, 24 : 157.

1923. *Perionyx simlaensis* : Stephenson, *Fauna Brit. India, Oligochaeta* : 359.

1995. *Perionyx simlaensis* : Julka, *Himalayan Ecosystem Series : Fauna of Western Himalayas, Part-1 : Uttar Pradesh* : 21.

Material Examined : India : U.A, Dehra Dun dist., Asan Barrage, Dhalipur, 2 exs., 7.ix.1995, coll. A Husain & party.

Distribution : India : Uttarakhand (Dehra Dun, Saharanpur), Present record from Asan Barrage, Dhalipur; Himachal Pradesh.

Remarks : This is a very rare endemic species.

6. *Perionyx* sp.

Material Examined : India : U.A, Dehra Dun dist., Asan Barrage, Dhalipur, 2 exs. (Juvenile). 14.x.1996, coll. N. K. Sinha & party.

Family OCTOCHAETIDAE

7. *Dichogaster bolau* (Michaelsen)

1891. *Benhamia bolau* Michaelsen, *Jb, hamb. wiss. Anst.*, 8 : 9.

1900. *Dichogaster bolau* : Michaelsen, *Tierreich*, 10 : 340.

1988. *Dichogaster bolau* : Julka, *The Fauna of India and the adjacent countries, Megadrib oligochaeta, Octochaetidae* : 103.

1995. *Dichogaster bolau* : Julka, *Himalayan Ecosystem Series : Fauna of Western Himalayas*, Part-1 : Uttar Pradesh : 21.

Material Examined : India : U.A, Dehra Dun dist., Asan Barrage, Dhalipur, 2 exs., 11.vii.1995, coll. A Husain & party; 2 exs., 3.viii.195, coll. N. K. Sinha & Party.

Distribution : India : Uttarakhand (Allahabad, Rara Baki, Dehra Dun, U. A., Fatehpur, Jhusi, Lucknow, Moghul Sarai, Saharanpur, Tehri), present record from Asan Barrage, Dhalipur; Andaman & Nicobar Islands; Andhra Pradesh; Arunachal Pradesh; Delhi; Goa; Gujarat; Himachal Pradesh; Karnataka; Kerala; Madhya Pradesh; Maharashtra; Meghalaya; Orissa; Rajasthan; Sikkim; Tamil Nadu; West Bengal.

Elsewhere : Widely distributed, cosmopolitan species.

Remarks : Though the original home of this peregrine species is Southeast Asia, it is widely distributed in India.

8. *Eutyphoeus orientalis* (Beddard)

1883. *Typhoeus orientalis* Beddard, *Ann. Mag. nat. Hist. ser.*, (5)12 : 219.

1889. *Typhoeus masoni* Burne, *O. Jl. micros. Sci.*, 29 : 117.

1907. *Eutyphoeus paivi* : Michaelsen, *Jb. hamb. wiss. Anst.*, 24 : 178.

1907. *Eutyphoeus bastianus* : Michaelsen, *Jb. hamb. wiss. Anst.*, 24 : 183.

1907. *Eutyphoeus andersoni* : Michaelsen, *Jb. hamb. wiss. Anst.*, 24 : 185.

1938. *Eutyphoeus orientalis* : Gates, *Rec. Indian Mus.*, 40 : 98.

1995. *Eutyphoeus orientalis* : Julka, *Himalayan Ecosystem Series : Fauna of Western Himalayas*, Part-1 : Uttar Pradesh : 20.

Material Examined : India : U.A, Dehra Dun dist., Asan Barrage, Dhalipur, 2 exs., 9.viii.1994, coll. N. K. Sinha & Party; 4 exs., 7.ix.1995, coll. A Husain & party.

Distribution : India : Uttarakhand (Buzru Kurme, Chhitauni, Dehra Dun, U. A., Katwari Bazar, Mowaie), present record from Asan Barrage, Dhalipur; Bihar; West Bengal.

Remarks : This endemic species is common in U. P., Bihar and West Bengal.

9. *Lenngaster pusillus* (Stephenson)

1920. *Eudichogaster pusillus* Stephenson, *Mem. Indian Mus.*, 7 : 253.

1921. *Eudichogaster barkudensis* Stephenson, *Rec. Indian Mus.*, 22 : 765.

1988. *Lenngaster pusillus* : Julka, *The Gauna of India and the adjacent countries, Megadrile Oligochaeta, Octochaetidae* : 252.

1995. *Lenngaster pusillus* : Julka, *Himalayan Ecosystem Series : Fauna of Western Himalaya*, Part-1 : Uttar Pradesh : 20.

Material Examined : India : U.A, Dehra Dun dist., Asan Barrage, Dhalipur, 5 exs., 9.viii.1994, coll. N. K. Sinha & Party.

Distribution : India : Uttarakhand (Allahabad, Almora U.A., Chanar, Fyzabad, Manikpur Junction, Nainital U. A., Pauri U. A., Robertoganj, Tanda Falls, Varanasi), present record from Asan Barrage, Dhalipur; Himachal Pradesh; Karanataka; Madhya Pradesh; Orissa.

Remarks : This endemic species is common in U. A., and is recorded here for the first time from Dehra Dun dist.

10. *Octochaetona beatrix* (Beddard)

1902. *Octochaetus beatrix* Beddard, *Ann. Mag. nat. Hist. (ser. 7)*, 9 : 450.

1907. *Octochaetus fermeri* Michaelsen, *Jb. hamb. wiss. Anst.*, 24 : 171.

1907. *Octochaetus hodgarti* Michaelsen, *Jb. hamb. wiss. Anst.*, 24 : 172.

1910. *Octochaetus pitmyi* Michaelsen, *Abh. Geb. Baturus, Hamburo*, 19 : 86.

1914. *Octochaetus dasi* Stephenson, *Rec. Indian Mus.*, 10 : 346.

1924. *Octochaetus (Octochaetoides) fermori* f. *tetracystis* Stephenson, *Rec. Indian Mus.*, 26 : 343.

1929. *Octochaetus lunatus* Gates, *Proc U.S. natn. Mus.*, 75 : 24.

1988. *Octochaetona beatrix* : Julka, *The Fauna of India and the adjacent countries, Megadrile Oligochaeta, Octochaetidae* : 271.

1995. *Octochaetona beatrix* : Julka, *Himalayan Ecosystem Series : Fauna of Western Himalaya, Part-1 : Uttar Pradesh* : 20.

Material Examined : India : U.A, Dehra Dun dist., Asan Barrage, Dhalipur, 4 exs., 9.viii.1994, coll. N. K. Sinha & Party.

Distribution : India : Uttarakhand (Allahabad, Bara Banki, Chakia, Chunar, Dehra Dun, Fatehpur, Eyzabad, Jonghai, Jhusi, Lucknow, Madhasingh, Manikpur Junction, Mirzapur, Naini Tal, Pauri, Pratabgarh, Rai Bareli, Robertsganj, Saharanpur, Sohagi, Tanda Falls, Varanasi), present record from Asan Barrage, Dhalipur; Chandigarh; Goa; Gujarat; Himachal Pradesh; Jammu & Kashmir; Karanataka; Kerla; Madhya Pradesh; Maharashtra; Orissa; Punjab; Rajasthan; West Bengal.

Elsewhere : Pakistan, Nepal; Myanmar, Malay Peninsula, Philippines.

Remarks : This endemic species is widely distributed in India.

Class HIRUDINEA
Order ARHYNCHOBDELLAE
Family HIRUDIDAE

11. *Poecilobdella manillensis* (Lesson)

1842. *Hirude manillensis* Lesson, *Revue Zoologique Societe Curierieme*, 6.

1970. *Poecilobdella manillensis* : Soos, *Opusc. Zool. Bpest.*, 10(2) : 213.

1991. *Poecilobdella manillensis* : Chandra, *The Leeches of India-A Handbook* : 92.

Material Examined : India : U.A, Hardwar dist., Bhimgoda Barrage, 5 exs., 129.x.1994, coll. A. Husain & party.

Distribution : India : Uttarakhand (Landaaur), present record from Bhigoda Barrage; Assam; Karanataka; Kerla; Maharashtra; West Bengal.

Elsewhere : Pakistan, China, Sri Lanka, Myanmar, Borneo, Malaysia, Philippines.

Remarks : This is a common aquatic leech.

12. *Poecilobdella granulosa* (Savigny)

1820. *Sanguisuga granulosa* Savigny, *Systeme des Annelides, Paris*.

1927. *Hirudinaria (Poecilobdella) granulosa* : Moore, *Fauna Brit. India. Hirudinea* : 226.

1970. *Poecilobdella granulosa* : Soos, *opusc. Zool. Bpest.*, 10(2) : 313.

1991. *Poecilobdella granulosa* : Chandra, *The Leeches of India-A Handbook* : 91.

Material Examined : India : U.A, Dehra Dun dist., Asan Barrage, Dhalipur, 2 exs., 11.vii.1995, 2 exs., 12.x.1995 & 14.x.1996, coll. N. K. Sinha & party; 6 exs., 7.ix.1995, coll. A. Husain party.

Distribution : India : Uttarakhand (Agra, Baharaich, Kumaon, Mathura), present record from Asan Barrage, Dhalipur; Andhra Pradesh; Assam; Bihar; Delhi; Gujarat; Himachal Pradesh; Jammu & Kashmir; Kerla; Madhya Pradesh; Manipur; Orissa; Pondicherry; Punjab; Rajasthan; Sikkim; Tamil Nadu; West Bengal.

Elsewhere : Nepal; Sri Lanka, Myanmar.

Remarks : This is a common aquatic medicinal leech widely distributed in India. It is recorded here for the first time from Dehra Dun dist.

13. *Poecilobdella* sp.

Material Examined : India : U.A, Dehra Dun dist., Asan Barrage, Dhalipur, 1 ex., 16.xi.1995, coll. Arun Kumar & party; 3 exs., 16.x.1995, coll. N. K. Sinha & party.

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ANNELIDA : OLIGOCHAETES (FRESHWATER)

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INTRODUCTION

Aquatic Oligochaetes are very common micro invertebrates in freshwater bodies like ponds, tanks, lakes, ditches and river living in association with algae, aquatic vegetation, floating rotten material and also in bottom mud. These worms belong to phylum Annelida and are grouped together along with few earthworms into the group microdrile. There are three families such as Aeolosomatidae, Naididae and Tubificidae under aquatic oligochaetes. Worms belonging to the family Naididae is well represented in the Indian subcontinent with 59 species but those of family Tubificidae living in the bottom of water sources are ill represented with 15 species in this subcontinent while they are well represented in Europe and other parts of the world.

Aquatic Oligochaetes are either microscopic or small in size, colours, pale red and deep brown in colour, slender to relatively robust in size constituting the bulk of food for other aquatic animal like fishes.

Our knowledge of systematics of freshwater Oligochaeta of India is derived from the pioneer worker of Stephenson (1926a-1932), Aiyar (1926-1930), Naidu (1963a-Naidu), and Mukhopadhyay (1998-2005). As a result 82 species under 20 genera and 3 families so far recorded from India. The most constant and dependable taxonomic character identifiable even in the preserved state are the locomotor organelles or setae which have various morphological patterns with regards to shape, size number and are immense importance for the determination of genera and species. The present attempt was under taken to survey different water bodies of different districts of Uttarakhand (Dehradun, Haridwar, Nainital, Musouri and Rishikesh) and reported 9 species under 9 genera and 2 families. The present

material deals with one new record to the state. A list of freshwater Oligochaetes recorded from Uttarakhand is also furnished. Therefore, the present paper includes description, distribution along with the key for identification of 9 species so far recorded from the present study area.

MATERIAL AND METHODS

Collection : Aquatic worms living in mud and slit are collected along with under water soil and them washing them on a white based enamel tray. Those found on surface of water collected readily with the help of a wide mouthed pipette.

Preservation : Among the various methods of preservation applied for successful studies of the worm in the laboratory, preservation by putting the worms directly 4% formalin provided to be the best. Though formalin brings about certain amount of opacity of the skin. A greater part of it may be overcome by bleaching the skin with chemicals like lacto phenol. Narcotisation prior to preservation with alcohol appeared to be useless because their soft bodies disintegrate easily under its influence.

Study : The detailed study of the anatomy and morphology can be best accomplished by examining the worms in living condition.

Laboratory studies with preserved specimen are done under microscope with dilute glycerin under cover glass. For the studies of minute features of the setae oil immersion and is used with success.

MORPHOLOGY AND TERMINOLOGY

Prostomium : Anterior part of the body above the mouth opening it may be conical, semicircular rounded, triangular or sharply or bluntly pointed. It may also extend as a whip like process, the proboscis (Stylaria).

Setae : Specialised organelles for locomotion, crawling or swimming, arranged in dorsal and

ventral bundles, one pair of each per segment. In shape and number they vary much and are of immense taxonomic importance.

Dorsal bubble : Made up of dorsal setae which are of three different kinds, viz.,

Hair : Elongated, slender, hook like an individual hair.

Needles : Short, broad with simple or bifid tips or pectinate with multiple tips; usually with a median swelling, the nodules. The body may be bent in the form of sickle.

Crotchets : these resemble single or double pointed hooks with equal or unequal ends or teeth. The teeth may again be pointed, blunt or pectinate.

Ventral bundle : Constituted fully or crotchet setae, double pointed with a nodules at various position of the body of shaft. In appearance these resemble the English letter T and usually begin from the II segment.

Gills or branchiae : Specialised organelles for gaseous exchanges. These may be simple extension of the body arranged serially on the mid dorsal line each having a loop of blood vessel or leaf like extensions at the hind end of the body in a hollow area, the branchial fossa (Dero, Branchiodnulus, Branchiura), sometimes guarded by a pair of lateral extension or palps (Aulophorus)

Pharynx : Dilation of the dorsal part of the foregut extends from the II to V segment.

Stomach : A dilation of the digestive tube behind the oesophagus.

Nephridium : specialised convoluted tube having external opening for the purpose of excretion of nitrogenous waste. One pair per segment from the VII.

Clitellum : a protective band overlying the organ generation situated approximately in V to VII segment.

Testes : Glandular bodies lying attached to the posterior phase of the septum 4/5 on each side of the ventral nerve cord.

Ovaries : Small structures attached similarly to the sides of the nerve cord and septum in front.

SYSTEMATIC ACCOUNT

List of freshwater Oligochaeta recorded from Uttarakhand :

Family NAIDIDAE Sub family CHAETOGASTRINAE Genus *Chaetogaster* Von Baer

1. *Chaetogaster limnaei limnaei*, Von Baer, 1827

Genus *Slavina* Vejdovsky, 1883

2. *Slavina appendiculata* (d'udekem, 1855)

Genus *Stylaria* Lamarck, 1816

3. *Stylaria fossularis* Weidy, 1852

Genus *Haemonais* Bretscher, 1900

4. *Haemonais waldvogeli* Bretscher, 1900

Genus *Aulophorus* Schmarde, 1861

5. *Aulophorus tonkinensis* (Vejdovsky, 1894)

Genus *Tubifex* Lamarck, 1816

6. *Tubifex tubifex* (Midler, 1774)

Genus *Limnodrilus* Claparede, 1816

7. *Limnodrilus hoffmeisteri*, Claparede, 1862

Genus *Branchiura* Beddard, 1892

8. *Branchiura sowerbyi* Beddard, 1892

Genus *Bothrioneurum* Stole, 1886

9. *Bothrioneurum iris* Beddard, 1901

Key to the families

Size small, hair setae always present in dorsal bundles; occurrence of asexual reproduction; testes in V or VI and ovaries in VI or VII segment..... NAIDIDAE

Size large; hair setae absent in dorsal bundles; absence of asexual reproduction; testes in X and ovaries in XI segment TUBIFICIBAE

Sub family CHAETOGASTERINAE

Prostomium reduced; segment III elongated, bundle with a double hook. Eye absent, dorsal setae absent, when present consists of double pronged crotchets oesophageal as well as septal gland absent. Nephridia closed. Testes in V and ovaries in VI segment. Prostrate gland absent.

Genus *Chaetogaster* Von Baer, 1827

1827. *Chaetogaster* Von Baer, *Wova Ada Phy. med. Acad. Woop. Card. Nat. Car. Bonn.*, 3 : 611.

1980. *Chaetogaster* : Persia. In Aquatic Oligochaeta Biology, Brinkhurst and Cook (Eds.), p. 85.

1998. *Chaetogaster* : Fauna of West Bengal, Part 10 : 95 : 23. 1998.

Type species : *Chaetogaster limnae* Von Baer, 1827.

Description : worms transparent and whitish. Body wall of most segments and prostomium covered with cilia. Dorsal setae absent. Ventral setae double-pronged or simple setae, absent in III-V setae incomplete. Clitellum in V-VI. Penial setae present.

1. *Chaetogaster limnaei limnaei* Von Baer, 1927

1960. Sperber, C. Contribution a l'etude de la faune d'Afghanistan 40, Oligochaeta Naididae ibid., 13(8) : 155-158.

1966. Naidu, K.V. checklist of freshwater Oligochaeta of the Indian subcontinent and Tibet. *Hydrobiol.*, 27(1-2) : 208-226.

1972. Vasist, H.S. and Gandhi, S.S. The freshwater Oligochaetes of North India. Ibid., 23(1-2) : 99-100.

1972. Gates, G.E. Burmese earthworms : An introduction to Systematics and Biology of Megadrile Oligochaetes with references to south east Asia. *Trans. amer. Philosoph. soc.*, (New Series) 62 : 1-326.

Type locality : Unassigned in Germany.

Material examined : 1.4.2005 Nainital Lakeside drain-16 exs., 2.4.2005-Haldwani roadside drain-10 exs., Coll. T. Biswas & C.K. Mandal.

Description : Worms minute, colourless and transparent with annular wrinkles on body surface. Ventral setae strongly hooked with teeth at right angle to shaft, in II 5-20/bundle and in others 4-20/bundle. Clitellum in V-VII. Pineal setae 14/bundle with a double hook.

Habitat : Swimming absent. Worms live in freshwater among the polyzoan colonies of plumatella and sponges belonging to spongilla and also in the mud.

Habit : Worms live as parasites or commensals in respiratory chamber of freshwater mollusks, belonging to several species of *Limnea planorbis*.

Distribution : India : Nainital (Uttarakhand), Chandigarh (Punjab); Pakistan; Myanmar; Afghanistan.

Elsewhere : Asia, Africa, Europe, North & South America.

Genus *Slavina* Vejdovsky, 1883

1883. *Slavina* (Part) Vejdovsky. *Sitz bet: Bohn. Ges. Naturil. Prag.*, 1883, p. 219

1980. *Slavina* : Persia, In Aquatic Oligochaeta Biology, Brinkhurst Cook (Eds.) : 88.

Type species : *Slavina appendiculata* (d'udeken 1855).

Description : Body wall with round sensory papillae, and usually surrounded by adhering setae starts from VI segment, consisting of 1-2 stout hairs and 1-2 needles/bundle, hairs of VI segment much longer than others, sometime reaching four times the diameter of the body; needles simple pointed, suddenly tapering toward the end; ventral setae 2-5 per bundle bifid thinner in II to V segment and longest in II all having proximal nodules and angular proximal bend and distal teeth thinner and slightly longer than proximal. Clitellum embracing V to VII segment. Pineal setae 3 per bundle, with simple curved hook.

2. *Slavina appendiculata* (d'udekem, 1855)

1855. Nais appendiculata d'udekem, *Bull. Ac. Belgio*, 22 : 552.

1883. *Slavina appendiculata* Vejdovsky, *Sitz. ber. Bohm. Ges. Naturw. Prag.*, 1883 : 219.

1980. *Slavina appendiculata* : spencer, in Aquatic Oligochaete Biology, Brinkhurst and Cook (Eds.) : 120.

Material examined : 7 km from stn. Gorokhpur village pond (near Bidhan Sava, Dehradun). 25.03.2005-20 exs. Nainital lake 10 exs. 02.04.2005. Collector : T. Biswas & C.K. Mandal.

Description : Worms brownish somewhat opaque covered with mucous coating with diatoms and mud particle Prostomium bluntly triangular fringed with sensory cilia. Prostomium rounded. Dorsal setae starts from VI segment, consisting of 1-2 stout hairs and 1-2 needles/bundle, hairs of VI segment much longer than others, sometime reaching four times the diameter of the body;

needles simple pointed, suddenly tapering toward the end; ventral setae 2-5 per bundle bifid thinner in II to V segment and longest in II all having proximal nodules and angular proximal bend and distal teeth thinner and slightly longer than proximal. Clitellum embracing V to VII segment. Pineal setae 3 per bundle, with simple curved hook.

Habitat : Worms live in fresh water among the Polyzoan colonies of plumatella and sponges belonging to spongilla and also in mud.

Habit : Not swimming.

Distribution : India : West Bengal (Kolkata), Kerala, Tamilnadu, Uttarakhand and Andaman islands.

Elsewhere : Cosmopolitan.

Genus *Stylaria* Lamarck, 1816

1816. *Stylaria* Lamarck, Historienatuelle des animaux sans Vertebres. 3 pairs : 223-224.

1980. *Stylaria* : Persia. In Aquatic Oligochaeta Biology, Brinkhurst and Cook (eds.) : 90.

Type species : *Stylaria lacustris* (Linnaeus, 1767).

Description : Eyes normally present prostomium prolonged into a long filiform proboscis. Dorsal setae from VI, hairs and straight, simple pointed needles, without nodules, ventral setae bifid crotches having distal part straight while the proximal part angularly bent, proximal teeth weak. Penial setae present.

3. *Stylaria fossularis* Leidy, 1852

1852. *Stylaria fossularis* Leidy, Proc. Acad. nat. Sci. Philad., 5 : 287.

1980. *Stylaria fossularis* : Spencer. In Aquatic Oligochaeta Biology. Brinkhurst and Cook (eds.) : 120.

Material examined : 7 km from Station Gorukhpur village pond (near Bidhan Sava) 25.3.2005-20 ex. Nainital lake 2.4.2005-10 ex. and Bhimtal. Collector : T. Biswas & C.K. Mandal.

Description : Worms large, pale white with transparent body wall and delicate short, stiff cilia more on prostomium and anal segment. Eyes a pair, crescent shaped, blackish purple at the base of prostomium on either side of mouth. Prostomium semicircular with a median conspicuous long

proboscis dorsal setae begin in VI, 1-3 hair setae and 23 needle setae per bundle. Hair setae long, straight and smooth. Needle setae 40-70 u.m long, simple pointed without nodulus. Ventral setae consisting of bifid crotchets, 5-10/bundle, number decrease to 2 per bundle in posterior segments distal prong of crotchets very much longer, thin and hooked while proximal prong is almost rudimentary. Nephridia begin from VII segment. Buddy zone present.

Habitat : Worms live in freshwater among spirogyra filaments and other filamentous algae. Feeding on decaying vegetable matter.

Habit : They do not form tubes. Swim with brisk sagittal movement in horizontal plane.

Distribution : Kerala; Tamilnadu, A.P. Madhya Pradesh; Uttarakhand; Uttar Pradesh; Punjab; Jammu & Kashmir, West Bengal; Bangladesh; Lahore.

Elsewhere : Cosmopolitan.

Genus *Haemonais* Bretscher, 1900

1900. Bretscher, K. Mitteilungen über die Oligochaeten fauna der Schweiz ibid, 8 : 1-44.

1920. Stephenson, J. On a collection of Oligochaeta from the larger known parts of India and from Eastern Persia. Mem. Indian Mus., 7 : 141-261.

Description : Eyes absent dorsal setae originally from II to VI, hairs and short bifid crotchets. Ventral setae in a number of anterior segments differ in shape from posterior ones. Clitellum absent between male pores vasa differentia entering atria at upper part of anterior wall; Prostate absent. Penial setae present. Cosmopolitan.

Type species : *Haemonais waldvogeli*

4. *Haemonais waldvogelii* Bretscher 1900

Material examined : 30.3.2005 Roadside drain near Ramjholi (Rishikesh)-5 ex., and Bhagwanpore Bus stand road side drain-2 ex., Coll. T. Biswas & C.K. Mandal

Description : Prostomium semicircular with a median conspicuous long proboscis. Dorsal setae begin in VI, 1-3 hair setae and 23 needles per bundle. Hair setae long straight and smooth. Needle setae 40-70 im long, simple pointed without

nodules. Ventral setae consisting of bifid crotchets, 5-10 per bundle number decreasing to 2 per bundle in posterior segment distal prong of crotchets very much longer, thinner and hooked while proximal prong is almost rudimentary. Nephridia begin from VII segment. Buddy zone present.

Habit : They may swim by wriggling movement.

Habitat: Worms live in soft mud but not tube dwelling.

Distribution : Kerala, Tamilnadu, A.P., Madhya Pradesh, Uttarakhand, Uttar Pradesh, Punjab, Jammu & Kashmir, West Bengal,; Bangladesh; Lahore.

Elsewhere : cosmopolitan.

Genus *Aulophorus* Schmarde, 1861

Description : Dorsal setae start from IV, V or VI segment; ventral setae of II to V segment may or may not be different from the following segments. Posterior border of branchial fosses projecting into two pulps. Pineal setae absent usually, budding or fragmenting a sexual reproduction by budding or fragmentation. Usually like in portable tubes.

Type species : *Aulophorus furcatus* (Muller, 1773).

5. *Aulophorus tonkinensis* (Vajdovsky)

1894. *Aulophorus tonkinensis* (Vajdovsky) *Mem. Soc. Zool. Er.*, 7 : 244-245.

1909. *Aulophorus tonkinensis* Michalsen. *Mem. Ind. Mus.*, 1 : 132.

1962. *Dero (Aulophorus) tonkinensis*, Naidu. *J. Bombay nat. Hist. Soc.*, 59(3) : 911-914.

Material examined : Nainital Lake-2.3.2005 -2 ex. Coll. T. Biswas & C.K. Mandal.

Description : Size very small whitish and transparent. Prostomium bluntly triangular. Dorsal setae begin from VI segment and consisting of one hair and one needle in each bundle. Sometimes 2 of each; hairs smooth bayonet shaped, needles straight with distal nodulus having webbed teeth like oars; ventral setae 3-4/bundle, those of II to IV segment 4-5/bundle, bifid crotchets, having proximal nodulus. Branchial organ cup shaped,

fossa opening posteriorly; palps one pair with stiff hairs; gills 2 pairs, digit form, shorter than palps. Nephridium starting from VIII segment.

Habitat : Worms build tubes with the help of eversile disc like sucker of pharynx, mainly of free statoblasts of Polyzoan species, small seeds, statoblast of sponges with mucus secreted by, its body wall.

Habit : When free from tube the worms swim with brisk horizontal undulating movement.

Distribution : India: West Bengal, Andhra Pradesh, Kerala, Uttar Pradesh and Madhya Pradesh.

Elsewhere : Europe, Central America, South America, Africa and Australia.

Genus *Tubifex* Lamarck, 1816

1816. *Lumbricus* Lamarck, *Historie naturelle des animaux sans vertebre*, 3. pairs, p. 225.

1900. *Tubifex* Michaelsen : *Oligochaeta* : In *Das Tierreich*, 10, XXIX. p. 49.

1980. *Tubifex* : Persia, In *Aquatic Oligochaeta Biology*, Brinkhurst and Cook (eds.) : 99.

Type species : *Tubifex rivulorum* Lamarck.

Description : Both dorsal and ventral bundle of setae consists of bifid crotchets, in the later the crotchets are often modified into the prectinate type; dorsal crotchets are supplemented by hair setae at least in the anterior segments. Surface of the body smooth with papillae.

6. *Tubifex tubifex* (Miller, 1774)

1774. *Lumbricus tubifex* O.F. Muller, *Vermium Terrestrium et Fluviatilium* and C. *Historia; Habni. et Lips.*, p. 27.

1900. *Tubifex tubifex* (Michaelsen. *Oligochaeta Biology*, Brinkhurst and Cook (eds.) : 99.

Material examined : Tibetan market/Parade ground side drain 2 ex. 27.3.2005, Roorkee bus stand side drain, 30.03.2005 1 ex. Coll. T. Biswas & C.K. Mandal.

Description : Size large; reddish brown anteriorly, lighter posteriorly. Prostomium bluntly conical. Dorsal bundles of setae begin in II segment consists of 3-4 hairs and 4-5 crotchets in anterior segments hair absent in the middle

segments and setae absent altogether in posterior segments; hairs bayonet shaped crotchet setae having distal modulus, distal prongs thinner and longer than proximal, with pectinate out growths m between the prongs in posterior segments; ventral bundles have 3-5 bifid crotchet setae with distal nodulus and having distal prongs either equal to or thinner and longer than proximal. Nephridium begins VII segment paired, unpaired from XIV segment; Clitellum opaque white and covers 'A X to XII segment.

Habitat : Live in soft mud and remain coiled with *Limnodrilus hoffmeisteri*.

Habit : Anterior half of the body buried in the mud and the posterior half of the body in water, Withdraws posterior half completely in to mud when disturbed. Waving action vigorous when worms are crowded.

Distribution : India : West Bengal; Malda district; Karnataka, Tamil Nadu.

Elsewhere : Africa; Europe; Japan; New Zealand and North & South America.

Genus *Limnodrilus* Claparede, 1816

1862. *Limnodrilus* Claparede. *Mem. Soc. Phys. Hist. nat. Genevae*, 16 : 248, pis. 1. Fig. 1-3 II Fig. 2, IV, Fig. 6.

1980. *Limnodrilus* : Persia, in *Aquatic Oligochaete Biology*. Brinkhurst and Cook (eds.) : 99.

Type species : *Limnodrilus hoffmeisteri*, Claparede 1862.

Description : Both dorsal and ventral bundle of setae consisting of bifid crotchets of the same type. No hair setae. Posterior part of body having vascular plexus. Testes in X and ovaries in XL

7. *Limnodrilus hoffmeisteri* Claparede, 1862

1862. *Limnodrilus hoffmeisteri*, Claparede, *Mem. Soc. Phys. Hist. nat. Crehera* 16 : 248-252, pi. 1. Fig. 1-3, pi. II, Fig. 2; pi. IV, Fig. 6.

1912. *Limnodrilus socialis* : Stephenson, *Mem. AS. Soc. Bengal*, 6 : 93, pi. IV Fig. 6-7. *Limnodrilus hoffmeisteri*, Claparede : Mukhopadhyay in *state Fauna Series, Fauna of West Bengal*, 3 : pt. II.

Material examined : Roadside drain near Bishnughat (Haridwar) 30.3.2005 6 exs.; Roorkee Bus stand roadside drain 1.4.2005 1 ex. and Sahasradhara road side drain (Dehradun) 27.03.05 10 exs.

Description : Size large, 90-100 mm brown anteriorly, lighter posteriorly hair end almost white. Posterior 1/4th white like without setae and respiratory in function. All setae dorsal and ventral start from II; bifid crotchets with equally long teeth. Dorsal bundle having 5-7 in anterior, 3-5 in the middle and 1-2 in the hind segments; thinner and shorter than those of the ventral bundle. Nephridium starts between VII-IX. Clitellum embraces XI and XII, opaque white.

Habitat : Live buried in large numbers in soft clay or mud in clear, turbid even foul water and perform wavy movements of the hind end; disappear instantaneously as the water is disturbed.

Habit : They are found along with the *Branchiura sowerbyi*, *Branchiodrilus semperi* and *Dero digitata*.

Distribution : India : Andhra Pradesh; Srikakulam and Cuddapah dist; West Bengal, Meghalaya, Karnataka and Tripura.

Elsewhere : Cosmopolitan.

Genus *Branchiura* Beddard

1892. *Branchiura* Beddard *Quart. J. Micr. Sci*, 33p. 325.

Branchiura : Mukhopadhyay. In : *State Fauna series 3 : Fauna of West Bengal*. Pt. 11.

Type species : *Branchiura sowerbyi*.

Description : Hair setae and bifid setae present in dorsal bundles, but only bifid setae in ventral bundles. Segments of hinder part of body each with a dorsal and ventral gill. Male genital opening unpaired. Spermathecae paired in X. Penial setae absent.

8. *Branchiura sowerbyi* Beddard, 1892

Material examined : Kulagarh road side drain, Dehradun. Holdwoni road side drain, Dehradun-21 exs. Roadside drain near Ram Jhola (Rishikesh) 12 exs. Coll. T. Biswas & C.K. Mandal.

Description : Size large, about 7- mm in average; robust; blackish brown. Posterior one-third bear hollow gills serially and segmentally arranged mid-dorsally and mid-ventrally, gradually increasing in length anteriorly to reach a length of the widest diameter of the body, contractile and enclose in each a vascular loop. Both dorsal and

ventral bundle of setae starting in segment II; dorsal bundle having 2-4 hairs and 2-6 crotchet setae; hairs bayonet shaped, longer anteriorly, crotchets bifid with proximal prongs longer than distal, sometimes pectinate; ventral setae 4-6 per bundle anteriorly, 1-2 posteriorly, simple or bifid with distal nodulus. Clitellum covers X-Xii segments. Nephridium starting from IX segment. Pineal setae absent.

Habitat : Bottom dwellers, live in mud and silt of tanks, lakes, canals, streams and even drains along with *Limnodrilus hoffmeisteri*.

Habit : When disturbed coil up themselves into spirals instantaneously. The branchial region is easily detachable.

Distribution : India : Meghalaya-Shillong, E. Khasi Hills district; West Bengal; Manipur; Tamilnadu and Uttar Pradesh.

Elsewhere : Africa; Europe; China; Japan and N. America.

Genus *Bothrioneurum* Stole, 1888

1980. *Bothrioneurum* : Persia, In Aquatic Oligochaete Biology, Brinkhurst and Cook (eds.) : 103.

Type species : *Bothrioneurum iris* Beddard, 1901.

Description : Prostomium with a sensory pit. dorsal and ventral setae bundle with bifid crotchets; hair setae and gill absent.

9. *Bothrioneurum iris* Beddard, 1901

1901. *Bothrioneurum iris*. *Proc. zool. Soc. Lond.*, p. 81, Figs. 8-10.

1969. *Bothrioneurum iris* : Naidu, *Hydrobiologia* 25(3-4) : 475-477.

Material examined : Station roadside drain (Dehradun) 26.3.2005-6 exs. Kaulagarh roadside

drain (Dehradun near F.R.I.) 26.3.2005-9 exs., Coll : T. Biswas & C.K. Mandal.

Description : Small, 20-25 mm. Prostomium semicircular. Setae starts from II, composed mostly of 4 bifid crotchet setae; dorsal crotchets having distal prongs thinner and shorter than proximal white ventral crotchets having distal prongs much thinner and longer in outer but shorter in inner bundles than the proximal prongs. Nephridium starts from VII. Clitellum embraces X-XII.

Habitat: Like in soft mud of ponds and lakes. Coil up readily when disturbed.

Distribution : India : Andhra Pradesh; Cuddapah; Visakhapatnam dist., West Bengal, Tamil Nadu and Kerala.

Elsewhere : China; Malay and S. America.

SUMMARY

The paper deals with the fresh water Oligochaete specimens collected from 4 districts of Uttarakhand. A total of 9 species belonging to 9 genera and 2 families recorded from the State of Uttarakhand are described along with their distribution. A classified up-to-date list of aquatic Oligochaetes of Uttarakhand has also been furnished. One species is recorded for the first time from Uttarakhand.

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ANNELIDA : EARTHWORMS

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INTRODUCTION

Earthworms occur in diversified habitats from organic heaps (manure, compost, litter, humus, kitchen drainage, etc.) to forest land, grassland, agricultural land, plant nursery, etc. They are omnivorous, but most of them derive nutrition from dead organic matter. The beneficial effect of earthworms in increasing soil fertility has been documented since the time of Darwin (1881). Presently, earthworms are not restricted as a basic biology material but is being established as basic material for biotechnology (vermitechnology). Because of the vast number of species available in India and also because of the economic value, understanding of the distribution, abundance and ecological condition of the species has become very important. Indian Earthworms were well studied by Stephenson (1923); Julka (1988); Halder (1998). the earthworm fauna of western Himalaya studied by Julka (1995) includes only 36 species but the proper collection localities were not mentioned there. Later Paliwal & Julka (2005) reported 38 species from Western Himalayas. Halder et al (2007) reported 29 species from the unnamed collection of Zoological survey of India and mentioned 9 species from Uttar Pradesh. A recent survey was undertaken in different ecological regions of Uttarakhand during 2006-2008 and a total 21 species was collected of which 7 species have been recorded for the first time from this state. Total number of the species of earthworms of Uttarakhand is now 45 under 20 genera and 8 families. As all the species were described in the previous literature, only the specimens collected during our survey is incorporated here with brief diagnosis, locality and distributions.

SYSTEMATIC ACCOUNT

Phylum ANNELIDA

Class OLIGOCHAETA

Order MONILIGASTRIDA

Family MONILIGASTRIDAE

Genus *Drawida* Michaelsen, 1900

1. *Drawida japonica* Michaelsen, 1907
2. *Drawida nepalensis* Michaelsen, 1907
- *3. *Drawida wilsii* Michaelsen, 1907

Order HAPLOTAXIDA

Family ACANTHODRILIDAE

Genus *Plutellus* Perrier, 1873

4. *Plutellus* sp.

Family OCNERODRILIDAE

Genus *Ocnerodrilus* Beddard 1895

5. *Ocnerodrilus occidentalis* Eisen 1878

Family LUMBRICIDAE

Genus *Allolobophora* Eisen, 1874

6. *Allolobophora parva* Eisen, 1874
7. *Allolobophora eiseni* (Levinsen, 1884)
8. *Allolobophora parva* Eisen, 1874

Genus *Aporrectodea* Orley, 1885

9. *Aporrectodea caliginosa trapezoides* (Duges, 1828)

Genus *Dendrodrilus* Omodeo, 1956

10. *Dendrodrilus rubidus* (Savigny, 1826)

Genus *Eisenia* Malm, 1877

11. *Eisenia foetida* (Savigny, 1826)

Genus *Eiseniella* Savigny, 1826

12. *Eiseniella tetraedra* (Savigny, 1826)

Genus *Octolasion* Orley, 1858

13. *Octolasion cyaneum* (Savigny 1826)
14. *Octolasion tyrtaeum* (Savigny 1826)
15. *Octolasion* sp.

Family MEGASCOLECIDAE

Genus *Amyntas* Kinberg, 1867

- 16. *Amyntas alexandri* Beddard
- 17. *Amyntus cortices* (Kingberg, 1867)
- 18. *Amyntas gracilis* (Kingberg, 1867)
- 19. *Amyntus morrissi* (Beddard, 1892)

Genus *Metaphire* Sims & Easton, 1972

- 20. *Metaphire anomala* (Michaelsen, 1907)
- 21. *Metaphire houlleti* (Perrier, 1807)
- 22. *Metaphire posthuma* (Vaillant, 1868)

Genus *Perionyx* Perrier, 1872

- 23. *Perionyx bainii* Stephenson, 1915
- *24. *Perionyx gravellyi* Stephenson, 1950
- 25. *Perionyx nainianus* (Michaelsen, 1907)
- *26. *Perionyx fulvus* Stephenson, 1916
- 27. *Perionyx excavatus* Perrier, 1872
- 28. *Perionyx sansibaricus*

Genus *Lampito* Kinberg, 1866

- 29. *Lampito mauritii* Kinberg, 1866

Family OCTOCHAETIDAE

Genus *Dichogaster* Beddard, 1888

- 30. *Dichogaster bolau* (Michaelsen, 1891)

Genus *Eutyphoeus* Michaelsen, 1900

- 31. *Eutyphoeus annadalei* Michaelsen, 1907
- 32. *Eutyphoeus incommodus* (Beddard, 1901)
- 33. *Eutyphoeus nainianus* Michaelsen, 1907
- 34. *Eutyphoeus nicholsoni* (Beddard, 1901)
- 35. *Eutyphoeus orientalis* (Beddard, 1883)
- 36. *Eutyphoeus pharpingianus* Michaelsen, 1907
- 37. *Eutyphoeus waltoni* Michaelsen, 1907

Genus *Lenogaster* Gates, 1939

- 38. *Lenogaster parvus* (Fedarb, 1898)
- 39. *Lenogaster pusillus* (Stephenson)

Genus *Octochaetona* Gates, 1962

- 40. *Octochaetona beatrix* (Beddard, 1902)
- *41. *Octochaetona surensis* (Michaelsen, 1910)

Genus *Ramiella* Stephenson

- 42. *Ramiella bishambari* (Stephenson, 1900)

Family ALMIDAE

Genus *Glyphidrilus* Horst, 1889

- *43. *Glyphidrilus tuberosus* Stephenson, 1916
- 44. *Glyphidrilus* sp.

Family UDRILIDAE

Genus *Eudrilus* (Kingberg)

- *45. *Eudrilus eugeniae*

Species marked with asterisk (*) are recorded for the first time from Uttarakhand.

Phylum ANNELIDA

Class OLIGOCHAETA

Order MONILIGASTRIDA

Family MONILIGASTRIDAE

Genus *Drawida* Michaelsen, 19001895. *Moniligaster*, Beddard, Monog. 196.1900. *Drawida* Michaelsen, Tier. X, 114.1. *Drawida japonica* Stephenson 19221922. *Drawida japonica* Stephenson, P.Z.S., 119.1892. *Moniligaster bahamensis*, Beddard, P.Z.S., 690.

Diagnosis : Diagnosis is based on Julka (1995), Length 28-60 mm. Colour greenish grey. Two or three gizzards. Male pores on 10th segment. Prostates shortly tubular.

Distribution : India : Himachal Pradesh, Western Himalayas. Elsewhere : China, Japan, Bahamas.

2. *Drawida nepalensis* Michaelsen, 19071907. *Drawida nepalensis* Michaelsen, Mt. Mus. Hamburg, xxiv, 146.

Material examined : 2 ex., 3429/1, Berinag, Uttarakhand, Coll. A. Misra and party.

Diagnosis : Length 60-135 mm; diameter 2.1-5.2 mm. segments 120-180. Male pore at 10/11 segment. Female pore at 11/12 segment.

Distribution : India : West Bengal; Andaman and Nicobar Islands; Assam; Bihar; Himachal Pradesh; Meghalaya; Sikkim; Uttar Pradesh; Uttarakhand.

Elsewhere : Pakistan; Nepal, Bangla Desh; Myanmar; Indonesia.

3. *Drawida wilsi* Michaelsen, 19071907. *Drawida wilsi* Michaelsen, Mt. Mus. Hamburg, xxiv, 145.

Material examined : 17 ex, 3484/1, 26.10.2006, Chaubatia, Ranikhet, Uttarakhand, Coll. A. Misra and party.

Diagnosis : 55-60 mm in length, maximum diameter 2.5mm. Segments 155-160. Clitellum ring shaped. Two gizzards, in XIV and XV. Male pores on transversely oval papillae in b. Female pores in ab.

Distribution : India; Madhya Pradesh; Andhra Pradesh; Uttar Pradesh and Uttarakhand.

Remarks : This species is first recorded from this state.

Family ACANTHODRILIDAE
Genus *Plutellus* Perrier, 1873

1873. *Plutellus* Perrier, *Arch. Zool. Exp. Gen.*, 2 : 250.

4. *Plutellus* sp.

Diagnosis : 30-51 mm in length, maximum diameter 1.1.3mm. Segments 55-140. Clitellum saddle shaped. Male pores paired. Gizzard in V.

Family OCNERODRILIDAE
Genus *Ocnerodrilus* Eisen, 1878

1878. *Eisen*, *Nova Acta R. Soc. Sci. Upsaliensis*, Ser., 3 : 10.

5. *Ocnerodrilus occidentalis* Eisen 1878

1878. *Eisen*, *Nova Acta R. Soc. Sci. Upsaliensis*, Ser. 3, 10, 4.

1970. *Ocnerodrilus occidentalis*, Soota & Julka, *Proc. Zool. Soc. Calcutta*, 23 : 205.

Diagnosis : Segments 70-84. Prostomium epilobous. Male porophores in xvii. Clitellum annular.

Distribution : India; Andaman Islands.

Elsewhere : Widely distributed in the world.

Order HAPLOTAXIDA
Family LUMBRICIDAE
Genus *Allolobophora* Eisen, 1874

1874. *Eisen*, *ofvers. vetensk., Akad. forhandl. Stockholm* 30, 8. 1874.

6. *Allolobophora eiseni* (Michaelsen, 1909)

1909. *Helodrilus eiseni*, Michaelsen, *Mem. Ind. Mus.* i, 246.

1895. *Allolobophora eiseni*, Beddard, *Monong.*, 705.

Diagnosis : Diagnosis is based on Julka (1995), Length 30-48mm. Segments 75-110. Prostomium

tanylobous. Clitellum from xxiv or xxv to xxxii. No tubercles of puberty. Male pores with conspicuous glandular areas.

Distribution : Uttarakhand.

7. *Allolobophora parva* Beddard, 1895

1909. *Helodrilus parva*, Michaelsen, *Mem. Ind. Mus.* i, 248.

1895. *Allolobophora parva*, Beddard, *Monong.*, 705.

Diagnosis : Diagnosis is based on Julka (1995), Length 25-40mm. Segments 85-111. Colour brownish red. Prostomium epilobous. Clitellum saddle shaped xxiv or xxv to xxx. Tubercles or walls of puberty. Male pores with small but distinct glandular areas.

Distribution : Kashmir; N.W. Frontier Prov; Punjab; Uttarakhand; South Rajputana.

Genus *Aporrectodea* Orley, 1885

1885. *Aporrectodea* Orley, *Ert. Term. Kor.*, 15 : 1-34.

8. *Aporrectodea rosea* (Savigny, 1826)

1826. *Enterion roseum* Savigny, *Mem. Acad. Sci. Inst. Fr.*, 5 : 182.

1981. *Aporrectodea rosea* : Soota & Halder, *Rec. zool. Surv. India*, 79 : 233.

Diagnosis : Diagnosis is based on Julka (1995), Length 23-90 mm; diameter 2.5-5 mm. Segments 112-176. Prostomium epilobic, tongue open. Clitellum red and saddle shaped beginning in region XXII-XXVII.

Distribution : India : West Bengal; Himachal Pradesh; Kashmir; Sikkim; Tamil Nadu; Uttar Pradesh; Uttarakhand.

Elsewhere : Africa; Europe; U.S.S.R.; Israel; Lebanon; Turkey; Iran; Afghanistan; Pakistan; Korea; Australia; New Zealand; U.S.A.; Mexico; South America.

9. *Aporrectodea caliginosa trapezoides*
(Duges, 1828)

1828. *Lumbricus caliginosa trapezoids* Duges, *Annl. Sci. nat.*, 15 : 289.

Diagnosis : Diagnosis is based on Julka (1995), Length 85 mm; diameter 3-4 mm. Segments 180. Prostomium epilobic, tongue open. Clitellum saddle shaped beginning in region XXII-XXVII.

Distribution : India : Jammu and Kashmir; Himachal Pradesh; Uttar Pradesh.

Genus *Dendrodrilus* Omodeo, 1956

10. *Dendrodrilus rubidus* (Savigny, 1826)

1826. *Enterion rubidium*, Savigny, *Mem. Acad. Sci. Inst. Fr. (Hist.)*, 5 : 182.

1979. *Dendrodrilus rubidus*, Gates, *Megadrilogica*, 3 : 152.

Diagnosis : Diagnosis is based on Julka (1995), Length 85 mm; diameter 2.3-4 mm. Segments 180-189. Prostomium epilobic, tongue open. Clitellum saddle shaped beginning in region XXII-XXVII.

Distribution : India : Uttar Pradesh; Uttarakhand.

Genus *Eisenia* Malm, 1877

1877. *Eisenia* Malm, *Ofvers. Sallsk. Hortikult. Vann. Forh. Goteburg.*, 1 : 45.

11. *Eisenia foetida* (Savigny, 1826)

1826. *Enterion foetidum* Savigny, *Mem. Acad. Sci. Inst. Fr.*, 5 : 182.

1981. *Eisenia foetida* : Julka, *Rec. zool. Surv. India*, 80 : 132.

Material examined : 98ex., An 3390/, Harkot Village, 18.x.2006, A. Misra; 14ex., An 3424/1, Munsyari forest office, 18.x.2006, A. Misra & party; 1ex., Reg. No. An 3427/1, Berinag, Uttarakhand, 18.x.2006, Coll. A. Misra and party; 27ex., An 3458/1, Kilbury, Nainital, 29.x.2006, A. Misra & Party; 14ex., An 3477/1, Ranikhet, 28.x.2006, A. Misra; 19ex., An 3478/1, Dhawj Forest, Pithorgarh, 15.x.2006, A. Misra & Party;

Diagnosis : 28-129 mm length, segments 80-131. Prostomium epilobic, tongue open. Clitellum saddle shaped, beginning from XXVII-XXVII and ending in XXXI-XXXIV. Female pores at XIV. Male pores at or near BC on XV.

Distribution : India : West Bengal; Himachal Pradesh; Kerala; Nicobar islands; Sikkim; Tamil Nadu.

Elsewhere : Europe; Lebanon; Turkey; Afganistan; Korea; Japan; Australia; New Zealand; North America; West Indies; South America; Some islands in the Atlantic Ocean.

Genus *Eiseniella* Michaelsen 1900

1900. *Eiseniella* Michaelsen, *Das Tierreich*, 10 : 471.

12. *Eiseniella tetraedra* (Savigny, 1826)

1826. *Enterion tetraedrum* Savigny, *Mem. Acad. Sci. Inst. Fr.*, 5 : 184.

1937. *Eiseniella tetraedra* f. typical: Cernosvitov, *Rec. Indian Mus.*, 39 : 107.

Diagnosis : Diagnosis is based on Julka (1995), 30-58 mm length, segments 50-92. Prostomium epilobic, tongue open. Clitellum saddle shaped, beginning from XXII, XXIII-XXVI, XXVII, XXVIII. Male pores paired, at or somewhat below C on XV.

Distribution : India : West Bengal; Uttar Pradesh; Uttarkhand; Tamil Nadu.

Elsewhere : Africa; Europe; estern U.S.S.R.; Isreal; Lebanon; Syria; Turkey; Australia; New Zealand; Canada; U.S.A.; Mexico; South America.

Genus *Octolasion* Orley, 1858

1885. *Octolasion* Orley, *Ert. Term. Kor.*, 15 : 13.

13. *Octolasion cyaneum* (Savigny 1826)

1826. *Enterion cyaneum* Savigny, *Mem. Acad. Sci. Inst. Fr.*, 5 : 181.

1958. *Octolasion cyaneum* Gates, *Breviora. Mus. Comp. Zool. Harvard*, No., 91 : 8.

1980. *Octolasion cyaneum* Soota & Halder, *Rec. zool. Surv. India*, 76 : 203.

Material examined : 12ex., An 3413/1, Sitalakhe (Sahi Devi Temple), 25.x.2006, A. Misra & Party.

Diagnosis : Clitellum, saddle shaped, six segments, XXIX- XXXIV. Gizzard mostly in XVII.

Distribution : India : Uttarakhand; West Bengal; Himachal Pradesh; Uttarpradesh.

Elsewhere : Europe; Pakistan; Australia; New Zealand; Canada; U.S.A; Azore Island; South America.

14. *Octolasion tyrtaeum* (Savigny 1826)

1826. *Enterion tyrtaeum* Savigny, *Mem. Acad. Sci. Inst. Fr.*, 5 : 180.

1972. *Octolasion cyaneum* Gates, *Trans. Am. Phil. Soc.*, 62(7) : 125.

1980. *Octolasion tyrtaeum* Soota & Halder, *Rec. zool. Surv. India*, 76 : 203.

Material examined : 7ex., An 3404/1, Sitalakhet, 24.x.2006, A. Misra & Party; 2ex., Reg. No. An 3431/1, Chaubatia Horticulture Farm, Ranikhet, 26.x.2006, coll. A. Misra and party.

Diagnosis : Clitellum, saddle shaped, six segments, XXX-XXXV. Uninterrupted longitudinal bands.

Distribution : India : Uttarakhand; West Bengal; Himachal Pradesh; Kashmir; Sikkim; Tamil Nadu; Uttar Pradesh.

Elsewhere : Africa; Europe; Pakistan; Australia; Canada; U.S.A; Mexico; some islands in the Atlantic ocean; South America.

15. *Octolasion* sp.

Material examined : 27ex, an 3402/1, Choubatia, Ranikhet, 26.x.2006.

Diagnosis : Length 50-215 mm, Diameter 4.5-7 mm, segments 155, prostomium epilobic, Clitellum, saddle shaped, six segments, XXIX-XXXIV. Gizzard mostly in XV.

Distribution : India : Uttarakhand; Uttarpradesh.

Family MEGASCOLECIDAE Genus *Amyntas* Kinberg, 1867

1867. *Amyntas* Kinberg, *Ofvers. K. Vetensk. Acad. Forhandl. Stockholm*, 23 : 97.

16. *Amyntas alexandri* (Beddard, 1900)

1900. *Amyntas alexandri* Beddard, *Proc. Zool. Soc. Lond.*, 1900 : 988.

Diagnosis : Diagnosis is based on Julka (1995), Length 105-290 mm, Diameter 4.-9 mm, segments 90-141. Prostomium rudimentary. Clitellum on XIV- XVI. Male pores minute, on XVIII.

Distribution : India : West Bengal; Andaman & Nicobar Islands; Assam; Madhya Pradesh; Uttarakhand; Uttarpradesh.

Elsewhere : Myanmar; Thailand.

17. *Amyntas corticis* (Kingberg, 1867)

1867. *Perichaeta corticis* Kingberg, *Ofvers. K. Vetensk Acad. Forth. Stockh.*, 23 : 102.

Material examined : 60ex., Reg. No. An 3436/1, Bargar Village, Nainital, Uttarakhand, 30.x.2006, coll. A. Misra and party.

Diagnosis : length 45-170 mm. Diameter 3-6 mm. Segments 79-121. Prostomium epibolic, tongue open. Clitellum on XIV-XVI segment. Genital markings small.

Distribution : India : Uttarakhand; West Bengal; Himachal Pradesh; Jammu and Kashmir; Sikkim; Tamil Nadu; Uttar Pradesh; Arunachal Pradesh; Assam; Karnataka; Manipur; Meghalaya;

Elsewhere : Africa; Madagascar; Europe; China; Korea; Japan; Sri Lanka; Nepal; Bhutan; Bangla Desh; Myanmar; Indonesia; Philippines; Hainan; Hong Kong; Taiwan; Australia; New Zealand; Some islands in the Pacific Ocean; U.S.A; Central America; West Indies; South America.

Remarks : This species is first recorded from this state.

18. *Amyntas gracilis* (Kingberg, 1867)

1867. *Nitocris gracilis* Kingberg, *Ofvers. K. Vetensk Acad. Forth. Stockh.*, 23 : 102.

Diagnosis : Diagnosis is based on Julka (1995), length 45-155 mm. Diameter 2-4 mm. Segments 75-115. Prostomium epibolic, tongue open. Clitellum on XIV-XVI segment. Genital markings small.

Distribution : India : Uttarakhand; Himachal Pradesh.

19. *Amyntas morrisi* (Beddard, 1892)

1892. *Perichaeta morrisi* Beddard, *Proc. Zool. Soc. Lond.*, 1892 : 166.

1972. *Amyntus morrisi* Sims & Easton, *Biol. J. Soc.*, 4(3) : 236.

Diagnosis : Diagnosis is based on Julka (1995), length 40-150 mm. Diameter 2.5-6 mm. Segments 75-102. Prostomium epibolic, tongue open. Clitellum on XIV-XVI. Genital markings small discs.

Distribution : India : West Bengal; Maharashtra; Rajasthan; Uttarakhand; Uttar Pradesh.

Elsewhere : Europe, Pakistan, China, Myanmar, Thailand, Malay Peninsula, Indonesia, Hong Kong, Taiwan, Hawaii, U.S.A., Mexico, South America.

Genus *Metaphire* Sims and Easton, 1972

1972. *Metaphire* Sims and Easton, *Biol. J. Linn. Soc.*, 4(3) : 215.

20. *Metaphire houlleti* (Perrier, 1872)

1872. *Perichaeta houlleti* Perrier, *Nouv. Arch. Mus. Nat. Hist. Paris*, 8 : 99.

1982. *Metaphire. houlleti*. Julka, *Rec. zool. Surv. India*, 80 : 142.

Material examined : 13ex., Reg. No. An 3382/1, Chaubattia, Rasnikhet, 26.x.2006, A. Misra & Party; 54ex., Reg. No. An 3383/1, Ghukhan, uttaranchal, 31.x.2006, A. Misra & party; 37ex, Reg. No. An 3385/1, Berinag, Uttaranchal, 19.x.2006; 59ex., Reg. No. An 3388/1, Majkhali, 22.x.2006; 24ex., Reg. No. An 3389/, Vatti Village, Berinag, 20.x.2006; 161ex., Reg. No. An 3391/1, Kosi, Almora, 23.x.2006, A. Misra; 43ex., Reg. No. An 3394/1, Bazole, Ranikhet, 27.x.2006, A. Misra; 25ex., Reg. No. An 3396/1, Bagar Village, Nainital, 30.x.2006, A. Misra;

Distribution : India : West Bengal; J & K; H.P.; Uttarakhand; Uttar Pradesh.

Elsewhere : Sierra Leone, Pakistan, China, Sri Lanka; Myanmar, Thailand, Malay Peninsula, Indonesia, Florida (U.S.A), Salvador, Cuba, Bahamas.

21. *Metaphire anomala* (Michaelsen, 1907)

1907. *Pheretima anomala* Michaelsen, *Mitt. Naturah. Mus. Hamb.*, 24 : 167.

1972. *Metaphire anomala anomala a. centralis, insolita* : Sims & Easton, *Biol. J. Linn. Soc.*, 4(3) : 237.

Material examined : 50ex, An 3387/1, Harcot, Muncyari, 18.x.2006.

Diagnosis : Genital markings in some or all of on XVII-XIX. Spermathecal pores lacking. Male pores on XX.

Distribution : India : Uttarakhand; West Bengal; Madhya Pradesh; Uttar Pradesh.

Elsewhere : Myanmar; Thailand; Europe; China; Korea; Japan; Sri Lanka; Nepal; Bhutan;

Bangla Desh; Myanmar; Indonesia; Philippines; Hainan; Hong Kong; Taiwan; Australia; New Zealand; Some islands in the Pacific Ocean; U.S.A; Central America; West Indies; South America.

22. *Metephire posthuma* (Vaillant, 1868)

1868. *Perichaeta posthuma* Vaillant, *Annl Sci. Nat.*, (ser). 5, 10 : 228.

1972. *Metephire posthuma* Sims & Easton, *Biol. J. Linn. Soc.*, 4(3) : 239.

Diagnosis : Length 60-140 mm, diameter 3-8 mm. Segments 91-124. Prostomium epilobic. Genital markings paired. Female pore single, mid-ventral on XIV segment. Male pores, minute and invaginate, on XVIII.

Material examined : 3ex., Chaubattia, Ranikhet, 26.x.2006, A. Misra & Party.

Distribution : India Almost all over India.

Elsewhere : Pakistan; Bangla Desh; Myanmar; Thailand; Vietnam; Malay Peninsula; Indonesia; Philippines; U.S.A.

Genus *Perionyx* Perrier, 1872

1872. *Perionyx* Perrier, *Nouv. Arch. Mus. Nat. Hist. Paris*, 8 : 126.

23. *Perionyx bainii* Stephenson, 1915

1915. *Perionyx Bainii*, *Stephenson, Mem. Ind. Mus. Vi*, 72.

Diagnosis : Diagnosis is based on Julka (1995), Length 23-50 mm, diameter 2-2.5 mm. Segments 94. Prostomium epilobic. Tongue cut off behind. Clitellum xiii-xvii. Male pores, as transverse cracks with small tag-like papilla. Last heart in xii.

Distribution : India Uttar Anchal; Uttar Pradesh; Himachal Pradesh.

24. *Perionyx gravelyi* Stephenson, 1917

1917. *Perionyx. gravelyi* Stephenson, *Rec. Indian Museum*, 13 : 378.

1981. *Perionyx. gravelyi* Julka, *Rec. zool. Surv. India, Occ. Paper No.*, 26 : 22.

Material examined : 18ex., Reg. No. An 3437/1, Bargar Village, Nainital. Uttarakhand, 30.x.2006, coll. A. Misra and party.

Distribution : India : Uttarakhand; Arunachal Pradesh; West Bengal.

Remarks : This species is endemic in India and first recorded from Uttarakhand.

25. *Perionyx nainianus* (Michaelsen, 1907)

1907. *Perionychella nainiana*, Michaelsen, *Mt. Mus. Hamburg*, 155.

1917. *Perionyx nainianus* Stephenson, *Rec. Ind. Mus.*, 381.

Material examined : 29ex., Reg. No. An 34491, Majkhali, Uttarakhand, 22.x.2006, coll. A. Misra and party; 7ex., Reg. No. An 3466/1, Munsyari, Uttarakhand, 18.x.2006, coll. A. Misra and party;

Diagnosis : Length 85 mm, diameter 2.5-3.5mm. Segments 105. Prostomium epilobous. Clitellum only distinguishable by colour. Female pore single, mid-ventral on XIV. segment. Male pores on XVIII.

Distribution : India : Uttarakhand.

26. *Perionyx fulvus* Stephenson, 1916

1916. *Perionyx fulvus* Stephenson, *Rec. Ind. Mus.*, 322.

Material examined : 37ex., Reg. No. An 3448/1, Majkhal, Almora, Uttarakhand, 22.x.2006, coll. A. Misra and party.

Diagnosis : Length 175mm, diameter 2.5-4.5mm. Segments 178. Colour yellowish brown. Prostomium epilobous. Clitellum on XIII-XVII. Male pores very close together on XVIII segment.

Distribution : India : Uttarakhand; West Bengal.

Elsewhere : Inle, S. Shan States, Myanmar.

Remarks : First recorded from this state.

27. *Perionyx excavatus* Perrier, 1872

1872. *Perionyx excavatus* Perrier, *Nouv. Arch. Mus. Hist. nat. Paris*, 8 : 126.

1897. *Perionyx excavatus* Julka & Senapati, *Rec. zool. Surv. India, Occ. Paper No.*, 92 : 13.

Material examined : 6ex, Sitalakhet, Uttarakhand. 25.x.2006. coll. A. Misra and party.

Diagnosis : Length 175mm, diameter 2.5-4.5mm. Segments 178. Colour yellowish brown.

Prostomium epilobous. Clitellum on XIII-XVII. Male pores very close together on XVIII segment.

Distribution : India : Uttarakhand; All over India.

Elsewhere : Philippines; Malay Archipelago; Siam; China.

28. *Perionyx sansibaricus* Michaelsen, 1909

1909. *Perionyx sansibaricus* Michaelsen, *Mem. Ind. Mus.*, 174.

Material examined : 6ex, Sitalakhet, Uttarakhand. 25.x.2006. Coll. A. Misra and party.

Diagnosis : Length 175mm, diameter 2.5-4.5mm. Segments 178. Colour yellowish brown. Prostomium epilobous. Clitellum on XIII-XVII. Male pores very close together on XVIII segment.

Distribution : India : Uttarakhand; Almost all over India.

Elsewhere : Philippines; Malay Archipelago; Siam; China.

Genus *Lampito* Kingberg, 1867

1866. *Lampito* Kingberg, *Ofvers. K. Vetensk Acad. Forth. Stockh.*, 23 : 103.

29. *Lampito mauritii* Kinberg, 1866

1866. *Lampito* Kingberg, *Ofvers. K. Vetensk Acad. Forth. Stockh.*, 23 : 103.

Material examined : 13ex., Reg. No. An 3426/1, Berinag, Uttarakhand, 18.x.2006, Coll. A. Misra and party; 5ex., Regd. No. An 3433/1, Chaubattia, Uttarakhand, Coll A. Misra & Party;

Diagnosis : Clitellum annular, dorsal pores present. Digestive system with a single oesophageal gizzard in V. Male pores paired on XVIII. Female pores paired on XIV.

Distribution : India : Uttarakhand; All over India and world.

Remarks : First recorded from this state.

Family OCTOCHAETIDAE

Genus *Dichogaster* Beddard, 1888

1888. *Dichogaster* Beddard, *Q. Jl microsc. Sci.*, 29 : 251.

30. *Dichogaster bolau* (Michaelsen, 1900)

1900. *Dichogaster bolau*, Michaelsen, *Tierreich*, 10 : 340.

1978. *Dichogaster bolau bolau*, Righi *et al.*, *Acta Amazonica*, 8(3), suppl., 1 : 38.

Material examined : 20ex. An 3421, Bagar village, Nainital, 30.x.2006 Coll. A. Misra and party.

Diagnosis : Length 19-23 mm, diameter 1-3mm. Segments 70-98. Prostomium epilobous. Tongue closed. Clitellum on XIII-XXI. Male pores minute on XVIII segment. Female pores single, median, presetal. Genital markings absent.

Distribution : India : Uttarakhand; All over India and world.

Genus *Eutyphoeus* Michaelsen, 1900

1900. *Eutyphoeus* Michaelsen, *Tierreich*, 10 : 322.

31. *Eutyphoeus annadalei* Michaelsen, 1907

1907. *Eutyphoeus annadalei* Michaelsen, *Jb. Hamb. Wiss. Anst.*, 24 : 174.

1907. *Eutyphoeus annadalei* Gates, *Rec. Indian Mus.*, 40 : 64.

Diagnosis : Diagnosis is based on Julka (1995), Length 65 mm, diameter 1.7-2.3 mm. Segments 91. Prostomium tanylobic. Clitellum on XIII-XVII. Male and Female pores paired. Genital markings paired.

Distribution : India : Uttarakhand.

32. *Eutyphoeus incommodus* (Beddard, 1901)

1901. *Typhoeus incommodus* Beddard, *Proc. Zool. Soc. Lond.*, 1.

1938. *Eutyphoeus incommodus*, Gates, *Rec. Indian Mus.*, 40 : 83.

Diagnosis : Diagnosis is based on Julka (1995), Length 25-147 mm, diameter 2.5-6 mm. Segments 92-189. Prostomium combined pro/epilobic or pro/tanylobic. Clitellum on XIII- XVIII. Male and Female pores paired. Genital marking glands are absent.

Distribution : India : West Bengal.

33. *Eutyphoeus nainianus* Michaelsen, 1907

1907. *Eutyphoeus nainianus*, Michaelsen, *Jb. Hamb. Wiss. Anst.*, 24 : 177.

1938. *Eutyphoeus nainianus*, Gates, *Rec. Indian Mus.*, 40 : 91.

Diagnosis : Diagnosis is based on Julka (1995), Length 60 mm, diameter 3-4.5 mm. Segments 138.

Prostomium tanylobic. Clitellum on XIII- XVII. Male and Female pores paired. Genital marking closely paired.

Distribution : India : Uttarakhand.

34. *Eutyphoeus nicholsoni* (Beddard, 1901)

1901. *Typhoeus nicholsoni* Beddard, *Proc. zool. Soc. Lond.*, 1901 : 206.

1938. *Eutyphoeus nicholsoni*, Gates, *Rec. Indian Mus.*, 40 : 94.

Diagnosis : Diagnosis is based on Julka (1995), Length 141-270 mm, diameter 5-10 mm. Segments 172-225. Prostomium tanylobic. Clitellum on XIII-XVII. Male pores paired. Female pore single. Genital marking closely paired.

Distribution : India : West Bengal.

35. *Eutyphoeus orientalis* (Beddard, 1883)

1883. *Typhoeus orientalis* Beddard, *Ann. Mag. Nat. Hist. (ser. 5)*, 12 : 219.

1938. *Eutyphoeus orientalis*, Gates, *Rec. Indian Mus.*, 40 : 98.

Diagnosis : Diagnosis is based on Julka (1995), Length 130-250 mm, diameter 4.5-10 mm. Segments 130-216. Prostomium pro/tanylobic. First dorsal pore on XIII. Clitellum on XIII- XVII. Male pores paired. Female pore single. Genital markings paired. Penial setae spoon shaped.

Distribution : India : West Bengal; Uttarakhand.

36. *Eutyphoeus pharpingianus* Michaelsen, 1907

1907. *Eutyphoeus pharpingianus* Michaelsen, *Jb. Hamb. Wiss. Anst.*, 24 : 177.

1938. *Eutyphoeus pharpingianus*, Gates, *Rec. Indian Mus.*, 40 : 104.

Diagnosis : Diagnosis is based on Julka (1995), Length 130 mm, diameter 4.5 mm. Segments 118. Prostomium tanylobic. Clitellum on XIII- XVII. Male and Female pores paired. Genital markings paired.

Distribution : India : Uttarakhand.

Elsewhere : Nepal.

37. *Eutyphoeus waltoni* Michaelsen, 1907

1907. *Eutyphoeus waltoni* Michaelsen, *Jb. Hamb. Wiss. Anst.*, 24 : 179.

1938. *Eutyphoeus waltoni*, Gates, *Rec. Indian Mus.*, **40** : 112.

Diagnosis : Diagnosis is based on Julka (1995), Length 52-230 mm, diameter 4-8 mm. Segments 115-201. Prostomium pro or tanylobic. Clitellum on XIII-XVII. Male pores paired. Female pore single. Genital marking closely paired.

Distribution : India : Manipur; Uttarakhand; Uttar Pradesh.

Genus *Lenogaster* Gates, 1939

1939. *Lenogaster*, Gates, *Rec. Indian Mus.*, **41** : 198.

38. *Lenogaster parvus* (Fedarb, 1898)

1898. *Dichogaster parvus* Fedarb, *Proc. Zool. Soc. Lond.*, **1898**, 499.

1938. *Eutyphoeus waltoni*, Gates, *Rec. Indian Mus.*, **40** : 198.

Diagnosis : Diagnosis is based on Julka (1995), Length 40 mm, diameter 2 mm. Segments 132. Gizzard 2, in v-vi. Clitellum annular, on XIII- XVII.

Distribution : India : Uttarakhand.

39. *Lenogaster pusillus* (Stephenson, 1920)

1920. *Eudichogaster pusillus* Stephenson, *Mem. Indian Mus.*, **22** : 765.

Diagnosis : Diagnosis is based on Julka (1995), Length 52-230 mm, diameter 4-8 mm. Segments 115-201. Prostomium pro or tanylobic. Clitellum on XIII-XVII. Male pores paired. Female pore single. Genital marking closely paired.

Distribution : India : Manipur; Uttarakhand; Uttar Pradesh, Madhya Pradesh.

Genus *Octochaetona* Gates, 1962

1962. *Octochaetona* Gates, *Ann. Mag. Nat. Hist.* (ser.13), **5** : 211.

40. *Octochaetona beatrix* (Beddard, 1902)

1902. *Octochaetus beatrix* Beddard, *Ann. Mag. Nat. Hist.* (ser. 7), **9** : 456.

1962. *Octochaetona beatrix* Gates, *Ann. Mag. Nat. Hist.* (ser.13), **5** : 213.

Material examined : 2 ex., Reg. No. An 3446/ 1, Bargar village, Nainital, Uttarakhand, 30.x.2006, coll. A. Misra and party.

Diagnosis : Length 40-134 mm, diameter 2-5mm. Segments 133-197. Prostomium

proepilobous. Tongue closed. Clitellum on XIII-XVIII. Male pores minute. Female pores paired. Genital markings absent.

Distribution : India : Uttarakhand; Uttar Pradesh; Madhya Pradesh; Arunachal Pradesh; Maharashtra; Gujarat; West Bengal; Karnataka.

Elsewhere : Pakistan; Myanmar; Malay peninsula; Philippines.

41. *Octochaetona surensis* (Michaelsen, 1910)

1910. *Octochaetus surensis*, Michaelsen, *Abh. Geb. Naturw.*, Hamburg, **19(5)** : 88.

1962. *Octochaetona surensis* Gates, *Ann. Mag. Nat. Hist.* (ser.13), **5** : 213.

Material examined : 1ex., Reg. No. An 3430/ 1, Harcot Village, Munsyary, Uttarakhand, 18.x.2006; coll. A. Misra and party.

Diagnosis : Length 60-140 mm, diameter 2.5-6 mm. Segments 111-180. Prostomium epilobous. Tongue closed. Clitellum on XIII-XVII. Male pores minute. Female pores paired. Genital markings oval, paired on some of XVIII-XXXII.

Distribution : India : Uttarakhand; Uttar Pradesh; Madhya Pradesh.

Elsewhere : Myanmar.

Remarks : First recorded from this state.

Genus *Ramiella* Stephenson, 1921

1921. *Ramiella* Stephenson, *P.Z.S.*, 109.

42. *Ramiella bishambari* (Stephenson, 1914)

1914. *Octochaetus bishambari*, Stephenson, *Rec. Ind. Mus.* **X**, 347.

1923. *Ramiella bishambari*, Stephenson, *Fauna Br. India*, Oligochaeta : 398.

Diagnosis : Diagnosis is based on Julka (1995), Length 35 mm, diameter 1 mm. Segments 85. Prostomium epilobous. Gizzard in vi. Clitellum on xiv-xvi.

Distribution : India : Uttarakhand; Uttar Pradesh.

Family ALMIDAE

Genus *Glyphidrilus* 1889

1889. *Glyphidrilus* Horst. *Tijdschr. Nederlandsche Dierk. Ver.* **2**, **2** : LXXVI.

43. *Glyphidrilus tuberosus* Stephenson, 1916

1916. *Glyphidrilus tuberosus* Stephenson, *Rec. Indian Mus.*, 12 : 349.

1987 *Glyphidrilus tuberosus*: Julka & Senapati, *Rec. zool. Surv. India, Occ. Paper No.*, 92 : 6.

Material examined : 1 ex., Harcot Village, Munsyary, Uttarakhand, 18.x.2006; coll. A. Misra and party.

Diagnosis : Length 60-118 mm, diameter 2.5-3 mm. Segments 221. Clitellum annular, wings XX-XXIV. Genital markings small, circular to elliptical tubercles. Female pores paired on XIV.

Remarks : First recorded from this state.

Distribution : India : Uttarakhand; Uttar Pradesh; Madhya Pradesh.

Elsewhere : Myanmar.

44. *Glyphidrilus* sp.

Material examined : 1 ex., Reg. No. An 3430/1, Harcot Village, Munsyary, Uttarakhand, 18.x.2006; coll. A. Misra and party.

Diagnosis : Length 65-120 mm, diameter 2.6-3 mm. Segments 222. Clitellum annular, wings XX-XXIV. Genital markings small, elliptical tubercles. Female pores paired on XIV.

Distribution : India : Uttarakhand; Uttar Pradesh.

Family EUDRILIDAE**Genus *Eudrilus* Perrier, 1871**

1871. *Eudrilus* Perrier, *Compt. Rend. Acad. Sci. Paris*, 73 : 1175.

45. *Eudrilus eugeniae* Kingberg, 1867

1867. *Eudrilus eugeniae* Kingberg, *Ofvers. K. Vetensk. Akad. Forhandl.* Stockholm, 23 : 98.

Material examined : 1 ex., Harcot Village, Munsyary, Uttarakhand, 18.x.2006; coll. A. Misra and party.

Diagnosis : Length 90-135 mm, diameter 5-8 mm. Colour red to dark violet. Gizzard single in V. Setae lumbricine. Spermathaecal pores in or posterior to testis segment. Male pores paired, slightly in front of 17/18 segment. Female pores paired, transverse slits on XIV.

Distribution : India : Uttarakhand; Uttar Pradesh; Madhya Pradesh.

Elsewhere : Myanmar.

Remarks : First recorded from this state.

SUMMARY

The paper deals with Oligochaeta (Earthworm) specimen collected from difficult districts of Uttarakhand a total of 45 species belonging to 20 genera and 8 families recorded from the state Uttarakhand.

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ANNELIDA : LEECHES

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INTRODUCTION

Globally more than 667 species of leeches have been recorded. In India, 63 leech species have been recorded (Bandyopadhyay and Mandal, 2006). Harding and Moore (1927), Bhatia, M.L. (1955), Soos (1965) is the pioneer in Taxonomy of leeches. Mandal, C.K. (2002, 2004 and 2006), Nandi, N.C. and Raut, S.K., (1987) have done some work on taxonomy and ecological work of leeches in West Bengal. Soota, T.D. (1977), Chandra, M (1983), Ghosh G.C. (1998) contributed a lot on the taxonomy of leeches.

Chandra (1983) recorded 4 species from Uttar Pradesh and 5 species from Uttarakhand. So the present communication deals with 34 examples of leeches collected by the author during 2006 from Uttarakhand. A total 10 species of leeches under 8 genus and 4 families are reported here. 5 leeches out of 10 are newly recorded from this state.

MATERIAL AND METHODS

After making the collection, leeches were sorted out. Then the cleaned leeches were placed in a tray with a small quantity of water and were slowly killed by anaesthetizing with alcohol. Leeches usually die in an extended condition by the process. Just after death, the leeches were kept in 70% alcohol for permanent preservation. As fixing fluid 4% formalin was used.

Family GLOSSIPHONIDAE

Genus *Glossiphonia* Johnson, 1816

1. *Glossiphonia weberi* Blanchard, 1897

Genus *Hemiclepsis* Vejdovsky, 1883

- *2. *Hemiclepsis marginata asiatica* Moore, 1924
3. *Hemiclepsis marginata marginata* (Muller, 1774)

Family ERPOBDELLIDAE

Genus *Herpobdelloidea* Kaburaki, 1921

- *4. *Herpobdelloidea lateroculata* Kaburaki, 1921

Genus *Nematobdella* Kaburaki, 1921

- *5. *Nematobdella indica* Kaburaki, 1921

Genus *Barbronia* Johansson, 1918

- *6. *Barbronia weberi* (Blanchard, 1897)

Family HIRUDIDAE

Genus *Dinobdella* Moore, 1927

7. *Dinobdella ferox* (Blanchard, 1896)

Genus *Poecilobdella* Whitman, 1886

- *8. *Poecilobdella granulosa* (Savigny, 1820)

Family HAEMADIPSIDAE

Genus *Haemadipsa* Tennent, 1859

9. *Haemadipsa zeylanica agilis* Moore, 1927
10. *Haemadipsa sylvestris* Blanchard, 1894

Genus *Glossiphonia* Johnson, 1816

1816. *Glossiphonia* Johnson, Treatise on the medicinal leechj, 8° London.

1. *Glossiphonia weberi* Blanchard, 1897

1897. *Glossiphonia weberi* Blanchard, Zool. Ergeb. Einer Reise in Niederlandische Ost-Indian, Max Weber, 4 : 332 (Type Locality : Sumatra : Type-Deposit : Not known).

1977. *Glossiphonia weberi*, Chandra, Rec. zool. Surv. India, 73(1-4) : 189-195.

Diagnostic character : Body is ovate-acuminate. It is triangular in contraction. Larger form of bitten rice or Sumatra Leech (common name) attains a length of about 12 mm, general colour varies from grayish-white to light orange but usually white in preserved state; five longitudinal rows of dark spots; dorsal surface bears seven

longitudinal rows of prominent papillae. Dorsal surface is rough due to the presence of tubercles on every ring. Eyes are three pairs on rings 6, 7 and 8; male and female genital ducts open by a common pore between rings 27/28; rings 70; mouth opens within the anterior sucker; crop with six pairs of sub-lobate lateral caeca, the last and the longest pair reflected posteriorly.

Distribution : India : Widely distributed throughout India. Bihar; Uttar Pradesh; Andhra Pradesh; Assam; Tamil Nadu; Orissa; Madhya Pradesh; Jammu and Kashmir, Calcutta, North and South 24 parganas, Hughly, Birbhum, Nadia, Malda, Howrah, Purulia, Midnapore, Bankura, Dinajpur, Coochbehar, Jalpaiguri, (West Bengal); Karnataka; Uttarakhand.

Elsewhere : Pakistan, Nepal, Myanmar and Sumatra.

Genus *Hemiclepsis* Vejdovsky, 1883

1883. *Hemiclepsis* Vejdovsky, Sitzb. dex. Koenigl. Bohm. Gesel. Des Wissensch. Prag., 35-51.

2. *Hemiclepsis marginata marginata* (Muller, 1774)

1778. *Hirudo marginata* Muller, Vermium terrestrium et fluviatilium 1 Pars 2.4° Havniel et Lipsie, 1773-1774. (Type Locality and Type-Deposited Not known).

1976. *Hemiclepsis marginata marginata*, Chandra, Rec. zool. Surv. India, 69 : 325-328.

Material : was not collected during this survey.

Diagnostic characters : The common name is Pigmented leech. It is flattened and claviform in shape; ground colour light-yellow, profusely sprinkled above with bright green but this green colour disappears in preserved state; lemon-yellow spots arranged in seven longitudinal rows on dorsal surface; 72 rings; eyes two pairs; male pore and female pore open between rings 29/30 and 31/32 respectively.

Distribution : India : Bihar; Orissa; Rajasthan; Uttar Pradesh; Maharashtra; Madhya Pradesh; Karnataka; Andhra Pradesh; Tamil Nadu; Birbhum, Burdwan, Coochbehar, Malda, Murshidabad (West Bengal).

Elsewhere : Europe, Western Asia and Nepal.

3. *Hemiclepsis marginata asiatica* Moore, 1924

1924. *Hemiclepsis marginata asiatica*, Moore, Proc. Acad. Nat. Sci., Philad., 76 343-388. (Type Locality : Srinagar, Kashmir; Type-Deposited : Z.S.I.).

Material : 2ex., Lohabawati Nadi, District Pithorgarh, Uttarakhand. 14.x.2006. Registrtrtion number An 3611/1, coll. A Misra and Party.

Diagnostic characters : Larger forms attain a length of about 15 mm., width of about 4 mm., colour pinkish white with dull green pigmented cells on the dorsal side; body smooth ventrally but rough dorsally; middle ring of each somite bears three pairs of larger dorsal paillae; eyes three pairs arranged in two sub-parallel columns; the first, second and third pairs of eyes lie on ring 3, 4 and 7 respectively; male and female pores open between 29/30 and 31/32 respectively. rings 73, mouth subterminal; crop with nine pairs of lateral diverticula.

Distribution : India : Sirmour, Solan, Bilaspur (Himachal Pradesh); Kalka (Haryana); Chota Nagpur (Bihar) Mangaldai (Assam); Jodhpur, Nagaur, Jaisalmer, Jaipur, Bikaner, Sikar (Rajasthan), Igatpuri, Kolhapur, Satara (Maharashtra); Andhrapradesh; Assam; Himachal Pradesh; Rajasthan; Shimoga (Karnataka); Bankura, Burdwan, Howrah, Medinipur, Murshidabad, Purulia (West Bengal); Uttarakhand.

Remarks : *Hemiclepsis marginata asiatica* has been recorded from Uttarakhand for the first time.

Genus *Nematobdella* Kaburaki 1921

1921. *Nematobdella* Kaburaki, Rec. Indian Mus., 22 : 689-719.

4. *Nematobdella indica* Kaburaki, 1921

1921. *Nematobdella indica* Kaburaki, Rec. Indian Mus., 22 : 689-719. (Type Locality : Dharmapur, Himachal Pradesh; Type-Deposited Z.S.I.).

1983. *Nematobdella indica* Chandra, Rec. zool. Surv. India, 80 : 281.

Material : 2ex., Lohabawati Nadi, District Pithorgarh, Uttarakhand. 14.x.2006. Registrtrtion number An 3612/1, coll. C.K. Mandal.

Diagnostic characters : The common name is worm leech of Dharmapura, Himachal Pradesh.

Larger forms attain a length of about 20 mm and width about 3 mm; form very slender, attenuated anteriorly; colour bright buff when alive but fades away in preserved state; eyes six pairs, the first pair larger and dorsal on somite III, remaining five pairs smaller, sub-marginal on somites V to XI; gonopores separated by five annuli.

Distribution : Himachal Pradesh; Madhya Pradesh; Maharashtra; Rajasthan and Uttar Pradesh; Renuka, Simla hills, Srimour (H.P.); Punjab, Madhya Pradesh and Maharashtra. Howrah; Hughly; Medinipur; Burdwan; 24 Parganas; Nadia; South Dinajpur, Jalpaiguri, Coochbehar, Birbhum (West Bengal); Uttarakhand.

Remarks : *Nematobdella indica* has been recorded from Uttarakhand for the first time.

Genus *Herpobdelloidea* Kaburaki, 1921

1921. *Herpobdelloidea* Kaburaki, *Rec. Indian Mus.*, **22** : 668-719.

5. *Herpobdelloidea lateroculata* Kaburaki, 1921

1921. *Herpobdelloidea* Kaburaki, *Rec. Indian Mus.*, **22** : 668-719. Type Locality : Saugar, Madhya Pradesh; Type-Deposited Z.S.I.).

1983. *Herpobdelloidea lateroculata* Chandra, *Rec. zool. Surv. India*, **80** : 281.

Material : 3exs., Lohabawati Nadi, District Pithorgarh, Uttarakhand. 14.x.2006. Registration number An 3613/1, coll. A. Misra and Party.

Diagnostic characters : The common name of the leech is Worm leech of Saugar, Madhya Pradesh. Larger forms attain a length of about 27 mm and width of about 3 mm; form very slender, attenuated anteriorly; colour pale buff when alive but generally white in preserved state; eyes five or six pairs, the first pair larger and dorsal on somite IV; the remaining submarginal on somites V to VIII; gonopores separated by two and one-half to three annuli.

Distribution : India : Saugar (Madhya Pradesh); Loktak Lake (Manipur); Assam, Nagaur (Rajasthan); Satara (Maharashtra); Uttar Pradesh; Cuttack (Orissa); Calcutta; Hughly; Medinipur; Burdwan; Birbhum; Bunkura; South 24 Parganas; North 24 Parganas. Nadia; Malda; Murshidabad; Jalpaiguri; Coochbehar, West Dinajpur (W.B.); Pithorgarh, Uttarakhand.

Genus *Barbronia* Johansson 1918

1918. *Barbronia* Johansson, *Zoologie*, **2**(13) : 373-396.

6. *Barbronia weberi* (Blanchard, 1897)

1897. *Dina weberi* Blanchard, *Zool. Ergeb. Reise in Niederlandisch Ost-India*, **4** : 332-355. (Type Locality : Java : Type-Deposited : Not known).

1983. *Barbronia weberi*, Chandra, *Rec. zool. Surv. India*, **80** : 280.

Material : 2exs., Lohabawati Nadi, District Pithorgarh, Uttarakhand. 14.x.2006. Registration number An 3614/1, coll. A. Misra and Party.

Diagnostic characters : The Common name is Type leech of Java. It is very small, length 25 mm. - 35 mm. colour yellowish brown, eyes, three pairs, one large pair on dorsum of annulus II, two smaller pairs on sides of annulus IV.

Gonopores separated by nearly five annuli, male pore situated at b1/b2, the female on the middle of XIII b1. Accessory copulatory pores and areas at X/II and XII/XIV. Largest size 36 cm. and width 3.8 mm. Diameter of sucker is 2 mm. mouth small. Somite I and II uniannulate, III biannulate, IV biannulate or triannulate, V biannulate, VI is regularly triannulate. VII quadraannulate, VIII-XXIV are complete and quinquannulate, XXV is triannulate, XXVI is biannulate and XXVII is biannulate and post-anal. Preserved specimen grayish.

Distribution : India : West Godabari, Mehbub Nagar, Anantapur, Andhra Pradesh; Kathua, Udhampur, Poonch, Rajour Jammu and Kashmir; Sirmour, Solan, Bilaspur, Shimla, Himachal Pradesh; Hoshangabad, Madhya Pradesh; Malda, West Bengal. Nainital, Pithorgarh, Uttarakhand.

Remarks : *Barbronia weberi* has been recorded from Uttarakhand for the first time.

Genus *Poecilobdella* Blanchard

1893. *Poecilobdella* Blanchard, *Boll. Musei. Zool. Anat. Camp. R. Univ. Torino*, **7**(145) : 1-32.

7. *Poecilobdella granulosa* (Savigny, 1820)

1820. *Sanguisuga granulose*, *Système des annélides*, Paris. (Type Locality : Pondichery : Type Deposited : Not known).

Material : 1ex., Lohabawati Nadi, District Pithorgarh, Uttarakhand. 14.x.2006. Registration number An 3615/1, coll. A. Misra and Party.

Diagnostic characters : The common name is Medicinal leech of India. It is large, form robust; colour brown dorsally and light-green ventrally; narrow olive-green stripes four pairs on dorsum,

gradually disappears with the increase of size; gonopores separated by five annuli; sensillae prominent, elliptical, lip with median ventral fissure; jaws large with numerous prominent papillae and more than one hundred teeth; atrium pyriform with penis-sac, larger than prostate; vaginal stalk well developed; vaginal caecum and common oviduct opening into vaginal stalk.

Distribution : India : Patiala (Punjab); Bilaspur (Himachal Pradesh); Kumaon, Mathura, Agra, Bahraich (Uttar Pradesh); Ahmedabad (Gujarat); Maharashtra; Berar (M.P.); Madras (Tamil Nadu); Andhra Pradesh; Assam; Bihar; Manipur; Orissa; Rajasthan; Sikkim; Bunkura, Birbhum, Burdwan, Calcutta, Coochbehar, Hughly, Howrah, Jalpaiguri, Malda, Medinipur, Murshidabad, Nadia, Purulia, West Dinajpur, 24 Parganas North and South (West Bengal); Pithorgarh, Uttarakhand.

Elsewhere : Sri Lanka, Nepal and Myanmar.

Remarks : *Poecilobdella granulosa* has been recorded from Uttarakhand for the first time.

Genus *Dinobdella* Moore 1927

1927. *Dinobdella* Moore, *Fauna Brit. India, Hirudinea*, 175.

8. *Dinobdella ferox* (Blanchard, 1896)

1896. *Whitmania ferox* Blanchard, *Mem. Soc. Zool. Fr.*, 9 : 316-330. (Type Locality : Not known : Type-Deposited : British Museum).

1983. *Dinobdella ferox*, Chandra, *Rec. zool. Surv. India*, 80 : 283.

Material : was not collected during this survey.

Diagnostic characters : Size very large, up to 20cm to 25cm. Colour in life dark green, entirely without markings. Eyes five pairs, small and deeply placed usually obscure. Complete somites from IX To XXIV.

Distribution : India : Himachal Pradesh; Uttar Pradesh; Manipur; Sikkim; Darjeeling, Medinipur, West Bengal; Uttarakhand.

Elsewhere : Sri Lanka, Myanmar, China, Taiwan and Siam.

Genus *Haemadipsa* Tennet, 1859

1859 (1861). *Haemadipsa* Tennet, Ceylon. An account of the Island etc. Leeches, 1 : 301-307.

9. *Haemadipsa zeylanica agilis* Moore, 1927

1927. *Haemadipsa zeylanica agilis* Moore, *Fauna Brit. India, Hirudinea*, 266-267.

1983. *Haemadipsa zeylanica agilis*, Chandra, *Rec. zool. Surv. India*, 80 : 286.

Material : 2exs., Mayabawati, District Pithorgarh, Uttarakhand. 14.x.2006. Registration number An 3616/1, coll. A. Misra and Party.

Diagnostic characters : The common name "Sri Lankan Hemadipsidae". It has small cylindrical body. Colour in live is yellowish olive. Dorsal paler field bears a continuous median black line. Ventral region paler than dorsal. Marginal stripes are yellow. Sucker rays 66-76.

Distribution : India : Himachal Pradesh; Uttar Pradesh; Andaman; Tamil Nadu; Pithorgarh, Uttarakhand.

Elsewhere : Sri Lanka, Nepal and Myanmar.

10. *Haemadipsa sylvestris* Blanchard, 1894

1894. *Haemadipsa sylvestris* Blanchard, *Annali Mus. Civ. Stur. Nat.* Giacomo Doria, 2(4) : 113-118. (Type Locality : Carin, Myanmar; Type-Deposited : Not known).

1983. *Haemadipsa sylvestris*, Chandra, *Rec. zool. Surv. India*, 80 : 287.

Material : 1ex., Lohabawati Nadi, District Pithorgarh, Uttarakhand. 14.x.2006. Registration number An 3617/1, coll. A. Misra and Party.

Diagnostic characters : The common name "The largest and robust land leech of India" It has small cylindrical body. Colour is plain yellow, with three dark brown strips. The marginal stripes are bright yellowish orange. Furrow pits are five pairs on VIII to XII. Sucker rays 69-80.

Distribution : India : Sikkim; Assam; Arunachal Pradesh; Andaman and Nicobar Island; West Bengal; Uttar Pradesh; Pithorgarh, Uttarakhand.

Elsewhere : Sri Lanka, Nepal and Myanmar.

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CRUSTACEA : DECAPODA : PALAEMONIDAE : POTAMIDAE : GECARCINUCIDAE

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INTRODUCTION

We have examined a considerable amount of freshwater crab and prawn material from the various localities of the newly created state Uttarakhand formerly Uttar Pradesh. The state Uttarakhand presents a unique ecosystem in the Indian subcontinent. The river Yamuna, Ganga, Ramganga, Koshi, Sharda, Sarya etc. are major rivers of this state. The climate ranges from hot, dry sub tropical in the river valleys (18°C) to cool moist temperature in the higher hills (7°C). The rainfall is depended to the south-west monsoon from June to September. The average rainfall is about 2000 mm/annum.

A survey of available literature show that taxonomic and Zoo-geographical information on the freshwater prawns and crabs in this state is still inadequate. In this present report an attempt is made to add a few more new localities and new records. The literature helps us to draw a common opinion that six species of freshwater crabs namely *Potamon koolooense*, *Potamon atkinsonianum*, *Potamon emphysetm*, *Sartoriana spinigera* *Berytelphusa* (*Maydelliathelphusa*) *Lugubris masoniana* and *Barytelphusa* (*Barytelphusa*) *cunicularis* have so far been reported from Uttarakhand state. It is interesting to note that no report on the freshwater prawn from Uttarakhand state has so far been known.

The collections on which the present report is based were made by the collectors of Z.S.I., Calcutta and N.R.S., Z.S.I., Dehradun. An examination of material of freshwater prawns and crabs have revealed that nine species of freshwater crabs and eight species of freshwater prawns belonging to four genera (freshwater crabs) and one genus (freshwater prawns) have been incorporated with this report.

Wood, Mason (1893), De Man (1906), H. Milne Edwards (1837), Henderson (1893), Kemp (1917), Rathbun (1904), were the first carcinologist who described the freshwater crabs and prawns earlier from India. Subsequently Alcock (1900) in his monumental work on the freshwater crabs of India added more species from Uttarakhand. Bott (1970) in his revisionary work on the freshwater crabs has changed the classification of Alcock affecting a number of changes in nomenclature thus bringing down the number of species of freshwater crabs from Uttarakhand to six. Regarding prawns the previous record is not known from Uttarakhand state.

A brief synonyms and taxonomic account of all the species together with Zoo-geographical distribution have been dealt with.

Prawns and crabs are the largest group of Crustaceans having an immense economic value. They play a vital role in the aquatic ecosystem by reclying dead organic matter of the state. It is widely true that except marine and freshwater fishes the prawns and crabs form a major source of quality protein to man.

Though a total nuber of 1094 adult prawns and crabs belonging to five genera seventeen species have been collected yet it can not be taken to be exhaustive. More surveys conering all seasons may revel additional species and new localites.

SYSTEMATIC ACCOUNT

Class CRUSTACEA

Order Decapoda

Family PALAEMONIDAE

Genus *Macrobrachium* Bate, 1868

1. *Macrobrachium assamensis assamensis*
(Tiwari, 1958)

1955a. *Palaemon assamensis assamensis* Tiwari, Bull. natn. Inst. Sci. India, No., 7 : 234.

- 1955b. *Palaemon assamensis assamensis* Tiwari, *Bull. natn. Inst. Sci. India*, No., 7 : 190.
1958. *Palaemon assamensis* Tiwari, *Rec. Indian Mus.*, 35(1 & 2) : 297.
1988. *Macrobrachium assamensis assamensis* Jalihal, Shenoy & Sankolli, *Rec. zool. Surv. India, Occ. Paper No.*, 112 : 43.

Material examined : 10exs.; Yamuna, Kulhul, Dehradun, R. Tilak, 30.7.73. 7exs., Sela Kui (Western Himalaya), Dehradun, J. C. Tripathi, 24.4.84. 3exs., Rajaji National Park, Dehradun, R. Tilak, 2.1.87. 17exs., Nanak matta, T. Roy, 15.6.00.

Diagnosis : Rostrum extends upto midway between tips of antennular peduncle and antennal scale, broadly triangular in profile, upper edge horizontal, apex acute, rostral formula 7-11/2-5 with three post-Palm of second peraeopod broader than carpus, fingers longer than palm with velvety pubescences, cutting edge non-gaping with teething.

Distribution : India : Assam, Meghalaya, Arunachal Manipur, Tripura, West Bengal, Maharashtra.

Elsewhere : Nepal, Myanmar, Arakan, Pegu.

Type species : *Palaemon assamensis* Tiwari, 1958.

Type locality : Sameswari river, Siju, Garo Hills, Meghalaya.

Remarks : The species is first recorded from this area and it is seen in streams in hilly localities, never seen in plains.

2. *Macrobrachium Dayanum* (Henderson, 1893)

1893. *Palaemon dayanus* Henderson, *Trans. Linn. Soc. London*, (2)5 : 443, pl. 40, figs. 7-13.
1958. *Palaemon dayanus* Chopra & Tiwari, *Rec. Indian Mus.*, 45 : 215, figs. 1.
1950. *Macrobrachium dayanum* Holthuis, *Siboga Exped. Monogr.*, 39a(9) : 197.
1988. *Macrobrachium dayanum* Jalihal, Shenoy & Sankolli, *Rec. zool. Surv. India, Occ. Paper No.*, 112 : 43.

Material examined : 3exs., Kansro Forest, Dehradun, Arun Kumar, 16.2.83. 3exs., Kalapani, Rishikesh, J.C.T., 15.10.71. 3exs. Ridapur near Sahaspur, Dehradun, A Hussain, 18.8.88 3exs.,

Song river, Satya Narain, Raj Tilak, 14.9.87. 25 exs., Kumaon Hills, T. Roy, 12.6.00. 40exs., Kumaon Hills, T. Roy, 14.6.00. 36exs., Doraha, Kumaon Hills, T. Roy, 8.6.00. 24exs., Seohara Kumaon Hills, T. Roy, 10.6.00. 28exs., Kumaon Hills, T. Roy, 17.6.00. 3exs., Jalalia, 2 kms. East of Dak Pathar, R. Tilak, 4.9.73. 5exs., Amlawa river about its union of Yamuna river, R. Tilak, 4.10.73.

Diagnosis : The shape of rostrum usually straight, sometimes it is upturned distally. Rostral formula 7-11/4-7. Number of teeth on the rostrum varies according to its length. Carapace smooth, Chela of second peraeopod longer than carpus, fingers are densely pubescent.

Distribution : India : Assam, West Bengal, Orissa, Madhya Pradesh, Uttar Pradesh, Kerala, Jharkhand, Bihar, Tripura, Meghalaya, Punjab.

Elsewhere : Pakistan.

Type species : *Palaemon dayanus* Henderson, 1893.

Type locality : Northern India.

Remarks : The species occurs in plains as well as at lower altitudes in hills and not known to occurs beyond south of the Krishna river.

3. *Macrobrachium hendersoni* (De Man, 1906)

1906. *Palaemon (Parapalaemon) hendersoni* De Man, *Ann. Mag. Nat. Hist.*, Ser., 7, 17 : 405.
1910. *Bithynis (Parapalaemon) hendersoni* Rathbun, *Bull. Mus. Comp. Zool. Harvard*, 52 : 316, pl. 5, figs. 3.
1924. *Palaemon hendersoni* Kemp & Chopra, *Rec. Indian Mus.*, 26 : 12, 19.
1950. *Macrobrachium dayanum* Holthuis, *Siboga Exped. Monogr.*, 39a(9) : 197.

Material examined : 5exs., Western Himalaya, Kalsi, A. Hussain, 17.2.88.

Diagnosis : Rostrum extends to end of basal or middle segments of the antennular peduncle. Rostral formula 5-9/1-2. Palm of second peraeopod longer than carpus and fingers longer than palm with dense pubescence.

Distribution : India : Assam, Meghalaya, Arunachal Pradesh, Manipur, Sikkim, West Bengal, Uttar Pradesh, Madhya Pradesh.

Elsewhere : North Myanmar, South China.

Type species : *Palaemon (Parapalaemon?) hendersoni* (De Man, 1906).

Type locality : Darjeeling, West Bengal.

Remarks : This species is restricted to altitudes higher than 1500ft. to 5000ft. in hilly stream.

4. *Macrobrachium hendersoni platyrostris* (Tiwari, 1952)

1952. *Palaemon hendersoni platyrostris* Tiwari, *Ann. nat. Hist.*, (12) 5 : 32.

1933. *Macrobrachium hendersoni platyrostris* Kurian and Sebastian, *Prawns and Prawn Fisheries of India*, p. 76.

Material examined : 32exs., Dehradun, R. Tilak, 14.9.72. 5exs., Dehradun, A. Singh, 28.10.71. 9 exs., Kulhul, Dehradun, R. Tilak, 30.7.73. 7exs., Kalsi, Dehradun, A. Hussain 12.1.88 2exs., Dehradun, R.N. Chopra, 18.2.72. 5exs., Neminadi, R.N. Chopra, 8.10.71. 2exs., Rishikesh, J.C.T., 15.10.71. 1ex., Talper, R.N. Chopra, 26.2.72. 1ex., Pausi, J.C.T. 1.11.72. 4exs., Sachimala/Forest, A. Singh, 15.2.73. 1ex., Lukrunala, S. Hussain, 18.8.88. 1ex., Pukhtapat, R. Tilak, 16.3.70. 6exs., Satyanarain, R.N. Chopra, 23.2.83. 1ex., Yamuna river, R. Tilak, 18.5.78. 1ex., Boxar Corbett National Park, R.K.B., 2.12.70. 7exs., Dhikala, A. Singh, 1.2.71. 1ex., Yamuna river, R. Tilak, 30.7.73. 10exs., Amliari, A. Hussain, 27.9.72. 7exs., Kho River, A. Kumar, 18.4.89. 8exs., Rajaji National Park, N.K. Singh, 14.1.97. 9exs., Jalalia, R. Tilak, 4.9.73. 5exs., Ramganga river, J.C.T., 10.6.72. 11exs., Union of Song & Ganga River, R. Tilak, 24.10.73. 3exs., Amlawa river, R. Tilak, 4.10.73. 4exs., Yamuna river, N.K. Sinha, 23.8.88.

Diagnosis : Rostrum extends upto the end of antennular peduncle. Rostral formula 8-9/2-3. Teeth on lower margin drawn back from the apex. Rest of characters as in *Macrobrachium hendersoni*.

Distribution : India : Assam, Meghalaya, Arunachal Pradesh, Manipur, Tripura, West Bengal.

Elsewhere : Myanmar, China.

Type species : *Palaemon hendersoni platyrostris* Tiwari, 1952.

Type locality : Eastern Himalayan Region.

Remarks : The species is recorded for first time from this area. Hill stream species occurring at lower altitudes in between 1000ft. to 1500ft. and differ from *Macrobrachium hendersoni* in the length and depth of rostrum.

5. *Macrobrachium Kistnensis* (Tiwari, 1952)

1952. *Palaemon Kistnensis* Tiwari, *Ann. Mag. nat. Hist.*, 5 : 28.

1979b. *Macrobrachium kistnensis* Jalihal, Shenoy & Sankolli, *Bull. Fish. Fac. Konkon Agri. Univ., India*, 1(1) : 73.

1988. *Macrobrachium Kistnensis* Jalihal, Shenoy & Sankolli, *Rec. zool. Surv. India, Occ. Paper No.*, 112 : 34.

Material examined : 3exs., Rajaji National Park, Dehradun, T.C. Tripathi, 20.1.87. 52exs., Kaladhungi, Kumaon Hills, T. Roy, 19.6.00 19exs., Jeolikota, T. Roy, 20.6.00 24exs., Pantnagar, T. Roy, 17.6.00. 25exs., Nankuchial, T. Roy, 23.6.00. 11exs., Baijanath, T. Roy, 24.6.00. 16exs., Bageswar. T. Roy, 25.6.00.

Diagnosis : Rostrum extends in between tips of antennular peduncle and antennal scale. Rostral formula 8-9/4. Palm of second paraeopod shorter than carpus and merus, fingers non-pubescent and smooth.

Distribution : India : Rajasthan, Gujarat, Maharastra, Madhya Pradesh, Uttar Pradesh.

Elsewhere : Sri Lanka.

Type species : *Palaemon Kistnensis* Tiwari, 1952.

Type locality : Wai (Maharastra).

Remarks : Hill stream species in which males always shorter than female.

6. *Macrobrachium lamarrei* (H.M. Edwards, 1837)

1837. *Palaemon lamarrei* H. M. Edwards, *Hist. nat. Crust.*, 2 : 397.

1908. *Palaemon (Eupalaemon) lamarrei* De Man, *Rec. Indiam Mus.*, 2 : 222.

1950. *Macrobrachium lamaerrei* Holthuis, *Siboga Exped. Monogr.*, 39a(9) : 119.

1988. *Macrobrachium lamarrei lamarrei* Jalihal, Shenoy & Sankolli, *Rec. zool. Surv. India, Occ. Paper No.*, 112 : 2.

1993. *Macrobrachium lamarrei* Kurian & Sebastian, *Prawns and Prawn Fisheries of India*, : 77.

Material examined : 153exs., Kumaon Hills, T. Roy, 16.6.00. 7exs., Doraha, T. Roy, 8.6.00. 10exs., Seohara, T. Roy, 10.6.00. 19exs., Nanakmatta, T. Roy, 15.6.00. 18exs., Kirkha, T. Roy 17.6.00. 46exs., Lalkua, T. Roy, 11.6.00. 35exs., Konth, T. Roy, 10.6.00. 36exs., Khatima, T. Roy, 14.6.00. 1ex., Rajaji National Park, N.K. Sinha, 14.1.97.

Diagnosis : Rostrum either equal to or slightly longer than antennal scale and upturned distally. Rostral formula 6-9+0-2+1-2/4-8. Upper margin with diatal gap in between proximal series of 6-9 teeth and distal 1-2 subapical teeth and the gap sometimes bears 1-2 teeth.

Distribution : India : Assam, Arunachal Pradesh, Manipur, West Bengal, Tripura, Kerala, Tamilnadu, Orissa, Bihar, Jharkhand, Maharashtra, Chattrishgarh, Punjab.

Elsewhere : Pakistan, Nepal, Bangladesh.

Type species : *Palaemon lamarrei* H.M. Edwards, 1837.

Type locality : Karnataka, India.

Remarks : The species is distributed in small rivers streams, ponds tanks etc. and found in streams around bases of hills, but not higher up. It is not recorded from extreme south and Westernghats area.

7. *Macrobrachium mirabile* (Kemp, 1917)

1917. *Palaemon mirabilis* Kemp, *Rec. Indian Mus.*, 13 : 227.
1937. *Macrobrachium mirabilis* Suvatti, *Check-List ag. Fauna Siam*, : 49.
1950. *Macrobrachium mirabile* Holthuis, *Siboga Exped. Monogr.*, 39a(9) : 174.
1993. *Macrobrachium mirabile* Kurian & Sebastian, *Prawns and Prawn Fisheries of India*, : 77.

Material examined : 1ex., Kaladhungi, Kumaon Hills, T. Roy, 18.6.00. 2exs., Jeolikota, Kumaon Hills, T. Roy, 20.6.00. 3exs., Pantnagar, Kumaon Hills, T. Roy, 17.6.00.

Diagnosis : Rostrum extends upto end of antennular peduncle. Rostrum high and upper margin bears many teeth. Second legs of adult male smooth. Fifth legs longer than fourth.

Distribution : India : West Bengal.

Elsewhere : Bangladesh, Myanmar, Malayan Archipelago.

Type species : *Palaemon mirabilis* Kemp, 1917.

Type locality : Shibpur near Calcutta, West Bengal.

Remarks : This estuarine species is recorded for first time from the area.

8. *Macrobrachium rosenbergii* (de Man, 1879)

1879. *Palaemon carcinus* de Man, *Notes Leyden Mus.*, 1 : 165.
1898. *Palaemon (Eupalaemon) carcinus* de Man, *Notes Leyden Mus.*, 20 : 137.
1993. *Macrobrachium carcinus* pearse, *J. sima Soc. nat. Hist. Supple.*, 9 : 189.
1950. *Macrobrachium rosenbergii* Holthuis, *Siboga Exped. Monogr.*, 39a(9) : 111.
1995. *Macrobrachium rosenbergii* Ghosh, Sinha, Chakraborty, Das & Mazumdar, *Proc. Zool. Soc. Calcutta*, 48(1) : 1.

Material examined : 2exs., Kaladhungi, (Kumaon Hills, T. Roy, 18.6.00. 1ex., Bageswar, Kumaon Hills, T. Roy, 25.6.00.

Diagnosis : Rostrum with a distinct elevated basal crest, extends as far as the end of antennal scale and upturned distally. Lower margin of rostrum bears 8 to 14 teeth. Carpus of second peraeopod in adult male slightly longer than half as long as chela, fingers of that leg of the same length as palm. Tips of telson reaching beyond the tip of the longer posterior spines.

Distribution : India : West Bengal. Tripura, Orissa, Andhra Pradesh, Kerala, Tamilnadu, Punjab, Maharashtra.

Elsewhere : Srilanka, Myanmar, Singapore, Bangladesh Hongkong, Mergui Archipelago, Siam, Tavoy.

Type species : *Palaemon carcinus* de Man, 1879.

Type locality : Andai (N.W. New Guinea).

Remarks : It occurs both in fresh and brackish water, common in lakes and coastal area. It is recorded for first time from this area.

B. Family POTAMIDAE, Ortman 1896Genus *potamon*, Savigny 1816**9. *Potamon koolooense* Rathbun 1904**1904. *Potamon (Potamon) koolooense* Rathbun, *Nouv. Arch. Mus.*, (4)6 270, T. 10, F. 1, Abb. 10.1910. *Potamon (Potamon) fluviatile* var. *Monticola* Alcock, *Cat. ind. decap. Crust. ind. Mus.*, 1(2) : 23.1970. *Potamon koolooense* Bott, *Abh. senckend. natur. Ges. No.*, 526 : 143, pt. 38, Fig. 45, Fig. 17.

Material examined : 4M. 4F, Gumkhal, Garhwal Hills, T. Roy, 22.11.99. 1M, A stream near Govt. Fish Farm Talwari, Dist. Chamoli, R. Tilak, 25.9.79. 15M. 3F. Chilla forest, Dist. Pauri, N.K. Sinha, 12.6.87.

Diagnosis : The carapace is smooth, broader and flatter. The cervical groove is deeper cut. The epigastric crest are rugose and slightly larger than post-orbital crest. The epibranchial tooth is not prominent and large. The legs are longer than unequal chelipeds. Antero-lateral borders of carapace is more or less shorter than the postero-lateral. In adult male, the length of the sixth abdominal segment is more than a half but less than two-third its breadth. Antennular fossae is narrow. Mandible with sharp incisor edge and the maxillipeds have long exopodite with developed flagelle.

Distribution : India : Meghalaya, Khasi Hills, West Bengal, Darjeeling, Himachal Pradesh, Simla, Uttar Pradesh, Garhwal, Bhimtal, Nainital (Alcock, 1910).

Elsewhere : Afghanistan, Nepal, Terai (Alcock, 1910).

Type species : *Potamon (Potamon) koolooense* Rathbun, 1904.

Type locality : Simla (Himachal Pradesh).

Remarks : The present study included only 20 males and 7 females from this study area.

10. *Potamon atkinsonianum* (Wood-Mason, 1871)1871. *Telphusa atkinsonianum* Wood-Mason, *J. asiat. Soc. Bengal*, 40 : 205, T. 14, F. 12-16.1966. *Potamon (Potamon) atkinsonianum*, Bott, *Senckenbergiana biol.*, 47 : 474, Abb. 4 (Lit).1970. *Potamon atkinsonianum* Bott, *Abh. senckend. natur. Ges. No.*, 526 : 140, Taf. 37, Fig. 14-15, Taf. 44, Fig. 13.

Material examined : 6M. 3F, Nepali farm, Haridwar, Garhwal Hills, T. Roy, 25.11.99. 1M. Camp No. 4, Sta No. 16 Kanda (River Mandal), Corbett National Park, Dist. Pauri, Garhwal, R. K. Bhatnagar, 14.3.70.

Diagnosis : The carapace is flat. The cervical groove is deep cut. Epibranchial regions are prominently areolated. The epigastric and post-orbital crests are separated and form one curve. Sculptured chelipeds. Size is bigger. Antennular fossae very narrow. Sharp incisor edge of the mandible and the long exopodite of the maxillipeds is present. The antero-lateral angle of the merus is not rounded off but more sharply serrulate.

Distribution : India : West Bengal, Darjeeling, Kurseong 5000, Himachal Pradesh, Simla, U. P., Bhimtal, Sikkim.

Elsewhere : Nepal.

Type species : *Telphusa atkinsonianum* (Wood-Mason, 1871).

Type locality : Sikkim.

Remarks : The present study was carried out based on only 7 males and 3 females from the study area. *Potamon atkinsonianum* is very close to *Potamon koolooense* but the carapace is flat is *Potamon atkinsonianum*.

11. *Potamon emphysetum* Alcock, 19091909. *Potamon (Potamon) atkinsonianum emphysetum* Alcock, *Rec. Ind. Mus.*, 3 : 243.1966. *Potamon (Potamon) emphysetum*, Bott, *Senckenbergiana biol.*, 47 : 472, Abb. 3.1970. *Potamon emphysetum* Bott, *Abh. senckend. natur. Ges. No.*, 526 : 141, Taf. 37, Fig. 17, Taf. 44, Fig. 15.

Material examined : 4M. Narendranagar, Garhwal Hills, T. Roy, 8.11.99. 6M, 3F, Tilwara, Garhwal Hills, T. Roy, 18.11.99. 1M. 1F. Malan sanctuary, Dist. Pauri, Asket Singh, 9.11.71. 6M, 2F, Behra (Chamma), Dist. Tehri, R.N. Chopra, 3.5.73. 2M, Nakuri Nala, Dt. Uttarkashi, 1100m (approx), N.K. Sinha, 7.6.89. 4M, 4F, Kaddukhal Garhwal Hills, T. Roy, 14.11.99.

Diagnosis : The antero-lateral borders of the carapace from a very strongly concave curve and the postero-lateral borders are strongly convergent. The carapace is widened due to the bulge of the

epibranchial broaders. Wider gap is present between epigastric and post-orbital crest. Epigastric crests are very prominent. The length of the sixth abdominal segment of the male is two-third its greatest breadth. Epibranchial regions are much more oblique.

Distribution : India : Punjab, Bilaspur, Kangra, Himachal Pradesh, Simla, Uttarakhand, Kumaon.

Type species : *Potamon (Potamon) atkinsonianum emphysetum* Alcock. 1909.

Type locality : Bilaspur. bei Simla.

Remarks : *Potamon emphysetum* is differentiated with *Potamon atkinsonianum* by the lateral puffing of the epibranchial border.

Family GECARCINUCIDAE Rathbun, 1904

Genus *Potamon*, Savigny 1816

12. *Sartoriana spinigera* (Wood-Mason, 1871)

1871. *Paratelpusa spinigera* Wood-Mason, *J. asiat. Soc. Bengal.*, 40(2) : 194, T. 10, F. 1-4.

1910. *Paratelpusa (Paratelpusa) spinigera* Alcock, *Cat. ind. decap. Crust. ind. Mus.*, 1(2) : 72, T. 11, F. 53.

1970. *Sartoriana spinigera* Bott, *Abh. senckend. natur. Ges. No.*, 526 : 39, pl. 4, F. 35-37 Pl. 26, F. 38.

Material examined : 1M, 3F, Behra Vill. Chamma Dist. Tehri, R.N.C., 5.9.72.

Diagnosis : Carapace and cervical groove is convex and deep. Antero-lateral borders of carapace are well arched with acute prominent epibranchial spine is placed very far back. Orbits are small with a very wide antennal gap. Epigastric crests are prominent. Abdomen of adult male is provided with a broad based triangle in outline and the 7th segment is longer than broad. The first two joints of the mandibular palp are not separately distinguishable. Chelipeds are unequal in both sexes. It is longer in male. Legs and dactyli are stout and strong.

Distribution : India : Meghalaya, East Khasi Hills, West Garo Hills, Uttar Pradesh, Saharanpur, Haridwar, Punjab, Jullandar Dist, Orissa, Puri, West Bengal, Calcutta, Assam, Cachar, Bihar, Darbhanga, Kishanganj.

Elsewhere : Jessore, Sylhet, Karachi.

Type species : *Paratelpusa spinigera* Wood-Mason, 1871.

Type locality : India, Jessore (Bangladesh) (Spinigera)-Sibsagar Assam Trilobate.

Remarks : Alcock (1910) reported one female from Haridwar. In the present report, 55 specimens are added from Uttarakhand formerly Uttar Pradesh.

13. *Liotelphusa laevis laevis* (Wood-Mason, 1871)

1871. *Telpusa laevis* Wood-Mason, *J. asiat. Soc. Bengal.*, 201, T. 14, F. 1-6.

1910. *Paratelpusa (Liotelphusa) laevis* Alcock, *Cat. ind. decap. Crust. ind. Mus.*, 1(2) : 109, T. 13, F. 65.

1970. *Liotelphusa laevis laevis* Bott, *Abh. senckend. natur. Ges. No.*, 526 : 49, pl. 6, F. 63-65 Pl. 27, F. 28, Pl. 33, F. 17-20.

Material examined : 1F Anala on Rina Road near Naraina village and around, V. Khanna, 6.6.93. 5M, 3F, Pauri, Garhwal Hills, T. Roy, 22.11.99. 3F, 1M, Pipalkoti, Garhwal Hills, T. Roy, 20.11.99. 3M, 3F, Chamba, Garhwal Hills, T. Roy, 14.11.99. 2M, 2F, Gastiyad nearly 15 km. east of Kohiar Busket Road, Raj Tilak, 21.178. 1M, Nala near Kotalgate, Mussorie Road, Dehradun, Hussain, 18.8.73. 1M, Phondowala, Dehradun, R. N. Chopra, 20.5.87.

Diagnosis : Carapace is broadish and its surface is more or less smooth. Post-orbital crests are quite inconspicuous. Antero-lateral borders of carapace are well defined. Abdomen of adult male a broad based triangle in outline. The mandibular palp is bifurcated. The chelipeds are small. Epigastric crests are low, blunt and indistinct.

Distribution : India : Meghalaya, Cherrapunji, Shillong, Khasi Hills, Garo Hills, Assam, Sibsagar, West Bengal, Darjeeling, Nagaland, Naga Hills.

Type species : *Telpusa laevis* Wood-Mason, 1871.

Type locality : Sibsagar (Quardata), North India (Tesherrapundchi) Cherrapunjee (Laevis).

Remarks : As many as 25 specimens, of the species are reported here in for the first time from various localities of the Uttarakhand formerly Uttar Pradesh.

14. *Liotelphusa campestris* (Alcock, 1909)

1909. *Paratelpusa (Phricotelpusa) campestris* Alcock, *Rec. Ind. Mus.*, 3 : 377.

1910. *Paratelphusa (Phricotelphusa) campestris* Alcock, *Cat. ind. decap. Crust. ind. Mus.*, 1(2) : 107, T. 8, F. 27.

1970. *Liotelphusa campestris* Bott, *Abh. senckend. natur. Ges. No.*, 526 : 48, pl. 27, F. 29, Pl. 32, F. 8-10.

Material examined : 2M, 2F, Sahiya and around Dist. Dehradun, R.N. Chopra, 8.9.88. 1M. Kho River, Katwara, Dist. Pauri J.C.T. 4.6.72. 1M, vill., Jatta and Durya, Chamba Dist. Tehri, J.C.T. 7.2.72. 1F, Sahiya, Dehradun R.N. Chopra, 20.7.88. 3M, 1F, Dharasu Road, 2km. from Barkot, Uttarkashi, A. Kumar, 15.6.81. 2M, Camp No.-6, sta. No.-36, Maidaban (Khanda), A. Singh, 12.12.70. 2M, Biori nullah (Yud) nearly 13km. east of Kailas Barkat Road, Raj Tilak, 20.5.82.

Diagnosis : The carapace is not so flat and the front is more distinctly bilobed. The external orbital angle forms a distinct tooth. The antero-lateral borders are not defined and there is no trace of an epibranchial tooth. The epigastric crests are distinguishable. The Post-orbital crests are low and blunt and faint. No Flagellum is traced in the expodite.

Distribution : India : West Bengal, Baranagar near Calcutta.

Elsewhere : Nil.

Type species : *Paratelphusa (Phricotelphusa) campestris* Alcock, 1909.

Type locality : Baranagar near Calcutta.

Remarks : This is first report of this species from the newly created state of Uttarakhand formerly Uttar Pradesh.

Genus *Barytelphusa* Alcock, 1909

15. *Barytelphusa (Maydelliathelphusa) lugubris lugubris* (Wood-Mason, 1871)

1871. *Telphusa lugubris* Wood-Mason, *J. asiat. soc. Bengal*, 40(2) : 197, T. 12, F. 5-7.

1910. *Paratelphusa (Barytelphusa) lugubris* Alcock, *Cat. ind. decap. Crust. indian. Museum*, 1(2) : 91, T. 12, F. 58.

1970. *Barytelphusa (Maydelliathelphusa) Lugubris lugubris* Bott, *Abh. senckend. natur. Ges. No.*, 526 : 34, pl. 3, F. 24-26, Pl. 26, F. 15.

Material examined : 1M, 2F, Satya Narain, Dist. Dehradun, Raj Tilak 15.9.72.

Diagnosis : Carapace is flattend. Cervical groove is very broad and deep. Orbit are widen. Eyes are comparatively small. Antero-lateral borders of the carapace is fairly convex but not cristiform. Epigastric crests are broad and blunt. The post-orbital crests are sharpish in their outer half and can be traced into the lateral epibranchial denticle. Colour in the spirit is darkbrown and sometimes black. The length of the seventh segment of the abdomen is equal to its proximal breadth.

Distribution : India : Meghalaya, Khasi Hills, Garo Hills Jayantia Hills, West Bengal, Darjeeling, Kolkata, Manipur, Manipur Hills, Assam, Dafia Hills, Teesta Valley, Sikkim, Nagaland, Naga Hills.

Elsewhere : Nil.

Type species : *Telphusa lugubris* Wood-Mason, 1871.

Type locality : Sikkim Pankabarie, 200ft.

Remarks : The specimens are reported here in for the first time from this locality.

16. *Barytelphusa (Maydelliathelphusa) lugubris masoniana* (Henderson, 1893)

1893. *Telphusa masoniana* Henderson, *Trans. Linn. Soc. London*, (2) 5 : 381.

1910. *Paratelphusa (Barytelphusa) masoniana*, Alcock, *Cat. ind. decap. Crust. ind. Mus.*, 1(2) : 96, T. 12, F. 59.

1970. *Barytelphusa (Maydelliathelphusa) Lugubris masoniana* Bott, *Abh. senckend. natur. Ges. No.*, 526 : 36, pl. 3, F. 27-29, Pl. 26, F. 16.

Material examined : 7F, Khirsu, Garhwal Hills, T. Roy, 17.11.99. 2M, Kansra Forest and around, Dehradun, J.C. Tripathi 20.1.87. 2M, Narendranagar. Tehri, R.N. Chopra, 23.5.73. 6M, 4F, Almeri, Dehradun, A. Hussain, 27.9.72.

Diagnosis : The carapace as a whole is distinctly tumid. The cervical groove runs inside to the epibranchial tooth on either side. The epigastric crests are more or less oblique. Presence of acute prominent orbital tooth. The epibranchial tooth is also large and prominent. Convexity of the antero-lateral borders of the carapace is strong. Sharper spine of the capus of cheliped is present.

Distribution : India : Himachal Pradesh, River Bias, Uttar Pradesh, Saharanpur, Rurki, Uttarakhand, Haridwar, Nagla, Nainital, Dehradun, Bihar, Darbhanga, Assam, Tarai, Rajasthan, Bijnor Sikkim, Nishangal, Meghalaya, Garo Hills.

Type species : *Telphusa masoniana* Henderson, 1893.

Type locality : N. Indien, Jumna-Flu.

Remarks : The specimens have been recorded here in from several additional localities from the state of Uttarakhand formerly Uttar Pradesh.

17. *Barytelphusa (barytelphusa) cunicularis*
(West-Wood, 1836)

1836. *Telphusa cunicularis* West-Wood, in SYKES & WEST WOOD, *Trans. Linn. Soc. London*, 1 : 183, T. 19.
1910. *Paratelphusa (Barytelphusa) cunicularis* Alcock, *Cat. ind. decapod. Crust. ind. Mus.*, 1(2) : 83, T. 12, F. 56.
1970. *Barytelphusa (Barytelphusa) cunicularis* Bott, *Abh. senckend. natur. Ges. No.*, 526 : 31, pl. 2, F. 18-20, Pl. 26, F. 13.

Material examined : 5M, 5F, Dharasu, Garhwal Hills, T. Roy, 13.11.99. 8F, 1M, Dharasu, Garhwal Hills, T. Roy 13.11.99. 10M, 11F, Gangarani, Garhwal Hills, T. Roy 11.11.99. 5M, 1F, Nepali farm, Dehradun, T. Roy, 2.11.99. 7M, 1F, Laldheng, Haridwar, T. Roy, 7.11.99. 5F, Mohand, Dehradun, T. Roy 3.11.99. 5M, 2F, Kaudiala, T. Roy, 9.11.99. 3M, 4F, Vikasnagar, Dehradun, T. Roy 5.11.99. 7M, Bhaniawala, Dehradun, T. Roy 2.11.99. 3M, 5F, Ganindikheta, Haridwar T. Roy, 6.11.99. 3M, 2F, Kishanpur, Haridwar, T. Roy, 6.11.99. 3M, 2F, Muni-Ki-Rati, T. Roy, 9.11.99. 2M, 5F, Kunjapuri, T. Roy 8.11.99. 4M, 1F, Narendra Nagar, T. Roy 8.11.99. 2M. 7F. Bhatwari, T. Roy, 11.11.99. 2M, 3F, Pantgaon (Desprayag) Tehari, Asket Singh, 30.10.73. 5M, Song River, Puttapul, Kansro, Dehradun, Arun Kumar, 20.5.76. 2M, 1F, Barkot, Uttarkashi (4200). Asket Singh, 16.11.73 1M, Gaurighat near Satya Narain, Dehradun, Raj Tilak, 19.4.72. 3F, 1M, Bed Bagadea 7km. on Soregarh Gupta Kashi Road, Chamoli, Arun Kumar, 26.9.79. 2F, Chillaforest, Pauri, J.C. Tripathi, 2.6.87. 4M, A small Nala na. Rly. Sta. Kansro Dehradun, N.K. Sinha, 14.1.87. 1M, song River, Satya Narain, Dehradun, Raj Tilak, 18.4.73. 1M, Amlaura River, Kalsi, Dehradun, P.T. Bhutia 9.2.83. 3M. 1F, Along Berivari Kud 15km. from

Sahiyan Chakrata Rd., Dehradun, Arun Kumar, 6.10.82. 5M, 1F, A stream 4km. from Fhille F.R.H. Dist. Pauri, Raj Tilak, 21.2.86. 1M, Motichur Rao, Motichur, Dehradun, Raj Tilak, 28.12.72. 5F, 1km. upstream oid Yamuna bridge, Haripur, Dehradun, R.N. chopra, 8.8.88. 2M, Mussoorie Hills, Chamma, Tehri, R.N. Chopra, 29.5.73. 2M, Stn. No. 23, Basketbag, Almora, R.N. Chopra, 21.8.75. 1F, A long a tributary of Kamda River on Jharmda forest Road, Parob, Uttarkashi (5000ft.), Raj Tilak, 20.6.73. 1M, Milechoore forest Dehradun, Asket Singh, 28.10.71. 2M, Hill stream below village pokhal, Tehri, Arun Kumar, 20.4.89. 1M, Sureva River under Railway bridge Styarian, Dehradun, Raj Tilak, 3.3.73. 2M, Patirpani C.N.P. Dist. Pauri, Garhwal, J.C.T., 4.11.72. 2M, Amlawa River, Dehradun, Raj Tilak, 4.10.73. 1M, Dak Pathar, Dehradun, R.N. Chopra, 23.5.74. 3M, Sahiya, Dehradun, R.N. Chopra, 24.1.86. 1M, Narendra Nagar, Tehri, R.N. Chopra, 24.5.73. 1F, Paddy field 9km. from sahiya on Chakrata Road, Dehradun, N.K. Sinha, 17.9.88. 2M, Kandhali, Dehradun, R.N. Chopra, 8.10.71 1M, Lachhiwala, Dehradun, J.C.T., 21.3.86. 8.10.71 1M, Lachhiwala, Dehradun, 2M, Assam silver Herbertpur (2000ft), Dehradun, Arun Kumar, 10.1.79.

Diagnosis : Carapace is broader and sometimes flat. The cervical groove is not so broad and deep. The antero-lateral borders of the carapace are covex and the lateral epibranchial tooth is smaller. Post-orbital crests are prominently seperated from the lateral epibranchial tooth. The merus is quadrangular in shape. The legs are strong but shorter than chelipeds.

Distribution : India : Kerala, Nilgiris, Maharastra, Bombay, Karnatak, Mangalore, Chennai, Annamalai Coonoor, Shevaroy Hills.

Elsewhere : Nil.

Type species : *Telphusa cunicularis* (West Wood, 1836).

Type locality : Umgebung von Bombay West Ghats 17°-19° 23 N. 73°-75° E (*cunicularis* Sykes) Umgebung von poona (*Jacquemontii* Rathbun).

Remarks : 172 specimens of the species are reported here in from Uttarakhand and Uttar Pradesh. The species occur in abundance through on Uttar Pradesh and Uttarakhand.

SUMMARY

Eight species of freshwater prawns belonging to one genus and nine species of freshwater crabs belonging to four genera have been dealt with this report. The freshwater prawns *Macrobrachium assamensis assamensis* (Tiwari, 1958), *Macrobrachium dayanum* (Henderson, 1893), *Macrobrachium hendersoni* (De Man, 1906), *Macrobrachium hendersoni platyrostris* (Tiwari, 1952), *Macrobrachium kistnensis* (Tiwari, 1952), *Macrobrachium lamarrei* (H. M. Edwards, 1837), *Macrobrachium mirabile* (Kemp, 1917), *Macrobrachium rosenbergii* (de Man, 1879) and the freshwater crabs *Liotelphusa comprestis* (Alcock, 1909), *Liotelphusa laevis laevis* (Wood-Mason, 1871), *Barytelphusa* (*Maydelliathelphusa*)

lugubris lugubris (Wood-Mason, 1871) have recorded for first time from the study area. The systematic account inclusive of synonymy, material examined, diagnosis, type species and localities of the concerned species from various ecological niches, geographical distribution have been incorporated.

ACKNOWLEDGEMENT

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CHILOPODA : SCOLOPENDROMORPHA : CENTIPEDES

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INTRODUCTION

Studies on the Scolopendrid centipede fauna of Uttarakhand have been extensively undertaken by Khanna, 1987, 1991, 1994a, 1994b, 1994c, 1994d, 1997, 1998, 2001, 2003, 2005a, 2005b, 2006, Khanna and Kumar 1984, 2005 and Khanna and Tripathi 1984, 1985, 1986. On perusal of literature and on study of material extensively collected recently from Uttarakhand state during the surveys undertaken from 2002 to 2005, the author has come across 32 species of Scolopendrid centipedes, belonging to two families, Scolopendridae (31 species and Cryptopidae (1 species). The family Scolopendridae, in Uttarakhand State, is represented by two subfamilies, 1. Scolopendrinae and; 2. Otostigminae, the former represented by two tribes, viz. Scolopendrini (5 species belonging to two genera viz. *Scolopendra* and *Cormocephalus*) and Asanadini (One species and One Genus i.e. *Asanada*). The tribe Otostigminae is represented by 26 species spread over 3 genera viz. *Otostigmus* (10 species), *Ethmostigmus* (1 species) and *Rhysida* (15 species).

These 32 species includes, the description of two new subspecies viz. *Otostigmus politus quadrispinosus* and *Rhysida longipes punctata*, both from Nainital district and six species (namely, *Otostigmus morsitans*, *Otostigmus ruficeps*, *Otostigmus burn-murdochi*, *Otostigmus splendens*, *Ethmostigmus pygomegas* and *Rhysida crassispina*, recorded for the first time from Uttarakhand state.

The family Cryptopidae is represented by only one species, *Cryptops doriae* Pocock that was also recorded recently as first record by Khanna (1997).

With the description of these two new species, the Uttarakhand state has the distinction of having "Type Localities "for six species of the known Scolopendridae"

All the 32 species have been placed in the systematic status with full descriptions, illustrations, type localities, wherever known, and also the names of the Repository Museums housing the Type Specimens, with Registration numbers, wherever possible.

SYSTEMATIC ACCOUNT

Class CHILOPODA

Order SCOLOPENDROMORPHA

1815. Scolopendrides. Leach, *Trans. Linn. Soc.*, London, 11 : 382.

1907. Scolopendromorpha, Verhoeff, *Bronn, KL Ordng.*, 5(II) : 242.

Family SCOLOPENDRIDAE

1893. Subfamily Scolopendrinae + Scolopendropsinae, Bollman, *Bull. US Nat. Mus.*, 46 : 165.

1914. Scolopendridae, Attems, *Arch. naturges.*, 80A-4 : 101.

Tribe SCOLOPENDRINAE

1906. Scolopendrinae, Verhoeff, *Acta Ac, Leop.*, 86 : 435.

1926. Scolopendrini, Attems, in Kukenthal and Krumbach, *Handbook. Zool.*, 4 : 373.

Genus *Scolopendra* Linnaeus, 1758

1758. *Scolopendra* Linnaeus, *Syst. Nat.*, Ed. 10 : 637.

1987. *Trachycormocephalus*, Kraepelin, Lewis, *J. nat. Hist.*, 20 : 1083-1088.

Type Species : *Scolopendra morsitans* Linnaeus.

Distribution : India : Throughout.

Elsewhere : In all tropical and temperate zones of the world.

1. *Scolopendra morsitans* Linnaeus, 1758

1758. *Scolopendra morsitans*, Linnaeus, *Syst. Nat.*, Ed. 10 : 638.

1831. *Scolopendra marginata*, Say, *J. Ac.*, Philad., 2 : 109.

1930. *Scolopendra morsitans*, Attems, *Das Tierr.*, *Scolopendromorpha*, 54(2) : 23-25 (fig. 38-39).

1977. *Trachycormocephalus jodhpurensis*, Khanna, *Orient. Ins.*, 11(1) : 151-156.

Type Locality : India.

Material Examined : Dehra Dun : Motichur, 10.ii.1964, 1ex., T.D. Soota; Mohund, 17.ii.1964, 3exs., T.D. Soota; Dharmawala Forest Block, Timli, 9.ii.1964, 2exs., T.D. Soota; Song River Bridge, 9.ii.1964, 1ex., T.D. Soota.

Description : (Figs. 1 a-c) Body length : 60-135mm, including antennae and anal legs. Colour : The species occurs in various colour forms in different ecological habitats and at different stadia of growth and development. Cephalic plate, maxillipedes and 1st segment of the tergite varies from brownish yellow to dark orange, sometimes dark olive-green to black. Antennae yellow to tan brown with proximal segments bluish green, changing to yellow in the distal half; tergal segment varying in colour from dark green to brownish yellow or blackish green, usually with a light and contrast colored posterior tergal margins, giving the specimens externally a banded appearance; endtergite, walking legs and sternites yellow or light yellowish green. The juveniles are light green in colour. On the basis of large variety of colour forms a number of species and sub species have been described under different names. Antennae : Long, 17-23 segmented (usually 20 or 21, sometimes 19, rarely 17, 18, 22 or 23), with 7 or 8 basal segment glabrous. Antennae when reflexed reaching behind to 6th tergal segments. Head : Cephalic plate smooth, sparsely punctate and without any sulcus. Coxosternum : Base of the coxosternum smooth, without furrows, however, a very weak median sulcus extending posteriorly from the base of the dental plate is visible; dental plate mostly with 4+4 teeth, rarely with 3+3 or 6+6 teeth; post dental spur present coming out from a

shallow depression. Arrangement of teeth index is also variable from all separate to 3 mesal coalesced and outer separate or all irregularly disposed. Tergites : Smooth, 2-20 tergal segments with a pair of complete paramedian longitudinal furrows; emargination of tergites begins normally from 10th segment, but occasionally in some larger specimen it is seen beginning still earlier, whereas in juveniles it is too less represented in anterior segments or it may be half complete. Endtergite wider than long with convexed posterior margin and presence of a complete median furrow. Sternites: Smooth; paramedian longitudinal furrows complete on 2-20 segments; endsternite gradually narrowing behind with its lateral margins convexed a little in some cases, normally straight; median sulcus on endsternite absent. Legs : 1-19 pair of walking legs with 1 spur to its first tarsal segment. Tarsal spur present on 20th pair of legs; 1-20 pair of walking legs with 2 spurs to the terminal claws. Coxopleura : The process of the coxopleura long to short but wide, conical, slender and cylindrical, densely punctate with its porose area extending on each side of the median ridge to the posterior edge; at the apex again with spines varying from 2-5 in number, generally 5 on each side with a lateral spine. Anal legs: The prefemur of the anal legs may be short or long, with 3 rows of 3 spines each ventrally, 2 rows of 4-6 spines each dorsally. The anal leg prefemur and femur in the males dorsally flat with a round ridge on the lateral margins, which is a character that merits for sexual dimorphism in the species *Scolopendra morsitans*. However, the ridge is smooth in females and juveniles. Note : 1. Only in few species like *S. morsitans* and *Cormocephalus dentipes* etc., the centipedes have sexually dimorphic individuals, otherwise in all the species

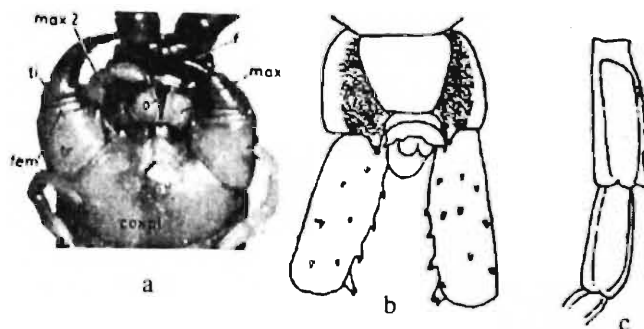


Fig. 1 : *Scolopendra morsitans* a. Head ventral view; b. Endsternite with coxopleurae and anal leg prefemur; c. Anal leg prefemur with lateral margins

of centipedes the sexes are alike. The species *S. morsitans* has much morphological characters in common with its sibling the *Scolopendra amazonica*, from which however, it differs in not having tarsal spur on 20th pair of legs. Both the species occur sympatrically without hybridization.

Distribution : India : Assam, Arunachal Pradesh, Andhra Pradesh, A & N Isl., Bihar, Bengal, Delhi, Gujarat, Himachal Pradesh, Haryana, Jammu and Kashmir, Karnataka, Kerala, Maharashtra, Madhya Pradesh, Meghalaya, Manipur, Mizoram, Nagaland, Orissa, Punjab, Rajasthan, Tamilnadu, Tripura, Sikkim, Uttar Pradesh and Uttarakhand.

Zoogeographical Distribution : In all tropical and temperate zones of the world.

2. *Scolopendra subspinipes dehaani* Brandt, 1840 Orange Legged centipede

1840. *Scolopendra subspinipes dehaani*, Brandt, *Bull. Ac. St.*, Petersburg, 5 : 152.

1930. *Scolopendra subspinipes dehaani*, Attems, *Das Tierr.*, *Scolopendromorpha*, 54(2) : 51.

Type Locality : Not known.

Repository of the Types : British Museum (Natural History)

Material Examined : No sample available.

Description : (Figs. 2 a-e) Length : 119mm (Largest form of the subspinipes group). Antennae : 18-19 segmented with its 6 basal segments glabrous and rest pilose. Cephalic plate : smooth, punctate and more or less roundish. Tergites : 1,2 and 21 without longitudinal sutures; 3-5 and 20 with a pair of incomplete and 6-19 with complete

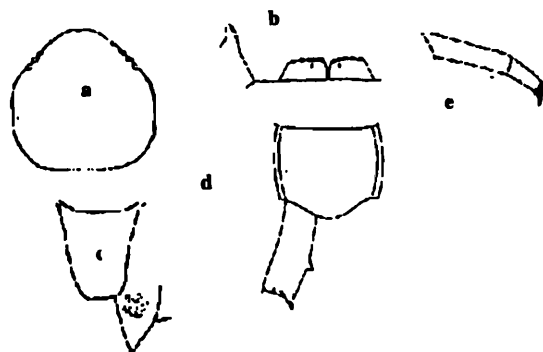


Fig. 2 : *Scolopendra subspinipes dehaani*: a. Cephalic plate; b. dental plate; c. endsternite with coxopleura; d. endtergite; e. analleg T1 & T2

paramedian longitudinal sutures; lateral emargination beginning rather feebly and indistinctly on 7th segment. Sternites : 2-20 with a pair of paramedian longitudinal furrows, not reaching posteriorly on 19 and 20 segment; 21st markedly elongate, gradually narrowing caudad, slightly incurved laterally at about one third of its long stretch from anterior and having rounded posterior corners and straight posterior border. Maxillipedes : coxosternal plate without sutures; dental plate broader than long, each bearing a post dental spur and 4-5 teeth, the outer 2 being distinctly spaced and rest partly united; median prefemoral process thumb-like and toothed. Coxopleura: pores minute and dense, porose area extending dorsally almost right upto border; Coxopleural process conical, moderately long and tipped with 2 spines; posterior spine absent. Legs: all legs with 2 claw spurs; 1-20 with 1 tarsal spur and 21 without it; anal leg prefemur bearing a lone dorso-medial spine, and 2 on the tip of postero-medial process; 1st tarsus nearly 2-1/3 times longer than IInd.

Distribution : India : Assam, A & N Isl., Kerala, Karnataka, Maharashtra, Madhya Pradesh, Tamil Nadu, Uttar Pradesh, Uttarakhand and West Bengal.

Elsewhere : Sumatra, Java, Malaysia, Myanmar, Thailand, China (Indo-Malayan Indo-Chinese).

Remarks : Check-listed in the Indian Centipedes by Khanna 2001 from Uttarakhand, presently no material studied.

3. *Scolopendra amazonica* (Bucherl), 1946

1946. *Scolopendra morsitans amazonica*, Bucherl, *Mem. Inst. Butantan*, 19 : 135-137.

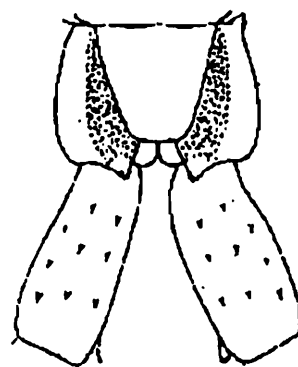


Fig. 3a

1985. *Scolopendra amazonica*, Khanna & Tripathi, *Bull. zool. Surv. India*, 7(2-3) : 267-270.

Type Locality : Amazona (Brazil)

It is a medium sized and most dominant species of Scolopendridae, occurring often sympatrically with its sibling the *Scolopendra morsitans*.

Material Examined : No material available in the present lot.

Description : (Figs. 3a-b) : The species is different from *Scolopendra morsitans* Linnaeus in not having the tarsal spur on 20th pair of walking legs, which is present in *morsitans*. Body length : 15-65 mm including antennae and anal legs. Colour : The species occurs in various colour forms. Cephalic plate, maxillipedes and 1st segment of the tergites varies from brownish yellow to dark orange, sometimes dark olive-green to black. Antennae yellow to tan brown. Antennae : Long, 19 segmented, not more than six basal segments glabrous. Antennae when reflexed reaching behind up to 6th tergal segments. Head : Cephalic plate smooth, sparsely punctate and without any sulcus. Coxosternum : Base of the coxosternum smooth, without furrows, however, a very weak median sulcus extending posteriorly from the base of the dental plate is visible; dental plate mostly with 4+4 teeth; post dental spur present. Tergites : Smooth, 2-20 tergal segments with a pair of complete paramedian longitudinal furrows; emargination of tergites begins normally from 17th segments. Endtergite wider than longer with convexed posterior margin and presence of a complete median furrow. Sternites : Smooth; paramedian longitudinal furrows complete on 2-20 segments; endsternite gradually narrowing behind with its lateral margins convexed a little in some cases, normally straight; median sulcus on endsternite

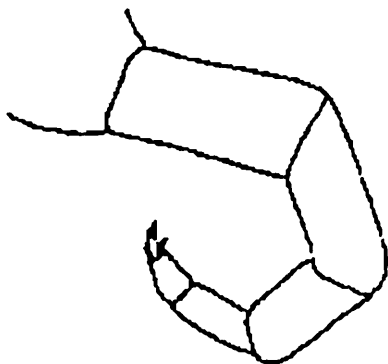


Fig. 3b

absent. Legs : 1-19 pair of walking legs with 1 spur to its first tarsal segment. Tarsal spur absent on 20th pair of legs; 1-20 pair of walking legs with 2 spurs to the terminal claws. Coxopleura : The process of the coxopleura long to short but wide, conical, slender and cylindrical, densely punctate with its porose area extending on each side of the median ridge to the posterior edge; at the apex again with spines varying from 2-5 in number, generally 5 on each side with a lateral spine. Anal legs : The prefemur of the anal legs may be short or long, with 3 rows of 3 spines each ventrally, 2 rows of 4-6 spines each dorsally.

Note : The species *S. morsitans* has much morphological characters in common with its sibling the *Scolopendra amazonica*, from which it, however, differs in not having tarsal spur on 20th pair of legs. Both the species occur sympatrically without hybridization.

Distribution : India : A & N Isl., Delhi, Goa, Gujarat, Kerala, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, and Tamilnadu. Uttar Pradesh and Uttarakhand.

Elsewhere : Brazil, Sudan, South Africa, Nepal, China, North and South America, Australia.

Remarks : Not available in the present lot. The species has a known distribution in Uttarakhand.

Genus *Cormocephalus* Newport, 1844

1844. *Cormocephalus*, Newport, *Trans. Linn. Soc.*, London, 19 : 275.

1903. *Cormocephalus* + *Cupipes* + *Psiloscolopendra* + *Hemicormocephalus* + *Hemiscolopendra* + *Colobopleurus*, Kraepelin, *Mitt. Mus.*, Hamburg, 20 : 174-217.

Type Species : *Cormocephalus rubriceps* (Newport).

Type Locality : New Zealand.

Distribution : Southern Europe, Spain, Greece (Palearctic); India, Bangladesh, Sri Lanka, Philippines (Oriental), Africa, Madagascar, Tasmania (Ethiopian); New Guinea, Australia (Australian Region); Central America, South America, West Indies (Neotropical) and Caroline Isls., Solomon Isls., Loyalty Isls., Lord Homes Islands, Galapagos Islands (All Tropical and Subtropical lands).

4. *Cormocephalus dentipes* Pocock, 1891

1891. *Cormocephalus dentipes*, Pocock, 1891, *Ann. Nat. Hist.*, Ser.6, 7 : 66.

1984. *Cormocephalus pseudonudipes*, Jangi and Dass, *J. Scient. Indl. Res.*, 43(2) : 37.

Type Locality : Bengal.

Repository of the Types : British Museum (Natural History), London.

Material Examined : Dehra Dun : Motichur, 10.ii.1964, 4exs., T.D. Soota; Mohund, 17.ii.1964, 3exs., T.D. Soota; Kansaro, 9.i.1987, 1ex., R. Tilak; Haridwar, 13.ii.1964, 2exs., T.D. Soota; Barkot Forest Block, 6.ii.1964, Pratap. Singh; Song River, 9.ii.1964, 1ex., T.D. Soota; Nainital, Sheeham Bagh, Haldwani, 6.i.1989, 9exs, G.S. Arora; Nainital, Kaladungi Road, 7.i.1989, 2exs, G.S. Arora; Pauri, Chilla forest, 5.vi.1987, 11exs, R.N. Chopra; Uttarkashi, Halaragad, 12.x.1993, Vinod Khanna; Osla, 11.x.1993, 2exs., Vinod Khanna.

Remarks : Jangi and Dass (1975) proposed a new form of sexual dimorphism in the species and subsequently (1980b) revised and redescribed *Cormocephalus dentipes* from the holotype. Khanna (1987) after studying a vast material of the species from Uttar Pradesh Terai, Western Himalaya and Uttar Pradesh Plains did not agree to the theory of the so-called sexual dimorphism. The vast material from Western Himalaya, U.P., Uttar Pradesh, Uttar Pradesh Terai, Uttarakhand and Himachal Pradesh, studied by the present author, reveals that the samples identified by the males (i.e. with tubercles on anal leg prefemur), as per Jangi and Dass (l.c.), did not have the emargination of tergites beginning from 13th segment or the samples that had emargination beginning on 13th segment did not have tubercles

on anal leg prefemur, except in few samples. Similarly the females supposed to be having tergal emargination beginning from 16th segments (vice Jangi and Dass, l.c.) had tubercles on anal leg prefemur, positively showing morphologically a masculine character. The juveniles, as agreed by themselves (J. & D.) do not exhibit sexually dimorphic characters.

The author has, therefore, considered it necessary to amend the description of the species incorporating the variations noticed. The occurrence of the tubercles, though of taxonomic value, could possibly be taken as an acquired character during breeding season. The emargination of the tergite should be taken as range between 13 and 16th segment. *Cormocephalus pseudonudipes* Jangi and Dass, 1984 described from Nasik, Maharashtra, should certainly fall within the above controversy and, therefore, Khanna (1987) treated it as junior synonym of *Cormocephalus dentipes*. Further substantiating to the contention the author apprehends that "the width of the endtergite broader than long, in *C. pseudonudipes*, does not hold good as a stable character for delineation of the species since like *Scolopendra morsitans*, the species *Cormocephalus dentipes*, is also very much morphologically a variable species, occurring in various colour forms, and having overlapping characters with closely allied species. As such the characters like, length and width ratio of endtergite or the involvement of the number of emarginate tergal segments, are done away with and the species *Cormocephalus pseudonudipes* is treated as junior synonym of *Cormocephalus dentipes*. Lewis (1992) further supports the authors contention by stating that his Nepalese specimens of *C. pygmaeus** also runs down to the description of *C. pseudonudipes* Jangi and Dass (1984). *While Lewis (in a personal communication dated 22nd August 2001) informs me that the specimens from Nepal identified and

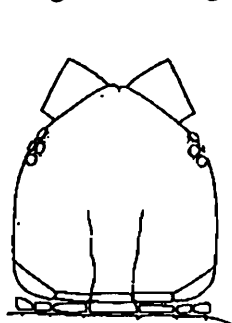


Fig. 4a

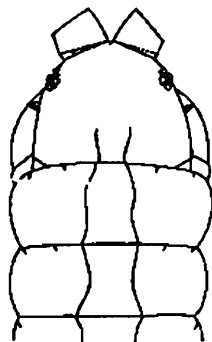


Fig. 4-6

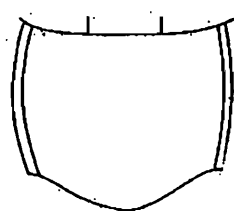


Fig. 4c

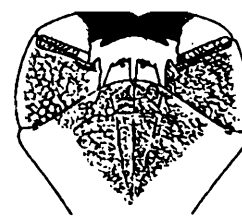
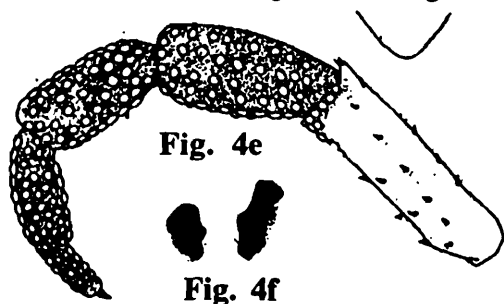


Fig. 4d

described as *C. pygmaeus* were in fact *C. dentipes*.

Description : (Figs. 4 a-f) Length : Average body length ranges from 41-58 mm. Colour : Dark purplish black to olive green or bluish-black. Ahmed (1980) reported reddish green colour variety from A & N islands. Antennae : 16 segmented with 6 to 7 segments glabrous. Cephalic Plate : Punctate with two anteriorly divergent longitudinal furrows confined to posterior half; a pair of basal plates; a pair of paramedian sclerite and a median sclerite constituting hind margin, followed by a transverse row of seven sclerites in between cephalic plate and first tergite. Tergites : Punctate; 1-20 with a pair of complete paramedian longitudinal furrows; first two with additional two pairs of short sutures at the anterior margins, succeeding tergites with a pair of antero-laterally situated short, oblique sutures; no suture on 21st; lateral tergal emargination beginning on 13th segment; 21st tergite with convex margins. Sternites : Punctate, with two complete paramedian longitudinal furrows on 2-20; 21st markedly tapering and with almost straight margins, rounded posterior corners and a posterior median depression. Maxillipedes : Dental plates broader than long with 4+4 teeth, the 3 inner on each side partly united and a socket of post-dental spur; each trochanter with two tridentate projections- a smaller dorso-medial and a large ventro-medial; ventral surface markedly rough in texture; the coxal plate bearing, in addition, three rather evanescent posteriorly converging groove- a median and two lateral- and ramifying sutures comprising essentially a part of short lateral oblique ones, and a longitudinal median one forming an inverted-T with a more posterior transverse suture. Coxopleura : Porose; each with a posterior spine and a moderately long coxopleural process tipped with two spines, the dorsal being larger and curved upwards. Anal legs : 1-21 with two claw spurs but without tarsal spur; anal legs showing



tuberculations on prefemur ventrally and medially near distal end, on femur ventrally, medially and dorso-medially near distal end, on tibia ventrally, medially, dorso-medially, and with slight indication of it laterally, and on both tarsal segments all around except near distal end of the IInd tarsus; prefemoral spinulation of the anal legs represented by 3 medial spines dorsally, four rows of 5,3,3 and 4 on right, and 5,3,3,3 on left leg ventrally besides an additional small spine very close to the foremost one in second row on each leg and two spines tipped on prefemoral process.

Distribution : India : A & N Isls., Bihar, Delhi, Himachal Pradesh, Meghalaya, Mizoram, Madhya Pradesh, Orissa, West Bengal, Uttar Pradesh and Uttarakhand. (Indian : Endemic).

5. *Cormocephalus pygmaeus* Pocock, 1892

1892. *Cormocephalus pygmaeus*, Pocock, J. *Bombay nat. Hist. Soc.*, 7(2) : 140.

1930. *Cormocephalus (Cormocephalus) pygmaeus*, Attems, *Das Tier., Scolopendromorpha*, 54(2) : 97

1976. *Cormocephalus (s.str.) pygmaeus*, Vazirani & Khanna, *Newsl. zool. Surv. India*, 2(1) : 25-26

1987. *Cormocephalus pygmaeus*, Khanna, D. Phil Thesis, Univ. of Garhwal, pp. 1-243.

Type Locality : India : Madras (Tamilnadu)

Repository of the Types : British Museum (Natural History).

While Jangi and Dass (1981) established that the porose area of the coxopleuron does not reach the hind margins, Vazirani and Khanna (1976) have added some characters of taxonomic importance not described earlier by Attems (1930). Combining the additional characters the species has been re-described here.

Material Examined : Dehra Dun : Sahastradhara Forest Block, 30.vii.1964, 11ex., R.K. Bhatnagar.

Description : (Figs. 5 a-d) Body length : 22-31mm, including anal legs. Colour : Antennae, tergites and anal legs greenish blue; coxosternum, and coxopleura light yellow to green; head ochereous yellow. Antennae: small, 17 segmented with 6-6-1/2 basal segments glabrous; when reflexed reaching back to upto the end of the 2nd or the middle of the 3rd tergal segment. Cephalic

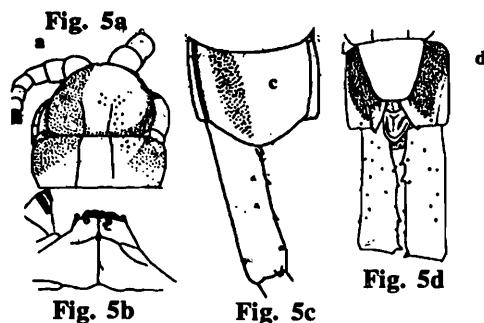


plate : Head shield small (as in *dentipes*) with two longitudinal furrows, in continuation to the two paramedian longitudinal furrows on the their tergites, restricted to posterior one third and slightly divergent anteriorly. Coxosternum: Base of the coxosternum finely punctate with 4+4 teeth, the three on inner side slightly coalesced; prefemoral process of the maxillipedes unidentate. Tergites : Finely punctate segments of the tergites, with a complete paramedian furrows on segment 1-20; endtergite always with a complete median furrow; emargination of tergites beginning rather feebly on 17th segment clearly visible on 18-21st. Sternites : Smooth, punctate; 2-20 segments with a pair of complete paramedian longitudinal furrows; endtergite tapering posteriorly with its posterior margin rounded. Coxopleura : The process of the coxopleura short, hardly a fifth of its length extending behind endsternite; at the apex with 2 curved spines and one sub-apical spine. Walking legs : All legs without tarsal spur; 1-20 pair of walking legs with 2 spurs to the terminal claws. Short and very sparse pubescence seen on two tarsal segments of the posterior legs as in *C. pilosus* Jangi, in which only anal segments are pilose. Anal legs : Moderately long; prefemur ventro-laterally with 3 and 4 and dorsally with 3 thorns in each row; prefemoral process 'Eckdorn' with 2 spines at the apex

Distribution : India : Assam, A & N Isl., Bihar, Maharashtra, Rajasthan, Tamilnadu, Uttar Pradesh, Uttarakhand and West Bengal.

Elsewhere : Myanmar, Nepal*.

*Lewis in a personal communication dated 22nd August 2001 informs me that the specimens from Nepal identified and described, as *C. pygmaeus* were *C. dentipes*, a mistake which he proposes to amend later.

Tribe ASANADINI

1907. Asanadidae, Verhoeff, *Bronn. K.L. Ordng.*, 5ii : 263.

1914. Asanadini, Attems, *Arch. Naturgesch.*, 8A 4 : 102.

1930. Asanadini, Attems, *Das Tier., Scolopendromorpha*, 54(2) : 121.

Genus *Asanada* Meinert, 1886

1886. *Asanada*, Meinert, *P. Amer. Phil. Soc.*, 23 :

1891. *Pseudocryptops*, Pocock, *Ann. Nat. Hist.*, ser.6, 7 : 225

Type Species : *Asanada brevicornis* Meinert

Distribution : India, Myanmar, New Guinea, Philippines, Sokotra, Palestine, Sudan, French Guinea, South Africa. (Palaerctic, Ethiopian, Oriental and Indo-Malayan, extending to Australia).

6. *Asanada indica* Jangi and Dass, 1984

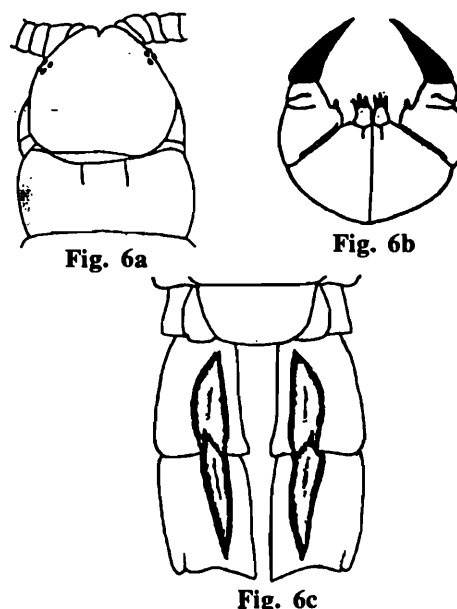
1984. *Asanada indica*, Jangi and Dass, *J. Scient. Indl. Res.*, 43(2) : 38-39.

Type Locality : India : Urlikanchan, Pune (Maharashtra).

Repository of the Types : NZC, Zoological Survey of India.

Material Examined : Dehra Dun : Motichur Sal Forest, 21.iii.1986, 1ex., Vinod Khanna.

Description : (Figs. 6a-c) : Length : 22mm approx., including antennae and anal legs. Colour : Brick red with two black streaks running all along the tergum. Antennae : short, tapering, composed



of 17 segments with 6 segments more or less glabrous, rest densely pilose; when reflexed hardly reaching the 2nd tergal segment. Cephalic Plate : anteriorly with a short median groove. Tergites : with 2 paramedian sutures complete on 6-20, broken on 4 and 5, and confined anteriorly on 1-3; 21st without suture, nearly 2-1/2 times broader than long and with an angular posterior margin.

Sternites : complete paramedian sutures on 2-20; 21st without sutures, nearly twice as broad as long, posteriorly narrowing slightly, arched and with a slight median notch at posterior margin. **Maxillipedes** : base of the coxosternum with a complete median groove running all along its length to 1st sternal segment; dental plate longer than wide with 3 conical and pointed teeth, the middle on each side is longer; pre-hensorial coxal tooth single. **Coxopleura**: without pores, process and spines. **Legs** : 1-20 with 2 claw spurs; anal legs short and thick, with dorsal median groove present on femur only on the distal half; anal leg prefemur ventrally also with a deep median longitudinal groove confluent with such groove on the femur; prefemur, femur and tibia respectively with 1st tarsus nearly 1-1/4 times longer than 2nd which in turn is as much longer than claws; ventrally serrate claw bearing about a score of teeth and without claw spurs.

Distribution : Delhi, Haryana, Himachal Pradesh, Kerala, Maharashtra, Rajasthan, Uttar Pradesh and Uttarakhand.

Zoogeographical Distribution : Indian.

Remarks : Fairly common in Uttarakhand, U.P. and U.P Terai.

Subfamily OTOSTIGMINAE

1903. *Otostigminae*, Kraepelin, *Mitt. Mus.*, Hamburg, 20 : 29, 64.

1930. *Otostigminae*, Attems, *Das Tier., Scolopendromorpha*, 54(2) : 127.

Genus *Otostigmus* Porath, 1876

1876. *Otostigmus*, Porath, *Bih. Svenska Ak.*, 4(7) : 18.

1877. *Branchiotrema*, Kohlrausch, *Beitr. Scolopendr.*, p. 22.

1886. *Otostigmus*, Haase, *Abh. Mus.*, Dresden, 5 : 69.

Type Species : *Otostigmus orientalis* Porath

Type Locality : India (Bombay) (Attems, 1930).

Distribution : In all tropical and subtropical lands.

7. *Otostigmus morsitans* Pocock, 1890

1890. *Otostigmus morsitans*, Pocock, *Ann. nat. Hist.*, ser. 6, 5 : 246.

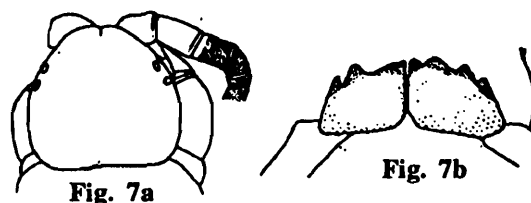
1930. *Otostigmus (O.) morsitans*, Attems, *Das Tierr., Scolopendromorpha*, 54(2) : 141.

Type Locality : Madras (Tamil Nadu)

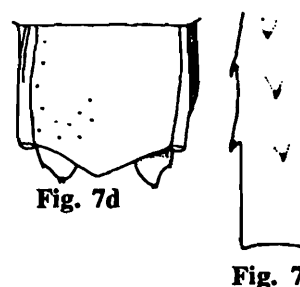
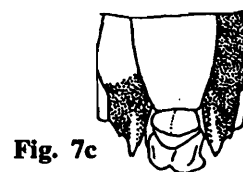
Repository of the Types : British Museum (Natural History) (Reg. No. 1890.1.23.23-25)

Material Examined : Pithoragarh : Sabala and around (Alt. 5700 ft. ASL), 26.iv.1998, 1ex., A.K. Joshi and Parmod Kumar.

Description : (Figs. 7a-e) : Length : 62mm. Colour : Olive green to ochreous yellow. Cephalic Plate : Somewhat punctate. Antennae. 17 segmented with 2-1/3 basal segments glabrous,



rest pilose. **Maxillipedes** : with 4 +4 rather indistinct dental plate. **Tergites** : Complete paramedian longitudinal furrows beginning from 6th segment; emargination of the segments beginning from 8th tergite; wrinkled from 5th segment, distinctly with thorn like striate in the posterior segments; without carinal streaks. **Sternites** : With 2 complete paramedian longitudinal furrows approximating each other in the middle and



posteriorly with a median groove; endsternite reduced, posteriorly slightly rounded. Coxopleura : Process of the coxopleura small with 2 spines at the apex, 1 lateral spine and without dorsal spine. Legs : 1-20th pair of walking legs with 2 tarsal spurs. Anal leg prefemur ventro-laterally with 2, ventro-medially with 3, dorso-medially without thorns; Eckdorn absent.

Remarks : According to Lewis (1996) "Kraepelin (1903) too re-examined Pocock's material and concluded that *O. morsitans* resembled a spined *O. orientalis* Porath. Apart from these spines they are virtually identical. A number of species of *Otostigmus* show spined and unspined individuals so there seems no justification for retaining *O. morsitans*. It too is a junior synonym of *O. orientalis*, a species in which some individuals have posterior tergites with spines".

Distribution : India : Himachal Pradesh, Tamilnadu, Uttarakhand and Uttar Pradesh.

Elsewhere : Myanmar and Sri Lanka (Indian).

Remarks : First record from Uttarakhand.

8. *Otostigmus poonamae* Khanna and Tripathi, 1986

1986. *Otostigmus poonamae*, Khanna and Tripathi, *Annals of Entomol.*, 4(1) : 35-39.

1995. *Otostigmus poonamae*, Khanna, *Zool. Surv. India, Himalayan Ecosyst. Ser, Fauna of Western Himalaya I, Uttar Pradesh*, 111-113.

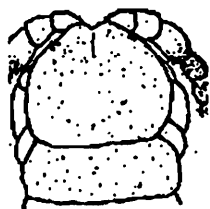


Fig. 8a

1997. *Otostigmus poonamae*, Khanna, *Zool. Surv. India, Fauna Cons. Area 9 : Fauna of Nanda Devi BR*, 105-106.

2004. *Otostigmus poonamae*, Khanna, *Fauna of Conservation Area Series : Fauna of Gobind Pashu Vihar, Uttarakhand, Zool. Surv. India*, pp. 29-31.

2005. *Otostigmus poonamae*, Khanna, *Fauna of Western Himalaya II.H.P., Zool. Surv. India*, pp. 221-229.

Type Locality : India : Durgathi, Dist. Chamba, Himachal Pradesh.

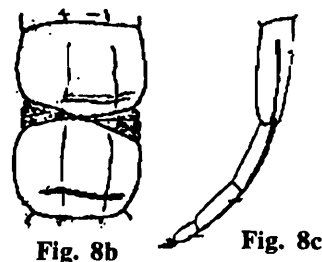


Fig. 8b

Fig. 8c

Repository of the Types : NZC, Zoological Survey of India.

Material Examined : Pauri : Naogaon Khol Dam, Deval Road, 24.iv.1985, 2exs., Arun Kumar; Dehra Dun, Chakrata, Kalsi-Sahiya Road, 4.viii.1988, 1ex., Arun Kumar; Chamoli, Reni Village (Alt. 6000-7000ft ASL), NDBR, 5.ix.1989, 1ex., P.C. Tak; Uttarkashi, Osla, 11.x.1993, 3exs., Arun Kumar.

Description : (Figs. 8 a-e) : Length : 43mm, excluding antennae and anal legs. Colour : All tergites, head and antennae dark olive green to blackish green; sternites and legs yellowish green (in specimen preserved in 70% alcohol). Cephalic Plate : Head and first tergite sparsely punctate almost equal in length and width; without furrows and basal plates. Antennae : 18-19 segmented with 2-1/2 to 2-1/3 basal segments glabrous; reflexed antennae reaching back to the end of the 4th or beginning of the 5th tergal segment. Tergites : 3-20 segments with complete paramedian longitudinal furrows; 20th and 21st with a median sulcus; 15 or 17th to 21st with lateral emargination. Sternites : Smooth; segment 2-20 with a pair of complete paramedian longitudinal furrows; segment 6-20 with transverse furrows at the distal end. Maxillipedes : Dental plate of the coxosternum with 4+4 teeth, all separate; no basal

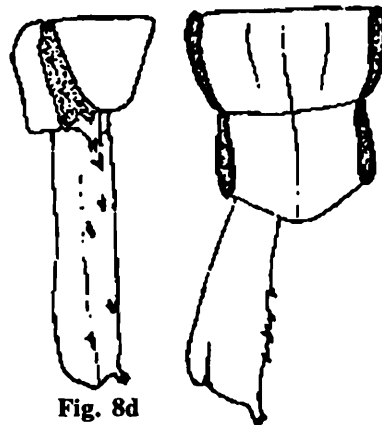


Fig. 8d

Fig. 8e

furrow; no post dental spur; prefemoral process with one tooth on each side. Coxopleura : Densely punctate, strong, slender process of the coxopleura extending a third of its length behind endsternite, at the apex with 3 spines on each side; without dorsal or lateral spines; porose area of Coxopleural process very slightly extending beyond the proximity of endsternite. Walking legs : 1-20th pair of walking legs with 1 spur to first tarsal segment; 1st tarsal segment of all legs almost double the length of the 2nd. Anal Legs : Prefemur of the anal legs slightly more than thrice as long as wide, dorso-laterally with 2, dorso-medially with 3, medially with 2 and ventrally with 3 thorns.

Distribution : Himachal Pradesh and Uttarakhand.

9. *Otostigma ruficeps* Pocock, 1890

1890. *Otostigma ruficeps*, Pocock, *Ann. nat. Hist.*, ser. 6, 5 : 247.

1930. *Otostigma (Otostigma) ruficeps*, Attems, *Das Tier., Scolopendromorpha*, 54(2) 141-142.

1985. *Otostigma ruficeps*, Khanna and Tripathi, *Bull. zool. Surv. India. India*, 7(2-3) : 269 (U.P. Terai).

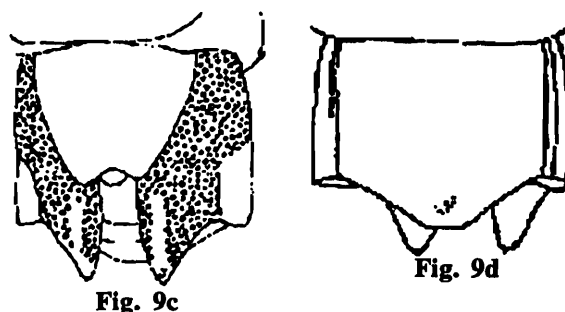
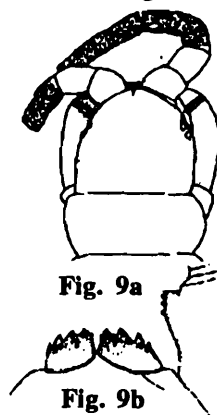
1994. *Otostigma ruficeps*, Khanna, *Rec. zool. Surv. India*, 94(2-4) : 467 (NE States).

Type Locality : India : Madras (Tamil Nadu).

Repository of the Types : British Museum (Natural History), London (Reg. No. 890.1.23.22).

Material Examined : Dehra Dun, Taluki (WDS), 15.vi.2001, N.K. Sinha.

Description : (Figs. 9 a-d) : Length : 41mm. Colour : Grass green. Head and 1st tergite chestnut brown. Antennae : 21 segmented with 2 basal



segments glabrous. Tergites : 2 complete paramedian longitudinal furrows starting from 7th segment; emargination of tergites beginning from 10th segment. Endtergite reduced, posteriorly remarkably rounded. Sternites: without furrows. Maxillipedes : Dental plate of the maxillipedes with 4 teeth on each side. Coxopleura : Process of the coxopleura small with 1-2 spines at the apex, without lateral or dorsal thorns. Legs : Femur of the 1st pair of walking legs and tibia of 1-7 pair ventrally at the distal end with a spur.

Remarks : Lewis (1996) after examining the types of *O. ruficeps* relegated it as a junior synonym of *O. multidens*, which has its distribution known from Vietnam, Java, Sumatra, Krakatau, Borneo, Sulawesi and New Guinea and India.

Distribution : India : Meghalaya, Tamilnadu and Uttarakhand.

Remarks : First Record from Uttarakhand.

Zoogeographical Distribution : Indian.

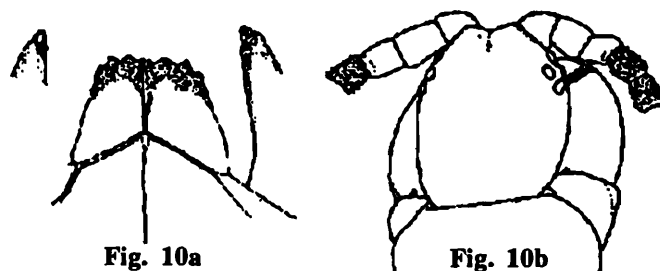
10. *Otostigma nudus* Pocock, 1890

1890. *Otostigma nudum*, Pocock, *Ann. nat. Hist.*, ser. 6, 5 : 247.

1930. *Otostigma nudus*, Attems, *Das Tier., Scolopendromorpha*, 54(2) : 149.

Type Locality : India : Madras (Tamil Nadu)

Repository of the Types : British Museum (Natural History), London (Reg. No. 90.1.23.21).



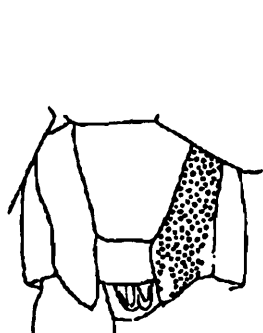


Fig. 10c



Fig. 10d



Fig. 10e

Material Examined : Haridwar : Dholkhand, 12.ii.1964, 4ex., T.D. Soota; Mohund, 16.ii.1964, 22exs., T.D. Soota.

Description : (Figs.10a-e) Length : 52mm. Colour : Ocherous yellow to brownish black in general colour; cephalic plate brownish red. Antennae : 17-18 segmented with 3 basal segments glabrous. Tergites : Paramedian longitudinal sulci indistinct in the middle of the third, clear and complete from the beginning of the fourth segment; tergites wrinkled on the lateral sides posteriorly; endtergite considerably long; tapering and posteriorly rounded; 19th tergite also with a median groove; emargination of tergites begins from 7th or 8th segment. Sternites : 2-20 segments with a pair of complete paramedian longitudinal furrows and also with a median furrow; endsternite reduced posteriorly round. Coxosternum : Dental plate of the coxosternum with 4+4 teeth, longer than wide; base of the Maxillipedes with a median furrow restricted to the anterior one-third only. Coxopleura : The process of the coxopleura very short, at the apex with 2 curved spines; no spine on dorsal or lateral margins. Legs : All legs without spurs to the tarsal segments. Anal leg prefemur ventro-laterally with 3, laterally with 3 and medially with 2 thorns; prefemoral process with 2 spines present.

Remarks : The species *O. nudus* is similar to *O. taeniatus* Pocock, 1896, *O. cuniventris* Porath, 1893 and *O. lawrencei* Dobroruka, 1968 but has an individual entity and hence retained as a valid species.

Distribution : Himachal Pradesh, Meghalaya, Tamilnadu, Uttarakhand and Uttar Pradesh. (Indian).

11. *Otostigmus ceylonicus* Haase, 1887

1887. *Otostigma ceylonicum*, Haase, *Abh. Mus.*, Dresden, 5 : 69.

1930. *Otostigmus* (*O.*) *ceylonicus*, Attems, *Das Tierr.*, *Scolopendromorpha*, 54(2) : 153.

Type Locality : Paradeniya, Sri Lanka.

Repository of the Types : Not Known.

Material Examined : No material available in the present lot.

Description : Length : 40mm. Colour : Olive green; legs yellowish. Cephalic Plate : Punctate. Antennae : 17 segmented with 3 shining basal segments and glabrous dorsally, ventrally plumose. Tergites : Paramedian longitudinal furrows present from 6th or 7th segment; emargination of tergites begins from 9th or 10th segment. Sternites : without paramedian longitudinal furrows but with two median grooves and two flat marginal lateral grooves; endsternite tapering posteriorly and sinuate. Maxillipedes : Dental plate with 3-5 teeth on each side. Coxopleura : Process of the coxopleura small with two apical spines, without dorsal or lateral spines. Legs : 1-3, some times upto 8 pairs of walking legs with 2 tarsal spurs, 20th mostly with one tarsal spur.

Distribution : India : Himachal Pradesh, Meghalaya, Maharashtra, Uttarakhand and Uttar Pradesh.

Elsewhere : Sri Lanka, Myanmar (Oriental).

12. *Otostigmus politus politus* Karsch, 1881

1881. *Otostigma politum*, Karsch, *Berlin. ent. Z.*, 25 : 219.

1930. *Otostigmus* (*O.*) *politus politus*, Attems, *Das Tierr.*, *Scolopendromorpha*, 54(2) : 149.

Type Locality : Beijing (Peking) and Tianjin (Tientsin). China.

Material Examined : Uttarkashi, Satta FRH, 25.iii.1996, 7exs., A. Husian; Dhaula-Istragad

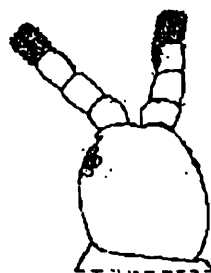


Fig. 12a

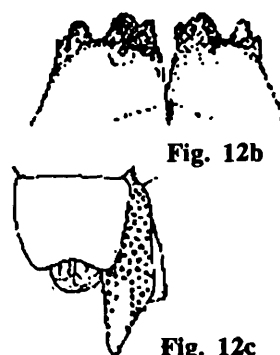


Fig. 12b

Fig. 12c

Trek, 27.iii.1996, 3exs., A. Husain; Netwar, nr. Confluence of River Rupin and Supin, 21.iii.1996, 3exs., A. Husain; Sankhri, 30.iii.1996, 5exs., A. Husain; Har-Ki-Doon- Jakhhol Road, 29.x.1996, 1ex., J.P. Sati.

Remarks : The species *Otostigmus politus* is represented by the nominate subspecies from China and India, *O. p. pigmentatus* Attems from Australia, *O. australianus* from Australia and *O. p. quadrispinosus* from India (Uttarakhand and Himachal Pradesh).

Description : (Figs. 12a-c) Length : 65mm. Colour : Blue-olive green. Cephalic plate : Finely punctate. Antennae : 17-18 segmented (sometimes 19), with 3 basal segments dorsally glabrous and shining. Maxillipedes : Dental plate of the maxillipedes small and broad, transversally cut at the end, with 4 + 4 or 5+5 teeth; prefemur with a hook. Tergites : Smooth; paramedian longitudinal furrows visible from 4th or 5th segment; emargination of tergites beginning from 11th segment. Sternites : 3-19 or 20 sternal segment with a pair of complete paramedian longitudinal furrows, mostly with median groove. Terminal segment reduced, posteriorly rounded. Coxopleura : Densely punctate process of the coxopleura small or long, with 2-3 spines at the apex, 1 or 2 thorns are often seen near the terminal spines, dorsally with without thorn, laterally with 0-1 thorn. Legs : 5-6 pair of walking legs with 2, followed by 1 spur to the first tarsal segment; anal leg prefemur ventro-laterally with 3-4, ventro-medially with 2-3, medially with 0-2, dorsally with 1-3 thorns; Eckdorn present.

Distribution : India : Assam, Delhi, Himachal Pradesh, Kerala, Maharashtra, Meghalaya, Orissa, Sikkim, Uttarakhand and West Bengal.

Elsewhere : China, Sumatra, Myanmar, New Guinea, Australia, (Indo-Chinese, Indo-Australian).

13. *Otostigmus politus quadrispinosus* ssp. nov.

1985. *Otostigmus politus quadrispinosus*, Khanna, D. Phil Thesis, Garhwal Univ., pp. 154-155.

Type Locality : India : Sitlakheth Road, Almora (Uttarakhand).

Repository of the Types : NZC, Zoological Survey of India.



Fig. 13a

Material Examined : Holotype : India : Uttarakhand : Almora, Sitla Khet Road, 14.ix.1978, 1ex. Arun Kumar and Party coll.



Fig. 13b

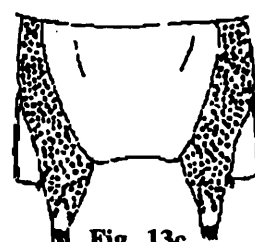


Fig. 13c

Paratypes : India : Nainital, Begul Dam and surrounding, 10.xii.1985, 1ex., J.C. Tripathi and party coll.; Tanakpur, 9.x.1977, 1ex., J.C. Tripathi Coll.; Almora, Kausani, 5.ix.1978, 1ex., Arun Kumar and Party coll.; Pithoragarh, x.1973 3exs., Arun Kumar and Party coll.; Pauri, Landsdowne-Jhariakhal Road, 21.iv.1989, 11exs., Arun Kumar; Tehri, Rani Chauri, Gaza Road, 3.v.1989, 1ex., Arun Kumar; Tehri, Dandichali, Rani Chaura, Gaza Road, 2.v.1989, 1ex., Arun Kumar; Dehra Dun : Chakrata Golf ground, 30.ix.1988, 7exs., R.N. Chopra; Chakrata, Sahiya and around, 4.viii.1988, 1ex., R.N. Chopra; Almora : Pine Forests, Kameri Devi, 13.i.1989, 7exs., G.S. Arora; Nainital, Kaladungi, 7.i.1989, 2exs., G.S. Arora.

Description : (Figs. 13a-e) : Length : 58mm, including antennae and anal legs. Colour : Head, antennae, tergites and all walking legs light olive green; sternites light yellow (preserved in 70% alcohol). Antennae : In holotype 18 (and in paratype 17) segmented with its 2-2-1/3 segments glabrous, when reflexed reaching posteriorly up to the beginning of the 4th tergite. Cephalic Plate : smooth, longer than wide, distinctly overlapped by

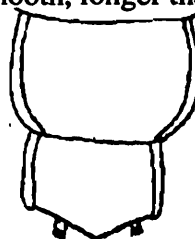


Fig. 13d

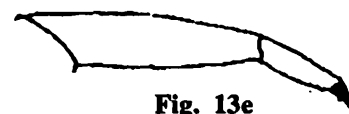


Fig. 13e

the first tergite, anteriorly rounded with a delicate median notch; without median furrow; with a pair of dark olive spots at the base. Coxosternum : Base of the dental plate of the coxosternum not furrowed; dental plate with 4+4 all separate teeth but the gap between the inner two is lesser than the outer two; prefemoral process of the Maxillipedes unidentate. Tergites: Smooth, 4-20 segments with a pair of fine and complete longitudinal paramedian furrows; emargination of tergites beginning from 8th segment (9th in paratypes from Almora and 10th in case of two samples from Pithoragarh); emargination very much pronounced on 20th and 21st segment; endtergite rectangular, broader than long with its posterior margin a little posteriorly directed, meeting at the at 110° angle. Sternites: Smooth; 3-19 sternal segments with a pair of complete paramedian longitudinal furrows; endsternite tapering posteriorly, broader than long with its posterior margins deeply incurved. Coxopleura : Densely punctate process of the coxopleura with 4 spines on each side at the apex; and one spine on the lateral margin; the coxopleural process extends slightly more than one-third the length of the endsternite; porose area well formed and extending upto apex; the size of the puncts being slightly less than the intervening gaps between them. Legs : All walking legs with 2 spurs to the claws; 1-5 (or 6) pair of walking legs with 2 spurs to the tarsal segment; 20th with one spur; Ist pair of legs also with a spur at the distal end of the tibia and femur. Anal Legs : Prefemur of the anal legs with single spine 'Eckdorn'; ventro-laterally 3, ventro-medially 2 and medially with 3 thorns in rows; distal end of the prefemur with a transverse groove ending in a spine; Ist tarsal segment of the anal legs almost 2 to 2-1/2 times longer than distal tarsus.

Remarks : The sp. nov. fits well within the characters of *Otostigmus politus* Karsch as described by Jangi (1930) but differs in having 18 segmented antennae (vs. 17 segmented), with 2-1/3 basal segments glabrous (vs. 3 in *O.p. pigmentus*); emargination of tergites beginning from 8th segment (vs. 11th in *O.p. politus*, 9th in *O.p. pigmentus* and 17-19 in *O.p. australianus*; Ist pair of legs always with the presence of a spine on the distal end of the femur and tibia. The ssp.nov possess a quadrispinose coxopleura (vs.

2-3 spines). *Otostigmus politus* is distributed through China, Sumatra, New Guinea, Australia and Myanmar and India).

Distribution : Uttarakhand. Khanna (2005) subsequently recorded the subspecies from Himachal Pradesh.

14. *Otostigmus amballae* Chamberlin, 1913

1913. *Otostigmus amballae*, Chamberlin, *Ent. News.*, Philad., 24 : 74.

1930. *Otostigmus (Otostigmus) amballae*, Attems, *Das Tierr.*, *Scolopendromorpha*, 54(2) : 153-154.

1987. *Otostigmus amballae*, Khanna, D. Phil Thesis, Garhwal Univ., pp. 1-243.

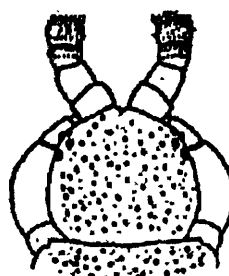


Fig. 14a

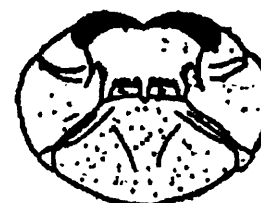


Fig. 14b

Type Locality : India : Ambala (Haryana).

Repository of the Types : Museum of Comparative Zoology, Cambridge.



Fig. 14c

Material Examined : Nainital : Bhimtal, 26.xii.1989, 1ex., S.C. Verma; Bhowali Road, 25.xii.1989, 8exs., S.C. Verma; Pithoragarh : Champawat, 6.ii.1989, 1ex., S.C. Verma (CR No. 3/5634); Champawat, 7.12.1989, 2exs., S.C. Verma; Jaulzibi Forest, Askot Road, 17.xii.1989, 1ex, S.C. Verma; Chamoli : Deoria Tal, 1.vi.1989 1ex., N.K. Sinha; Pauri, Deoprayag, 18.ix.2002, 4exs., Vinod Khanna; Lansdowne, Nr. Jehrikhal, 24.ix.2002, 7exs., Vinod Khanna; Pithoragarh, Suggad, 6 kms from Sobala towards Tawaghat (Alt. 7000ft ASL), 29.iv.1998, 1ex, A.K. Joshi and

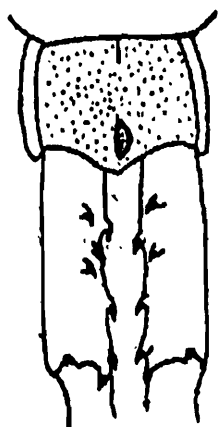


Fig. 14d

Parmod Kumar; Thal Kedar, ca. 30 kms from Chandag (Alt. 8500 ft ASL), 22.iv.1998, 1ex., A.K. Joshi and Parmod Kumar; Tejani (6500ft), 27.iv.1998, 3exs. A.K. Joshi and Parmod Kumar.

Description : (Figs. 14 a-d) Length : 38mm. Colour : Antennae, head and 1st tergite dark olive green; rest of the tergal segments including anal legs light olive green; coxosternum anterior 2-3 segments of sternites olive to yellowish green; rest of the sternal segments and legs yellowish green. Antennae : 17-19 segmented with 2-1/4 to 2-2/3 basal segments glabrous. Apical eighth segments dark olive green and basal light yellowish green with a clear demarcation of the colour. Reflexed antennae reaching back to the middle of 5th tergal segments. Cephalic Plate : sparsely punctate, bearing anteriorly a short median groove; head shield dome shaped, almost equal in length and width or very slightly broader than long, distinctly overlapped by the 1st tergite. Tergites : Sparsely punctate, non-granulate with complete paramedian longitudinal furrows beginning from the second or the middle of the third to 19 or 20 the segment; emargination beginning from 6th segment; endtergite shield shaped, broader than long with its posterior margins curving in on their sides meeting posteriorly in a round bulge; endtergite also with a median depression at the posterior end and a very small median furrow also. Sternites : Sternites sparsely punctate anteriorly and granulate in posterior body segments; 2-19 segments with a pair of complete paramedian longitudinal furrows; in addition an intermittently broken median sulcus on sternite 3-19 is also visible; endsternite also sparsely punctate, without furrows, tapering posteriorly with its posterior margin incurved; slightly longer than wide. Coxosternum: Base of

the maxillipedes finely punctate without any suture; dental plate broader than long with 4+4 teeth, all separate; post dental spur present; mesal prefemoral process of the coxosternum tridentate. Coxopleura : Densely punctate process of the coxopleura almost a third of its length extending behind the endsternite, tipped with 4+4 spines along with a spine on its lateral margins. The size of the puncts are predominant. Legs : 1-2, 1-3, 1-4, 1-5, 1-6, 1-7 or 1-8 pair of walking legs with two spurs to the tarsal segment; 21st pair of legs without such spurs; all legs with two spurs to the claws. Anal legs: Prefemur of the anal legs nearly 4 times longer than wide with 4-2-2-3 thorns arranged in 4 rows; prefemoral process present.

Distribution : Haryana, Himachal Pradesh, Uttar Pradesh and Uttarakhand.

Elsewhere : Nepal.

15. *Otostigmus burn-murdochi* Gravely, 1912

1912. *Otostigmus burn-murdochi*, Gravely, *Rec. Indian Mus.*, 7(1) : 69-73.

2005. *Otostigmus burn-murdochi*, Khanna, *Fauna of Western Himalaya II.H.P.*, Zool. Surv. India, pp. 221-229.

Type Locality : India, Himachal Pradesh, Upper Rohtang.

Repository of the Types : NZC, Zoological Survey of India.

Material Examined : Pauri, Deoprayag, 18.ix.2002, 2exs. Vinod Khanna.

Description : Length : 63mm, excluding antennae and anal legs.

Colour : The dorsal surface of the head and body dark olive green. Ventral surface paler than dorsal; legs distally a more bluish tinge than the body. Antennae : 19 segmented, (rarely 17), the basal three large, shining and glabrous, rest smaller and pilose. Cephalic Plate: sparsely and evenly punctate. Tergites : The punctures on the head and

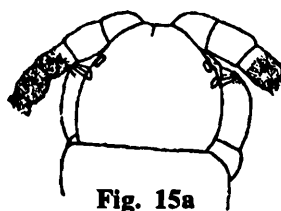


Fig. 15a



Fig. 15b

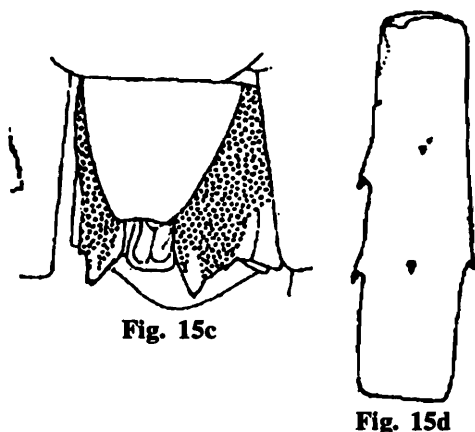


Fig. 15c

Fig. 15d

first one or two tergal segments a trifle larger and less clearly defined than the rest; segments 3-20 with a pair of fine and sometimes incomplete longitudinal grooves; these grooves usually more strongly impressed close to the posterior margin especially in the anterior or middle segments of the body, where they are often joined by a transverse groove between which and the posterior margin the surface may be rugose. Marginal grooves present behind segment 8-11; endtergite with strong lateral emargination, posterior margins composed of two straight halves meeting in an angle of about 120° . Sternites : endsternite narrowed posteriorly with its posterior margins more or less concave. Maxillipedes : dental plate of the coxosternum with 4-6 teeth on each side. Coxopleurae: Process of the coxopleura as long as the end-sternite, sometimes slender behind, armed with 1-2 distal, 1-4 dorsal spinules; tooth on the inner side of the femur of poison jaws strongly developed. Legs : 1st pair of legs with 1 distal spine on tibia, 2 on prefemur and 2 at the base of the claw; 2nd with 2 spines on the prefemur and claw, with or without 1 on tibia; 3-20 with 2 spines at the base of the claw, 1, or usually in many of the anterior segments 2, at the end of the proximal tarsus; anal legs with 2 at the base of claw only; femur of the anal legs with a strong dorsal tooth on the inner side at the end, "Eckdorn", with 1-3 smaller teeth behind it beneath on the outer side with 3, on the inner with 2, 2-3, 3 teeth often irregularly arranged.

Distribution : India : Himachal Pradesh.

Remarks : First record from Uttarakhand.

16. *Otostigmus splendens* Pocock, 1890

1890. *Otostigmus splendens*, Pocock, *Ann. nat. Hist.*, ser. 6, 5 : 245.

Type Locality : Madras (Tamil Nadu).

Repository of the Types : British Museum (Natural History), London (Reg. No. 90.1.23.26.38).

Material Examined : Haridwar, Ranipur, 8.viii.2002, 1ex., J.P. Sati.

Description : (Figs. 15 a-d) : Length : Colour : Ocherous with metallic luster. Antennae : 17 segmented with 2 basal segments glabrous. Maxillipedes : with 4+4 teeth on dental plate. Sternites : 5th segment onwards with paramedian longitudinal furrows; emargination of tergites beginning from 8th segment; from 6th on the sides slightly with wrinkles; sternites with 2 very small longitudinal furrows anteriorly and two grooves in the middle; endsternite reduced and posteriorly slightly rounded. Coxopleura : the process of the coxopleura small with 2 spines at the apex, one thorn dorsally and laterally without thorns. Legs : 1-19 pair of legs with 1 tarsal spur. Prefemur of the anal legs ventro-laterally with 3, ventro-medially with 2 dorsally in the middle with one thorn; Eckdorn present.

Remarks : Lewis (1996) after examining the types of *O. splendens* concluded that it is clearly a junior synonym of *O. orientalis* that has been recorded from Bombay and Seychelles. On examination Lewis (l. c.) found that Pocock (1890) described the coxopleural process as armed apically with two strong spines and "above" with one strong spine. Both Kraepelin (1903) and Attems (1930) took 'above' to mean dorsal surface, whereas, in fact, it means anterior. There is no dorsal spine in the types but lateral.

Distribution : India : Maharashtra, Tamilnadu.

Elsewhere : Indo-Malayan extending to Australia.

Remarks : First record from Uttarakhand.

Genus *Ethmostigmus* Pocock, 1898

1844. *Heterostoma*, Newport, *Trans. Linn. Soc.*, London, 19 : 275.

1898. *Ethmostigmus*, Pocock, *Ann. nat. Hist. ser.*, 7(1) : 327.

Type Species : *Ethmostigmus trigonopodus* (Leach).

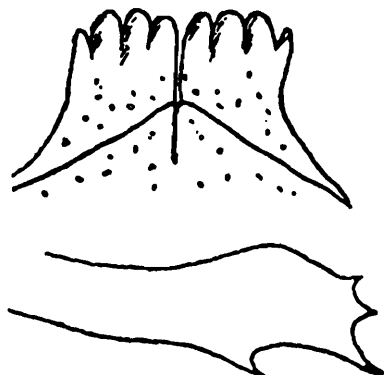
Type Locality : Ethiopia.

Distribution : Indo-Australian and Ethiopian region.

17. *Ethmostigmus pygomegas*
(Kohlrausch), 1881

1881. *Heterostoma pygomega*, Kohlrausch, Arch. Naturgesch., 47 : 63.

1994. *Ethmostigmus pygomegas*, Khanna, Rec. zool. Surv. India, 94(2-4) : 470. (NE States).



1998. *Ethmostigmus pygomegas*, Khanna, Panchchuli Multidimensional Expedition, Sapper Adv. Foundation, Indian Army, p. 80.

Type Locality : Sylhet, Bangla Desh (Himalya?).

Repository of the Types : Natural History Museum, Vienna, Austria.

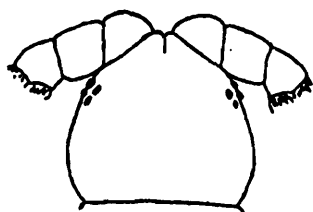


Fig. 17a



Fig. 17b

Material Examined : Pithoragarh, Khat Village, Ca 6 km from Sabala (alt 5400 ft ASL), 30.iv.1998, 1ex., A.K. Joshi and Parmod Kumar; Dhar Village, on way to Sola (Alt. 6600 ft. ASL), 28.iv.1998, 11ex., A.K. Joshi and Parmod Kumar.

Description : (Figs.16a-b) : Length : 110mm. Colour : Olive brown to green, legs yellowish. Cephalic Plate : Richly punctate. Antennae : Long; reflexed antennae reaching back upto 5th tergal segments with its 4 basal segments glabrous and punctate, rest pilose. Maxillipedes : Base of the

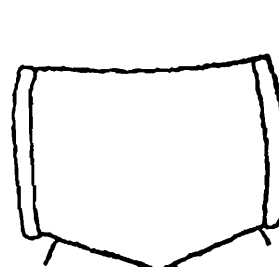


Fig. 17c



Fig. 17d

dental plate punctate; Dental plate of the maxillipedes with 4 + 4 teeth, the two outer of each side considerably smaller than the two middle ones; prefemoral hooks absent; 2nd maxillae with two side claws. Tergites : Fine and sparsely punctate tergites with paramedian longitudinal furrows beginning from 3rd segment, indistinct on 4th; emargination of tergites begins from 5th segment, smooth anteriorly. Sternites : with two distinct longitudinal furrows, small posteriorly; endtergite very long, posteriorly sinuate. Process of the coxopleura very long, hanging, extending behind the endsternite, at the apex with 2-3 spines, i.e. with an end spine and one or two near the apical spine, laterally with 1 thorn. Legs : 1st pair of legs with 2, 2-20 with one tarsal spur; all legs with two spurs to the claws. Prefemur of the anal legs ventro-laterally with 2, Ventro-medially with 2 or 3, dorso-medially with 3 thorns; Eckdorn simple.

Distribution : India : Assam, A & N Isl., Uttarakhand, Himachal Pradesh and West Bengal.

Elsewhere : Bangladesh, Bhutan, Himalayas (?).

Genus *Rhysida* Wood, 1862

1862. *Rhysida*, Wood, J. Ac. Philad., Ser. 2, 5 : 40.

1930. *Rhysida*, Attems, Das Tierr., Scolopendromorpha, 54(2) : 183.

Type Species : *Rhysida lithobioides* (Newport).

Distribution : Indo-Australian, Indo-Malayan, Ethiopian, Palearctic and Neotropical.

18. *Rhysida lithobioides shivalikensis* Khanna, 1994

1994. *Rhysida lithobioides shivalikensis*, Khanna, Zool. Surv. India, Fauna of Cons. Area 5 : Rajaji National Park, 312-313. Figs. 1-5.

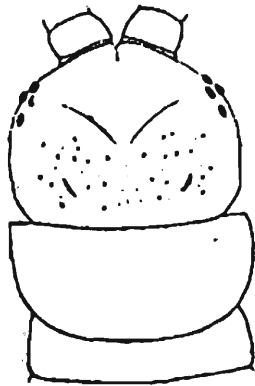


Fig. 18a

1995. *Rhysida lithobioides* ssp.1, Khanna, Zool. Surv. India, Himalayan Ecosyst. Ser., Fauna of Western Himalaya I, Uttar Pradesh, 111-113.

Type Locality : India : Motichur (North of Shiwaliks), Dehra Dun (Uttarakhand).

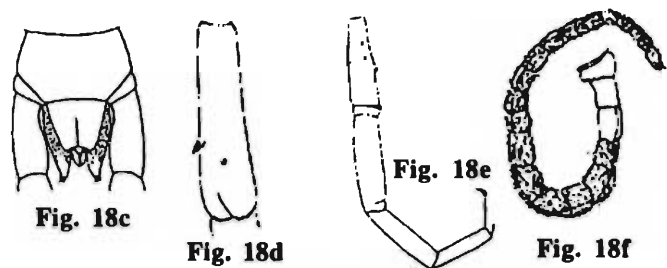
Repository of the Types : NZC, Zoological Survey of India.

Material Examined : Dehra Dun, Kaulagarh Road, ZSI Campus, 29.iv.1987, 1ex., S.S.L. Verma.



Fig. 18b

Description : (Figs. 17a-d) Length : 44mm, including antennae and anal legs. Colour : Cephalic plate and antennae dark greenish brown; tergite light brownish green in the center and brownish on the lateral margin; maxillipedes and sternites brownish yellow; legs olive green; Colour of the first tergite as that of head (in specimens preserved in 70% alcohol). Antennae : 19 segmented with 3 basal segments glabrous; reflexed antennae reaching behind upto the end of 6th tergal segment. Cephalic Plate : Cephalic plate smooth; sparsely distributed very small puncts visible only anteriorly; cephalic plate anteriorly with a small median notch. Tergites : 4-20 segments with a pair of complete paramedian longitudinal furrows; end tergite without median suture, its lateral margins slightly



curved outwardly in the middle; posterior margin sinuate; emargination of tergites represented prominently on 19-21st segment, feeble on 17th but a little more pronounced on 18th tergal segments. Sternites : smooth; paramedian longitudinal furrows not visible; endsternite tapering gradually posteriorly with incurved posterior margin; longer than wide. Maxillipedes : Sparsely punctate base of the coxosternum without any sulcus; dental plate with 4+4, all separate teeth; a post dental spur present; prefemoral process tridentate. Coxopleura : Finely punctate process of the coxopleura at the apex with 3 spines each and without dorsal or lateral spine. Legs : 1-16 pair of walking legs with 2 spurs to 1st tarsal segment; 19th and 20th with one and 21st without tarsal spur; 1st pair of legs also with a femoral and a tibial spur present dorsally; all legs with 2 spurs to the claws. Anal Legs : Prefemoral spinulation confined to proximal half only with 1 dorso- medial, 1 ventro- medial and 2 ventro- lateral spines; Eckdorn absent; a transverse groove present ventrally on the distal end of the prefemur, femur and also on the tibial segments; 1st tarsal segment of the anal legs slightly longer than the IInd.

Distribution : Delhi and Uttarakhand.

Zoogeographical Distribution : Indian.

19. *Rhysida lithobioides kumaonensis* Khanna, 1994

1994. *Rhysida lithobioides kumaonensis*, Khanna, Rec. Zool Surv. India, 94(2-4) : 338-341, fig. 8-11.

1995. *Rhysida lithobioides* ssp. 2, Khanna, Zool. Surv. India, Himalayan Ecosyst. Ser., Fauna of Western Himalaya I, Uttar Pradesh, 111-113.

Type Locality : India : Bijrani, Corbett National Park, Distt. Nainital (Uttarakhand).

Repository of the Types : NZC, Zoological Survey of India.

Material Examined : Nainital, Bijrani, 31.i.1971, 5exs., J.C. Tripathi.



Fig. 19

Description : (Figs. 18 a-f) : Colour : Antennae, cephalic plate and anal legs dark olive green; sternites, coxosternum and legs yellow to yellowish green. Antennae : 21 segmented, with 3 basal segments glabrous; reflexed antennae reaching behind to the end of 3rd or beginning of the 4th tergite. A deep longitudinal groove running all along the length of the antennae is visible. Cephalic Plate : sparsely punctate with a deep median notch present anteriorly; without median or longitudinal furrows; shape broader than long. Maxillipedes : Dental plate of the coxosternum with 4+4 teeth; base of the coxosternal plate sparsely punctate with a very small median furrow present only anteriorly; prefemur of the coxosternum tridentate; dental plate longer than wide, with a post dental spur. Tergites : smooth, 5 or 6 –19 (or 20th) with 2 complete paramedian longitudinal furrows; 18-21st tergites emarginated (beginning rather feebly from 16-17); endtergite without median sulcus; shape of the endtergite is like that in *R.l. trispinosus* but it differs from *R.l. shivalikensis*. Sternites : All segments without paramedian longitudinal furrows; endsternite tapering, posteriorly with a median notch as in *R.l. shivalikensis* and *R.l. trispinosus*. Coxopleura : Densely punctate process of the coxopleura, extending a third of its length behind endsternite, at the apex with 3 spines, without sub-apical or lateral spines. Walking Legs : 1-18 pair of walking legs with 2 spurs to the 1st tarsal segment; 19th with one and 20th without; all legs with 2 spurs to the claws. Anal legs : prefemoral spinulation confined only proximally with 2 ventro-medial, 1 medial and 2 ventro-laterally; a deep transverse groove present ventrally at the distal end of the anal leg prefemur, visible laterally on the femur upto

the middle. Tarsal second is about one half the length of tarsal –I.

Distribution : Uttarakhand and U.P. Terai, Distt. Lakhimpur Kheri.

Zoogeographical Distribution : Indian.

20. *Rhysida crassispina* Kraepelin, 1903

1903. *Rhysida crassispina*, Kraepelin, Mitt. Mus., Hamburg, 20 : 151 (fig. 94).

1994. *Rhysida crassispina*, Khanna, Rec. zool. Surv. India, 94(2-4) : 468 (NE States).

1998. *Rhysida crassispina*, Khanna, Panchchuli Multidimensional Expedition, Sapper Adv. Foundation, Indian Army, p. 80.

Type Locality : India : Matheran, Alibagh (Maharashtra).

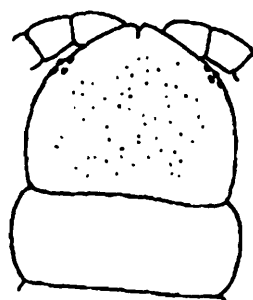


Fig. 20a



Fig. 20b

Repository of the Types : British Museum (Natural History), London.

Material Examined : Pithoragarh, Sobala and around (Alt. 5700 ft ASL), A.K. Joshi and Parmod Kumar.

Description : (Fig. 19) : Length : 65mm. Colour : Olive-yellow, with dark green posterior margins on the tergites. Head and 1st tergite yellowish red. Cephalic Plate : Head shield longer than wide, with dark large puncts. Antennae : 18 segmented with 4-1/2 basal segments shining and glabrous, rest pilose. Maxillipedes : Dental plate of the coxosternum with 4 + 4 teeth; dental plate almost doubly long than wide; basal furrow of the dental plate almost at right angle connecting the two dental plates. Basal plate sparsely punctate, anteriorly with a small median furrow. Tergites : Paramedian longitudinal furrows complete from segment 4th; emargination of tergites begins from segment 5 or 6. Sternites : Segment 1-4 with 2 small furrows anteriorly and two long paramedian longitudinal grooves in the middle; segment 5-19

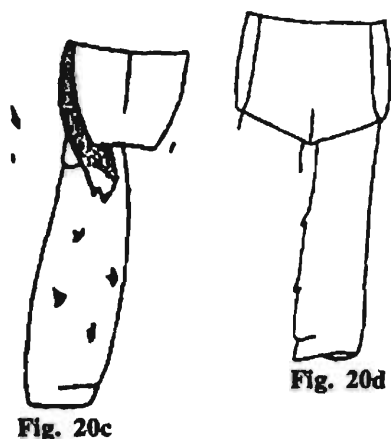


Fig. 20c

Fig. 20d

with a pair of complete paramedian longitudinal furrows, a shallow median depression and three rounded grooves on the posterior margins; Endsternite 1-1/3 times as long as wide, slightly tapering, posteriorly sinuate. Coxopleura : The process of the coxopleura conical with 2 apical spines, without dorsal or lateral spine. Legs : 1st pair of legs with 2, 2-17 (or 18) pair of legs with 1 tarsal spur. Prefemur of the anal legs ventro-laterally with 4 thorns in two rows. The large median peg-shaped, dorso-medial also 2 peg shaped large thorns and one large Eckdorn with one spine.

Distribution : Maharashtra, Meghalaya, Uttarakhand and Uttar Pradesh.

Remarks : First record from Uttarakhand.

21. *Rhysida nuda nuda* (Newport) 1845

1845. *Branchiostoma nudum*, Newport, *Trans. Linn. Soc.*, 19 : 412 (Type).

1912. *Rhysida nuda*, Gravelly, *Rec. Indian Mus.*, 7(1) : 71.

1995. *Rhysida nuda nuda*, Khanna, *Zool. Surv. India, Himalayan ecosyst. Ser., Fauna of Western Himalaya I, Uttar Pradesh*, 111-113.

Type Locality : Paramatta, New South Wales, Australia.

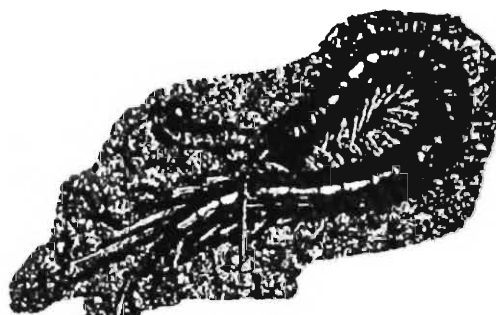


Fig. 21a

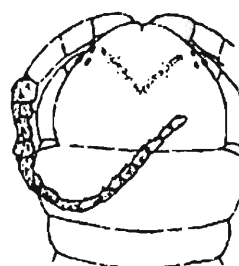


Fig. 21b

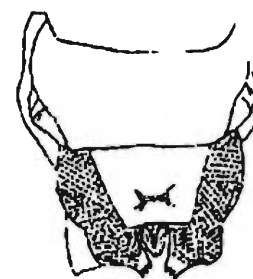


Fig. 21c

Repository of the Types : British Museum (Natural History).

Material Examined : Dehra Dun : Mohund, 17.ii.1964, T.D. Soota; Pauri, Sarapduli, 1.xi.1972, 1ex., J.C. Tripathi; Chamoli, Nand Prayag, 5.ix.1979, 1ex., Vinod Khanna.

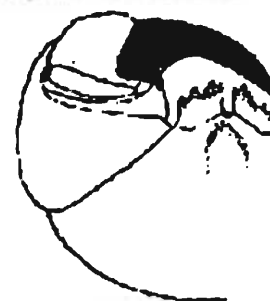
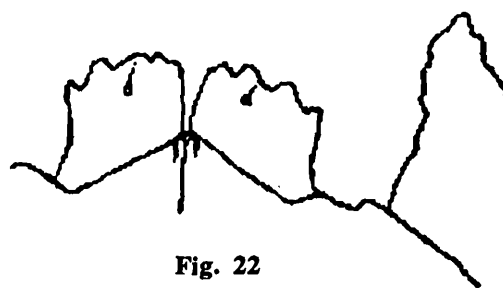
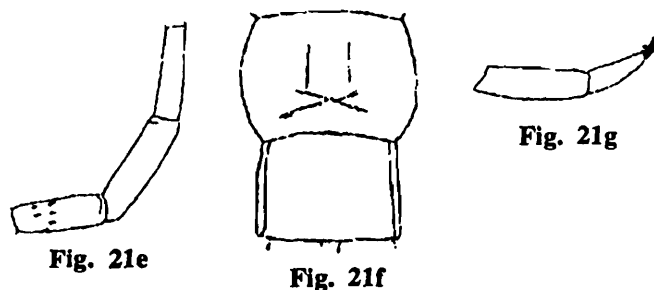


Fig. 21d

Description : (Figs. 20a-d) : Length : 55mm, including antennae and anal legs. Colour : Posterior segments of tergites olive green; cephalic plate bluish yellow to blackish green; 3 basal segments dark to light bluish green, remaining yellow; sternites and legs yellow; distal part of the legs and nearly the whole of the anal legs bluish. Antennae : Very long antennae, 18-21 segmented; reflexed antennae reaching back to the end of the 6th tergal segments; 2 to 2-1/3 basal segments glabrous. Cephalic plate : sparsely punctate, without furrows, broader than long. Maxillipedes : Dental plate of the coxosternum broader than long with 4+4 teeth; a post dental spur present and embedded in a depression; base of the maxillipedes sparsely punctate, without furrows, however, 2 small divergent furrows are seen below the dental plate, meeting at an angle of 120°. Tergites : Smooth and sparsely punctate; complete paramedian longitudinal furrows present from 3-19 segment; 2nd segment also with a very small, broken furrow; only endtergite laterally emarginate; both the lateral margins of the endtergite are almost parallel to each other and the posterior margin converging a little to meet at an angle; very small median



furrow visible at the posterior margin of the endsternite. Sternites : Sternites smooth paramedian longitudinal furrows are visible anteriorly on segments (Attems, 1930), however, the material under study by the present author has the sternal segments a bit granulose and paramedian furrows on sternites not at all visible. Endsternite tapering posteriorly with a median curve at its posterior margins and also a median sulcus running about 2/3rd of the endsternite anteriorly. Coxopleura : The process of the coxopleura moderately long, sparsely punctate with 2 apical spines and without dorsal or lateral spine; lateral sides of the porose area strongly trimmed. Walking legs : 1st pair of legs with 1 but without tibial spur; 2-18 with 2 spurs to first tarsal segment, 19th and 20th with one and 21st without tarsal spur; all legs with two spurs to the claws. Anal Legs : Prefemur of the anal legs long with 4 thorns; distal end of the prefemur with an incomplete transverse furrow; prefemoral process absent.

Distribution : Assam, Andhra Pradesh, Haryana, Karnataka, Meghalaya, Maharashtra, Madhya Pradesh, Orissa, Tamilnadu, Tripura and Uttar Pradesh. **Elsewhere:** Myanmar, Sri Lanka, Australia, Paraguay, North America (Mexico), Paraguay (Indo-Australian, Neotropical).

22. *Rhysida nuda immarginata* (Porath) 1876

1876. *Branchiostoma immarginatum*, Porath, *Bih. Svenska Ak.*, 4(7) : 24.

Type Locality : Manila, Philippines.

Location of the Type : British Museum of Natural History.

Material Examined : Nainital, Sarapduli (CTR), 28.i.2004, Vinod Khanna; Bijrani, 28.ii.1973, 2exs., Asket Singh; Sultan, 23.xi.1971, 2exs. Asket Singh; Gairal, 15.x.1972, 6exs., J.C. Tripathi; Pauri, Dhikala, 23.ii.1973 1ex., Asket Singh; Almora,

Kausani-Garur Road, 6.ix.1978, 1ex, Vinod Khanna; Dehra Dun, Dhakrani, 4exs, Vinod Khanna; Pashulok, 25.vi.1974, 1ex., J.C. Tripathi; Asarori Forest, 24.ii.1969, 1ex., M.K. Biswas; FRI Campus, 9.viii.1961, 1ex., Sikandar Lal.

Description : (Figs. 21a-g) : Length : 45mm, including legs and antennae. Colour : Cephalic plate and tergites olive green to brownish, sternites and legs yellow (preserved in 70% alcohol). Antennae : 19 segmented with 3 basal segments glabrous; reflexed antennae reaching behind upto the middle of 5th tergal segment (vs., 6th, Attems, l.c.). Cephalic Plate : wider than long, smooth, anteriorly with a small median notch. Maxillipedes : Dental plate of the coxosternum with 4+4 teeth, the two inner of each side being longer in size than the outer and giving a club shaped appearance; post dental spur not visible; prefemoral process unidentate. Tergites : smooth; very feeble but complete paramedian longitudinal furrows visible from 4th segment, partly visible on 12th and 13th segment; only endtergite laterally emarginate, without median furrow, rectangular in shape having its lateral margins almost parallel and posterior margin truncate; 1st tergite almost equal in length to the 3rd segment, whereas 2nd less than half of the first tergal segment; 20th tergite almost goblet shaped with its lateral margins convexed. Sternites : smooth; paramedian longitudinal furrows (vs. incomplete paramedian furrows, Attems, (1930); endsternite almost equal in length and width with its posterior margin slightly incurved. Coxopleura: Process of coxopleura densely punctate with 3 small, curved apical spines, without dorsal or lateral spines; lateral margin of the porose area incurved almost near the middle. Legs : 2-18 pair of walking legs with 2 spurs to the 1st tarsal segment; 19th with one and 20th without such spurs; all legs with two spurs to the claws. Anal legs : Prefemur of the anal legs about two and a half times longer than wide, basally with 2, ventro-laterally with 2, ventro-

medially and medially one each; distal end of the prefemur and femur of the anal legs ventrally with a transverse furrow; Pretarsus is roughly double the length of distal tarsus and smaller than the tibial segment; prefemoral process absent.

Distribution : Assam, A & N Isl., Delhi, Gujarat, Madhya Pradesh, Maharashtra, Rajasthan, Uttarakhand, Uttar Pradesh and West Bengal.

Elsewhere : West Africa, Myanmar, Philippines, Venezuela, Guatemala (Oriental, Ethiopian and Palaearctic).

Remarks : *Rhysida nuda nuda* (Newport) vs. *Rhysida nuda immarginata* (Porath) : Jangi and Dass (1984) in their key to the species of the genus *Rhysida* state that the tergites preceding 21st tergal segment are not normally emarginate laterally in *R. nuda*, and if at all they are then only a couple of them, incompletely and weakly, involved and treated both the species as two complete separate species. Koch (1985b) describes that the lateral emargination in Australian specimens of *R. nuda* beginning from 6-9 segments, the authenticity of this character is very much doubted by the present author. Pocock (1910) in American centipedes employed the emargination of endtergite only as a solid character for segregating the species *nuda* from *immarginata*. Attems (1930) treated the *nuda* complex as a whole with its endtergite only laterally emarginate. All the specimens studied by the present author, have only the endtergite laterally emarginate and, therefore, strongly support the Attems (l.c.) criteria in segregating *R. n. nuda* and *R. n. immarginata*, the latter with 3 spines at the apex of the process of coxopleura and the former with 2 spines. They cannot be treated as elevated to the rank of two good and separate species. Further, the juveniles of *R. nuda immarginata* have incomplete paramedian longitudinal furrows on tergites (Lewis, 1967). paramedian longitudinal furrows start from the 3rd tergite in *R. n. nuda* and from a tergite latter than 3rd in *R. nuda immarginata* (Koch, 1985b) in the Australian species. Accordingly the description of the nominate subspecies and *Rhysida nuda immarginata* have been revised and illustrated here.

23. *Rhysida longipes longipes* (Newport), 1845

1845. *Branchiostoma longipes*, Newport, Trans. Linn. Soc., London, 19 : 411.

1930. *Rhysida longipes*, Attems, Das Tierr., Scolopendromorpha, 54(2) : 194.



Fig. 23a

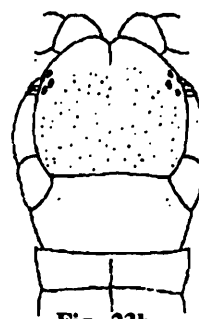


Fig. 23b

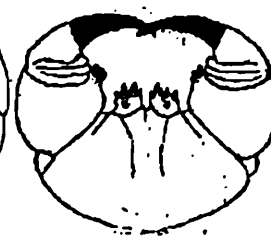


Fig. 23c

Type Locality : Not known.

Repository of the Types : British Museum (Natural History).

Material Examined : Pithoragarh : Champawat, 7.xii.1989; 1ex., S.C. Verma.



Fig. 23d

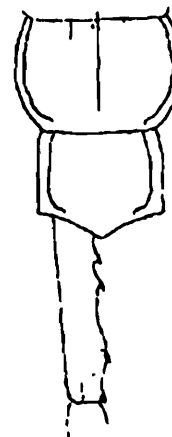


Fig. 23e

Description : (Fig. 22) : Length : 80mm. Colour : Rusty yellow to olive brown. Cephalic Plate : Sparsely punctate. Antennae : 18 segmented; reflexed antennae reaching behind upto 6th tergal segment; basal three segments dorsally glabrous; only ventrally with small plumes. Maxillipedes : Dental plate of the coxosternum with 4 + 4 teeth and a postal dental spur; the basal furrow of the dental plate meeting almost at 110°; base of the coxosternum with a small median furrow anteriorly. Tergites : Paramedian longitudinal furrows on tergites beginning from 5th segment, mostly from 6th or seventh; emargination seldom begins earlier than 15th segment. Sternites : Smooth; only small furrows visible anteriorly, endsternite tapering,

posteriorly sinuate. Legs : The first 7-12 pair of walking legs with 2, remaining upto 18th with one, 19th mostly with, 20th with or without tarsal spur. Coxopleura : The process of coxopleura long somewhat double the length of the endsternite, with 3 spines at the apex, 1 lateral thorn and without dorsal thorn. Prefemur of the anal legs ventro-laterally with 3 or 4, ventro-medially with 1-3, dorsally with 2-3 thorns; Eckdorn present.

Distribution : Arunachal Pradesh, A & N Isl., Delhi, Goa, Karnataka, Maharashtra, Madhya Pradesh, Uttar Pradesh, Uttarakhand and West Bengal.

Elsewhere : Pakistan, Australia, East and West Africa, Madagascar, Seychelles, Mexico, Central and South America (Oriental, Indo-Australian, Palaearctic, Ethiopian, Nearctic and Neotropical).

24. *Rhysida longipes punctata* ssp. nov.

Material Examined : Holotype : India : Uttar Pradesh : Nainital, Banbasa, 6.x.1977, 1ex., Vinod Khanna Coll.; Paratypes : Collection data same as holotype, 3exs.; Uttar Pradesh Terai, Distt. Lakhimpur Kheri, Chandan Chauki (Dudhwa National Park), ex. Decayed wood logs, 17.iii.1986, 25exs., Raj Tilak Coll; 22.iii.1986, 14exs., Raj Tilak Coll.

Type Locality : India : Banbasa, Nainital., Uttarakhand.

Repository of the Types : NZC, Zoological Survey of India.

Description : (Figs. 23a-e) : Length : 48mm, including antennae and anal legs. Colour : Head, tergite and antennae dark purple to peach brown in colour; legs onion pink; prefemur, femur and tarsal 2 of walking legs pink; tibia and tarsal-I olive green with pink tinge (Colour of the animal recorded live). Antennae : 17 segmented with its 3 basal segments glabrous; reflexed antennae reaching back upto 3rd tergal segment. Cephalic

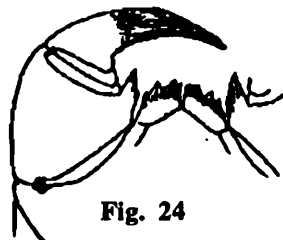


Fig. 24

Plate : sparsely punctate without longitudinal, median or transverse furrows; overlapped by first tergite. Tergites : 5 or 6 to 19th tergal segment with well defined and complete paramedian longitudinal furrows; endtergite with its posterior margins incurved on the sides, diverging again in the center to meet and at angle of 120° ; without median furrow; emargination of tergites begins from 9th segment; 2 or 3 to 20 or some times 21st tergal segment also dorsally with a black colored median streak, without keel or carina. Sternites : 2 very small furrows can be seen only on the anterior one- third or even less on sternite 2-19; endsternite without any median furrow but with a shallow depression in the center, visibly running all along its length to about its middle; posterior margin of endsternite incurved. Maxillipedes : Dental plate of the coxosternum with 4+4 teeth, the two inner on each side are quite close to each other and separated from the outer two by a definite gap; the base of the dental plate with small median furrow present anteriorly below the teeth junction; prefemoral process of the coxosternum tridentate. Coxopleura : The process of the coxopleura densely punctate, almost one and a half times longer than the endsternite, with 2 apical spines each on the lateral margins. Walking legs : 1-8 pair of legs with 2, 9-19th with 1, 20th without spurs to first tarsal segment; 1-4 or 5(6) pair of walking legs with one tibial spur at the distal end dorsally; 1st pair of legs also with a ventral femoral spine. Anal Legs : Prefemur of the anal legs almost slightly more than four times longer than wide; with 8 thorns arranged in 3 rows of 3-2-3; prefemoral process present with single spine.

Remarks and Affinities : *Rhysida longipes punctata* ssp. nov. is intermediate in characters between *R. longipes longipes* and *R. longipes simplicior* as can be seen from the table appended :

Distribution : Uttarakhand and Uttar Pradesh Terai.

25. *Rhysida longipes simplicior* Chamberlin, 1920

1920. *Rhysida simplicior*, Chamberlin. *Univ. Calif. Pub.*, 19 : 391, Figs. 13-16.

1930. *Rhysida longipes simplicior*, Attems, *Das Tierr.*, *Scolopendromorpha*, 54(2) : 194, fig. 244.

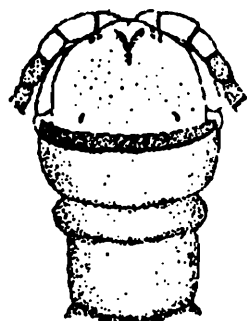


Fig. 25a

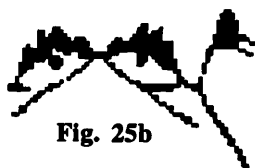


Fig. 25b



Fig. 25e



Fig. 25f

	longipes	simplicior	punctata ssp. nov
1. Antennae	18 segmented; reaching back to 6th basal segments; 3 basal segments glabrous	17 segmented; reaching back to 3rd segment; 3 basal segments glabrous	17 segmented; reaching back to 3rd segment; 3 basal segments glabrous.
2. Emargination of tergites	Only sometimes a segment prior to 15th emarginated	15-20 shallow, 21st deeply emarginated.	9-21 tergal segments emarginated.
3. Spinulation of walking legs	7-12 pair of legs with 2; 20 with or without tarsal spur.	1-5 with 2; 6-20 with 1 tarsal spur	1-8 with 2, 20th without tarsal spur.
4. Spinulation of Anal leg prefemur	V.L. with 3-4; V.M. with 1-3; D with 2-3 thorns	V.L.3; V.M.2, D. Nil	V.L.3; D.L.2, D with 3 thorns
5. Eckdorn	Present	Absent	Present
6. Median streak on tergites	Absent	Absent	Present

2004. *Rhysida longipes simplicior*, Khanna : *Fauna of Conservation Area Series : Fauna of Gobind Pashu Vihar, Uttarakhand, Zool. Surv. India*, pp. 29-31.

Type Locality : India : Coonoor (Tamilnadu).

Repository of the Types : Museum of Comparative Zoology, Cambridge, Massachusetts. Paratypes with Department of Zoology, University of California, Berkley, California.

Material Examined : Uttarkashi : Dewal Nursery, 28.iii.1996, exs., Akhlaq Husain.

Description : (Fig. 24) Length : 44mm. Colour : Olive brown; a narrow yellow margin posteriorly on tergites; pleurite, legs and antennae yellow. Cephalic Plate: broader than long, appearing smooth and shining, densely punctate. Antennae : 17 segmented, small; reflexed antennae reaching behind upto 3rd segment. Maxillipedes : Dental plate of the coxosternum with 4+4 teeth, the two median on each side somewhat coalesced; basal furrow almost at right angle. Tergites: Paramedian longitudinal furrow begins from 7th segment; emargination of tergites begins between 16- 20th segment or restricted sharply only on 21st; endtergite with shallow margins. Sternites : without any complete sulcii, at the most with short anterior traces end tergite strongly tapering posteriorly rounded. Coxopleura : Process of the coxopleura

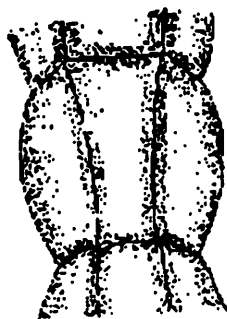


Fig. 25c

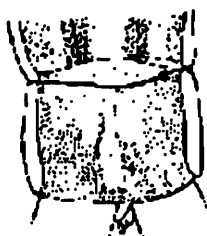


Fig. 25d

moderately long, with 2 apical spines, laterally at the base with one thorn. Legs : 1-5 pair of walking legs with 2, 6-20 pairs with 1 tarsal spur. Prefemur of the anal legs ventro-laterally with 3, ventro-medially with 2 thorns, medially with one thorn; Eckdorn absent.

Distribution : India : Delhi, Tamilnadu and Uttarakhand.

Zoogeographical Distribution : Indian.

26. *Rhysida stuhlmanni himalayanus*
Khanna, 1994

1994. *Rhysida stuhlmanni himalayanus*, Khanna, *Rec. zool. Surv. India*, 94(2-4) : 342-344, figs. 15-19.

1995. *Rhysida stuhlmanni* ssp. 4, Khanna, *Zool. Surv. India, Himalayan Ecosyst. Ser, Fauna of Western Himalaya I, Uttar Pradesh*, 111-113.

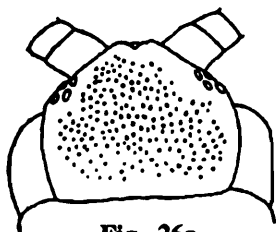


Fig. 26a

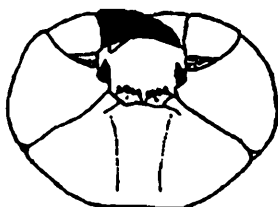


Fig. 26b

Type Locality : India : Kaladungi-Mangoli Road, Nainital (Uttarakhand).

Repository of the Types : NZC, ZSI.

Material Examined : Dehra Dun : Chakrata-Barkot Road, 4.viii.1988, 1ex., R.N. Chopra.

Description : Length : 66mm, including antennae and anal legs. Colour : Head, antennae, tergites and legs olive green; sternites and ventral surface of the head greenish yellow (in specimen preserved in 70% alcohol). Antennae : Long, 20 segmented with its 3 basal segments glabrous; reflexed antennae reaching back upto the end of 5th tergite or beginning of 6th tergite. Cephalic plate smooth, broader than long with a deep median notch present anteriorly followed by a small median



Fig. 26c

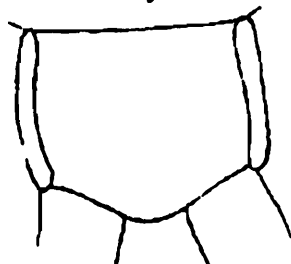


Fig. 26d

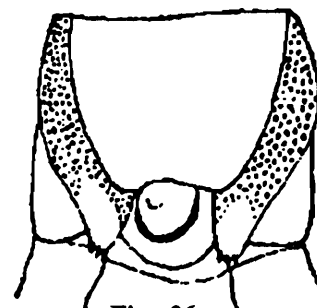


Fig. 26e

furrow confined below the notch; head shield clearly overlapped by 1st tergite. Maxillipedes : Dental plate of the coxosternum with 5+5 teeth, the inner three of each side being more nearer to each other and separated from each other by a gap; without post dental spur; prefemoral process of the maxillipedes tridentate; base of the coxosternum smooth, without furrows; dental plate meeting each other at 120°. Coxopleura : Densely punctate process of the coxopleura, strong and slender extending slightly behind endsternite, at the apex with 3 thorns; dorsally and laterally without thorn. Tergites : Tergites without any indication of the presence of paramedian longitudinal furrows, however, small transverse furrows can be seen anteriorly on the posterior tergal segments and sternites as well; only endtergite emarginate. Sternites : smooth with only very small paramedian longitudinal furrows present on posterior body segments; endsternite longer than wide with its lateral margins a little arched out and posterior margin incurved. Walking legs : 1-19 pair of walking legs with 2, 20th with 1 and 21st without tarsal spur to first tarsal segment; all legs with 2 spurs to the claws. Anal Legs : Prefemur of the anal legs nearly five times longer than its width; with 7 thorns present in the proximal half, ventro-laterally with 1, laterally with 2, medially 1 and dorso-laterally with 3 thorns; Eckdorn absent. A deep depression is seen on the distal end of the



Fig. 26f

anal leg prefemur and femur. Pretarsus about two and a half times longer than distal tarsus, which is again about five times longer than end claws. The ssp. differs from its nominate subspecies in a having a tridentate projection on the prefemur of the coxosternum (vs. unidentate in *stuhlmanni*); 20 segmented antennae (vs. 17-18) and in disposition of the spines on the anal leg prefemur. Khanna (1987) thus treated *Rhysida stuhlmanni* Kraepelin, 1903 as the nominate subspecies *Rhysida stuhlmanni stuhlmanni* (*forma typica*) and assigned the ssp. nov. the new name *Rhysida stuhlmanni himalayanus* Khanna, 1994.

Distribution : India : Uttarakhand.

27. *Rhysida carinulata* (Haase), 1887

1887. *Branchiostoma carinulata*, Haase, *Abh. Mus.*, Dresden, 5 : 82 (Original Diagnostic Characters).

1930. *Rhysida carinulata*, Attems, *Das. Tier. Scolopendromorpha* : 54(2) : 190. (Redescribed).

1985. *Rhysida carinulata*, Koch, *J. nat. Hist.*, 19 : 205-214. (Redescribed).

1995. *Rhysida carinulata*, Khanna, *Zool. Surv. India, Himalayan Ecosyst. Ser., Fauna of West Himalaya I*, Uttar Pradesh, 111-113.

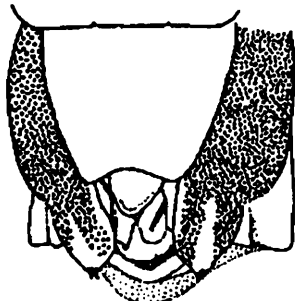


Fig. 27a

Type Locality : New Guinea, Australia.

Repository of the Types : Not known.

Material Examined : Material not available in the present lot.

Description : Length : 57-75mm, including antennae and anal legs. Colour : Tan brown (preserved in 70% alcohol). Antennae : 21 segmented; 3 basal segments glabrous. Cephalic Plate : almost equal in length and width, smooth and punctate. Maxillipedes : Base of the coxosternum with oblique sutures extending postero-laterally from median sulcus on the base

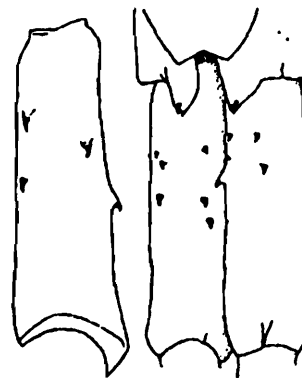


Fig. 27b

Fig. 27c

of the dental plate; dental plate with 6+6 teeth; dental plate wider than long; prefemoral process on the maxillipedes large, unidentate. Tergites : 3-20 segments with a pair of complete paramedian longitudinal furrows; emargination beginning from 6th or 7th segment; posterior tergal segments (i.e. 14-21) with additional longitudinal carina or keel; endtergite longer than wide with its posterior edge convexed and no median sulcus present. Sternites : All segments with very small paramedian longitudinal furrows; endtergite tapering posteriorly with concave posterior margin and also with a delicate and wide median depression. Coxopleura : Process of the coxopleura long and almost 3/4th longer than endsternite; the porose area reaching its posterior edge with 2 spines at its apex and one sub-apical spine; no lateral or dorsal spine present. Walking legs : 1-18 pair of walking legs with 2 spurs to the first tarsal segment; all legs with two spurs to the terminal claws. Anal Legs : Anal leg prefemur long, almost six times longer than wide, ventro-laterally with 1-2, ventro-medially with 2-3, and dorsally with 1 thorn; prefemoral process, "Eckdorn" present.

Distribution : India : Uttarakhand.

Elsewhere : Sumatra, Celebes, New Guinea, Australia, Thursday Islands (Indo-Australian).

28. *Rhysida longicarinulata* Khanna and Tripathi, 1985

1985. *Rhysida longicarinulata*, Khanna and Tripathi, *Annals of Entomol.*, 3(1) : 19-21 (Himachal Pradesh.).

1994. *Rhysida longicarinulata*, Khanna, *Zool. Surv. India, Fauna of Cons. Area 5 : Rajaji national park*, 312 (Uttarakhand).

1995. *Rhysida longicarinulata*, Khanna, *Zool. Surv. India, Himalayan Ecosyst. Ser., Fauna of Western Himalaya I*, Uttar Pradesh, 111-113.



Fig. 28c

2005. *Rhysida longicarinulata*, Khanna, *Fauna of Western Himalaya II.H.P.*, Zool. Surv. India, ms. pp. 221-229.

Type Locality : India : Paonta, Sirmaur (H.P.).

Repository of the Types : NZC, Zoological Survey of India.

Material Examined : Dehra Dun : Kalsi and around, 4.viii.1988, 1ex., R.N. Chopra; Haridwar, Dholkhand, 31.x.1986, 1ex., Raj Tilak.

Description : (Figs. 25a-f) : Length : 48 to 50mm. Colour : Legs green, sternites yellow in the center and brownish yellow on the margins and also on antero-posterior border on each segment; head, antennae and tergites peach brown (in specimen preserved in 70% alcohol). Cephalic Plate : Sparsely punctate, wider than long, posteriorly overlapped by first tergite. Antennae : 19 segmented antennae with 3 basal segments glabrous; reflexed antennae reaching back upto 5th tergal segment. Tergites : Granulate; 1st tergite goblet shaped, almost twice longer than 2nd and slightly smaller than 3rd; paramedian longitudinal furrows on tergites feebly visible on the posterior end of the middle or posterior body segments; end of the 3rd or beginning of the 4th tergite to 20th with a pronounced paramedian carina but without a median carina (as in *R. carinulata*); 14-21 tergite laterally emarginate; the emargination being represented only in the anterior half or one-third

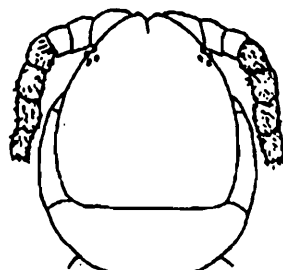


Fig. 28a

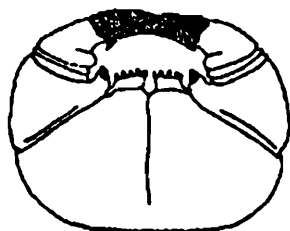


Fig. 28b

in the segments 14, 15, 16, 17, 18 and complete on 19-21st; posterior margin of the endtergite truncate. Sternites : Paramedian longitudinal furrows on tergites not visible; endsternite with a median sulcus visible on the anterior one-third portion only; endsternite tapering gradually posteriorly with its posterior border sinuate. A typical red coloured very prominent spiracles, slightly elliptical in shape, elevated with their openings a bit posteriorly directed. Maxillipedes : Dental plate of the coxosternum with 4+4 teeth, the outer and inner of each side being smaller than the middle ones; post dental spur present; both the dental plates meeting each other at an angle of 120°; prefemur of the coxosternum with an enlarged process and well developed hooks. Walking Legs : 1-15 pair of walking legs with 2, 16-20 with 1 spur to the first tarsal segment; 1st pair of legs with 1 spur each on femur and tibia whereas 2nd pair of legs with one tibial spur only. Anal Legs : Prefemur of the anal legs ventro-laterally with 4, ventro-medially with 1, medially with 3, dorso-medially with 2 and dorsally with one thorn; tarsal one of the last legs 2 times longer than the tarsal II; anal legs with 2 spurs to the claws. Coxopleura : Process of the coxopleura moderately long; densely punctate with 3 spines at the apex, without dorsal or lateral spines.

Distribution : India : Uttarakhand, Uttar Pradesh and Himachal Pradesh.

29. *Rhysida monalii* Khanna and Kumar, 1984

1984. *Rhysida monalii*, Khanna and Kumar, *Uttar Pradesh J. Zool.*, 4(1) : 93-95.

1992. *Rhysida monalii*, Lewis, *Senckenbergiana biol.*, 72(4/6) : 435-456.

1994. *Rhysida monalii*, Khanna, *Rec. zool. Surv. India*, 94(2-4) : 338.

1993. *Rhysida monalii*, Khanna, EIA Study, Report on Faunal Analysis, Tehri Dam, *Zool. Surv. India*, 78.

1994. *Rhysida monalii*, Khanna, *Zool. Surv. India, Fauna of Cons. Area 5 : Rajaji National Park*, 311.

1995. *Rhysida monalii*, Khanna, *Zool. Surv. India, Himalayan Ecosystem. Ser. Fauna of Western Himalaya I, Uttar Pradesh*, 111-113.

1997. *Rhysida monalii*, Khanna, *Zool. Surv. India, Fauna Cons. Area 9 : Fauna of Nanda Devi BR*, 105-106.

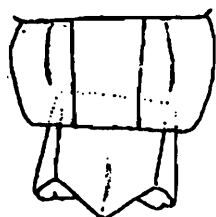


Fig. 29a

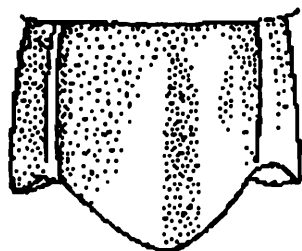


Fig. 29b

1998. *Rhysida monalii*, Khanna, Panchchuli Multidimensional Expedition, Sapper Adv. Foundation, Indian Army, p. 80.

2004. *Rhysida monalii*, Khanna, *Fauna of Conservation area Series : Fauna of Gobind Pashu Vihar, Uttarakhand*, Zool. Surv. India, pp. 29-31.

2005. *Rhysida monalii*, Khanna, *Fauna of Western Himalaya II*, H.P., Zool. Surv. India, pp. 221-229.

Type Locality : India : Pine Forest near Bageshwar, Almora (Uttarakhand).

Material Examined : Dehra Dun : Kansaro, 9.i.1987, 1ex., Raj Tilak; Uttarkashi, 9.vi.1985, 11ex., N.K. Sinha; Uttarkashi : Dunda and around, 8.vi.1989, 1ex., N.K. Sinha; Almora, Khairna Road, 2.ii.1978, 1ex., R.N. Chopra; Almora, On way to Dhakuri (Pindari Glacier, 2750m ASL), 25.viii.1980, P.C. Tak; Pauri, Khinanauli (CTR), 22.vi.2002, 3exs., J.P. Sati; Pithoragarh, Suggad, 6 kms from Sobala towards Tawaghat (Alt. 7000ft ASL), 29.iv.1998, 1ex., A.K. Joshi and Parmod Kumar.

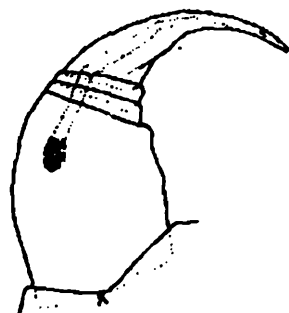


Fig. 29c

Repository of the Types : NZC, Zoological Survey of India

Description : (Fig. 26a-f) : Length : 31-40mm, excluding antennae and anal legs. Colour : Antennae and Cephalic plate bluish, all tergites and legs bluish green, Sternites light green (of live specimen). Cephalic Plate : Sparsely punctate, slightly overlapping the first tergite, broader than long, without basal plates or furrows. Antennae : 19 segmented with two to two and a half basal

segment glabrous; reflexed antennae reaching back upto the posterior margin of fifth tergal segment. Maxillipedes : Basal plate of the coxosternum broader than long, with 4+4 teeth; all teeth separated from each other by a definitive gap; base of the dental plate with a hair on each side immediately below the row of teeth; base of the coxosternum without furrows but with a funnel shaped marking. Tergites : All tergites without paramedian longitudinal furrows except smaller furrows at the posterior margins of the posterior body segments; first tergite longer than the second but shorter than the third; last tergite squared, without median furrow; posterior margin of the endtergite sinuate; only endtergite laterally emarginate. Coxopleura : The process of the coxopleura extending a third of its length beyond the end sternite; at the apex with three thorns; without thorns on the dorsal or lateral margins; Porose area of the Coxopleura process terminating into a cone; lateral margins of the porose area sinuate. Walking Legs : 1-18th pair of walking legs with two spurs to the first tarsal segment; 19th and 20th with one and 21st without tarsal spur; all legs with 2 spurs to the claws. Prefemur of the anal legs very longer than wide, ventro-laterally with 2, ventro-medially with 1 and dorsally with 1 thorn; prefemoral process absent.

Distribution : India : Himachal Pradesh, Jammu and Kashmir, Maharashtra, Uttarakhand, and Uttar Pradesh (Indian).

30. *Rhysida afra cuprea* Kraepelin, 1903

1903. *Rhysida afra cuprea*, Kraepelin, *Mitt. Mus.*, Hamburg, 20 : 154.

1912. *Rhysida cuprea*, Gravelly, *Rec. Indian Mus.*, 7(1) : 69-73.

1930. *Rhysida afra cuprea*, Attems, *Das Tierr.*, *Scolopendromorpha*, 54(2) : 197.

1995. *Rhysida afra cuprea*, Khanna, *Zool. Surv. India, Himalayan Ecosyst. Ser., Fauna of Western Himalaya I, Uttar Pradesh*, 111-113.

1996. *Rhysida afra cuprea*, Khanna, *Zool. Surv. India, State Fauna Ser.*, 6 : *Fauna of Delhi*, 467-475.

2005. *Otostigmus afra cuprea*, Khanna, *Fauna of Western Himalaya II.H.P.*, Zool. Surv. India, pp. 221-229.

Type Locality : Bhutan (Inhabane).

Repository of the Types : British Museum (Natural History), London.

Material Examined : Pauri : Landsdowne-Jhariakhal Road, 21.iv.1989, 21.iv.1989, 1ex., Arun Kumar; Nainital, Garjia and around (CTR), 2exs., 5.iv.2003, Vinod Khanna.

Description : (Fig. 27a-c) : Length : 64mm. Colour : Uniformly dark violet with metallic luster, almost copper colored. The large yellow hairs on antennae from 4th antennal segments, partially green. The antennal segment from 4th distinctly longer than wide; reflexed antennae reaching behind upto 6th tergite. Tergites : All tergites without paramedian longitudinal furrows, only posteriorly with 2 small furrows; only endtergite laterally emarginate. Sternites : With smaller furrows anteriorly. Coxopleura : Process of coxopleura considerably long with 2 apical spines, with or without lateral spines. Spiracles : 1st spiracle oval in shape. Legs : First 5-18 pair of walking legs with 2 tarsal spurs. Prefemur of the anal legs may be with or without thorns.

Remarks : Lewis (1992) regarded Nepalese material of *R. afra* without assigning further subspecific treatment and treated *Rhysida monalii* Khanna and Kumar from Western Himalaya and *R. afra cuprea* from Bhutan, Western and Eastern Himalaya, India and Bangladesh, as conspecific. The subject needs further studies and hence detailed discussion is abstained here.

Distribution : India : Assam, Arunachal Pradesh, Delhi, Himachal Pradesh, Meghalaya, Sikkim and West Bengal.

Elsewhere : Bhutan.

31. *Rhysida corbetti* Khanna, 1994

1994. *Rhysida corbetti*, Khanna, *Rec. zool. Surv. India*, 94(2-4) : 8, figs. 5-7.

Type Locality : India : Sarapduli (Corbett National Park), Distt. Pauri (Uttarakhand).

Repository of the Types : NZC, Zoological Survey of India.

Description : (Fig. 28a-c) : Colour : Totally faded on long preservation. Antennae : 18 segmented with 3 basal segments glabrous; reflexed antennae reaching behind up to the middle of the third tergal segment. Cephalic Plate:

smooth; longer than wide with an anterior median groove. Maxillipedes : Dental plate of the coxosternum with 5+5 all separate teeth, without post dental spur; prefemoral process of the coxosternum uni-dentate; base of the dental plate smooth but with a median sulcus running almost upto sternite-I; no oblique or oblong sutures visible. Tergites : smooth, not punctate; 5-19 tergal segments with a pair of complete paramedian longitudinal furrows but these furrows are rather feebly represented in the middle segments; endtergite without median furrow; emargination of tergites beginning from 18th segment; endtergite broader than long, arched laterally; posteriorly without any notch or suture. Sternites : smooth; 2-19 segments with a pair of deep paramedian longitudinal furrows; endsternite tapering posteriorly with posterior margin truncate; almost equal in length and width. Coxopleura : Sparsely punctate process of the coxopleura with 3 spines at its apex, without dorsal or lateral spine, slightly extends behind endsternite. Walking legs : Ist pair of walking legs with 2, 2-19 with 1 spur to first tarsal segment; 20th and 21st without such spur; all legs with 2 spurs to the terminal claws. Anal legs : Anal leg prefemur about 3 times longer than wide; 9 thorns arranged in 3 rows of three each; prefemoral process "Eckdorn" present with 2 spines.

Distribution : Uttarakhand.

Family CRYPTOPIDAE

1881. Cryptopsii, Kohlrausch, *Arch. Naturges.*, 47 : 53.

1930. Cryptopidae, Attems, *Das Tierr., Scolopendromorpha*, 54(2) : 200.

Subfamily CRYPTOPINAE Verhoeff

1906. Cryptopidae, Verhoeff, *N. Acta Ac. Leop.*, 86 : 432.

1926. Cryptopinae, Attems, *Kukenthal and Krumbach, Handb. Zool.*, 4 : 375.

Genus *Cryptops* Leach, 1814

1814. *Cryptops* Leach, *Trans. Linn. Soc.*, London, 11 : 384.

Type Species : *Cryptops hortensis* Leach.

32. *Cryptops doriae* Pocock, 1891

1891. *Cryptops doriae*, Pocock, *Ann. Mus.*, Genova, 30 : 421. (Myanmar).

1997. *Cryptops doriae*, Khanna, *Zool. Surv. India, Fauna Cons. Area 9 : Fauna of Nanda Devi BR*, 105-106.

1999. *Cryptops doriae*, Lewis, *Senckenbergiana biol.*, 79(1) : 19-38. (Nepal).

Type locality : Myanmar (Burma): Pegu, Palon; Upper Irrawaddy, Shwegoo; Carin Mount, Asciuii Ghecu district, village of Chiala.

Repository of the Types : Natural History Museum, London and Senckenberg Museum, Frankfurt.

Material Examined : Chamoli : On way to Dhakuri, (Pindari Trek) 1750-2900 M ASL), 25.viii.1890, 1ex., P.C. Tak; Dehra Dun, Mohund Rao, 4.i.2002, 1exs., A. Husain.

Description : (Figs. 29a-c) : Length : 10-33mm. Colour : Head yellowish brown to light brown; trunk brownish yellow to brown. Cephalic Plate : Cephalic plate about as long as wide, posterior border covered by 1st tergite; without longitudinal sutures. Antennae : Moderately long, 17 segmented; three basal segments dorsally with long setae and very few short setae on segment one; segment 4-17 with dense short setae and a single irregular whorl of long, mostly posteriorly directed setae. Tergite : 1st tergal segment without ring sulcus and longitudinal sulcus; tergites weakly punctate with complete paramedian longitudinal furrows beginning from 3rd, 4(5)-(19)-20. Curved, posteriorly incomplete lateral sulci on segment 3-20. Weak median longitudinal specie ridge present on 3,4,5-19, 20 segment. Endtergite a little wider than long with its posterior margin triangular with rounded apex and a shallow median longitudinal depression in the posterior half of the tergite. Sternites : Cruciform groove like sulci on segments 2/3-19/20. The longitudinal on sternite 1 and 20 or transverse sulcus on 19 and 20. The longitudinal

and transverse sulci equally developed, transverse sulcus curved forming some times a bow shape. Endsternite tapering behind, with posterior corners round and posterior margins straight. Coxosternum : An irregular row of 3+4 - 7+7 setae behind the anterior margin of coxosternum. Coxopleura : with 72 gland pores and 4+5 setae in the porose field; porose field occupying nearly 65% of the process, remaining pore-free posterior strip with 2-3 rows of strong setae, totaling 4-9. The posterior margin with 4,5, or 6 setae. Legs : 1-19 pair of legs with strong setae throughout the surface of the prefemur, but very few dorsally; femur with strong setae except dorsally, tibia with fine and strong setae. Legs 5-16 without strong setae. Strong setae occurring again on legs 17-19. Tarsi of most of the legs divided. 20th pair of legs with tarsus clearly divided. End Legs : Prefemur with strong setae except dorsally where they are fine. Femur with fine setae dorsally, becoming strong laterally and ventrally. Tibia and tarsus 1 and 2 with fine setae. Prefemur, femur without end teeth, very rarely present on tibia and tarsus. Anal-leg femur with single saw-like tooth. End teeth rarely present on tibia and tarsus. Tibial tooth row varies from 5 to 13 saw-like teeth. Tarsus with 2-5.

Distribution : India : Maharashtra and Uttarakhand.

Elsewhere : Java, Myanmar New Guinea, Nepal, Vietnam. (Indo-Malayan extending to Australia).

ACKNOWLEDGEMENTS

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Sl. No.	Name of the Species	Known Distribution in India	Remarks
1.	<i>Scolopendra morsitans</i> Linnaeus, 1758	Cosmopolitan	Occurs in many colour forms & sizes
2.	<i>Scolopendra subspinipes dehaani</i> Brandt, 1840	Assam, A & N Isl., Kerala, Karnataka, Maharashtra, Madhya Pradesh, Tamil Nadu, Uttar Pradesh, Uttarakhand and West Bengal.	Check listed in the Indian Centipedes by Khanna 2001. from Uttarakhand, presently no material studied.
3.	<i>Scolopendra amazonica</i> (Bucherl), 1946	A & N Isl., Delhi, Goa, Gujarat, Kerala, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, and Tamilnadu. Uttar Pradesh and Uttarakhand.	Not available in the present lot. The species has a known distribution in Uttarakhand.
4.	<i>Cormocephalus dentipes</i> Pocock, 1891	A & N Isls., Bihar, Delhi, Himachal Pradesh, Meghalaya, Mizoram, Madhya Pradesh, Orissa, West Bengal, Uttar Pradesh and Uttarakhand.	(Indian : Endemic).
5.	<i>Cormocephalus pygmaeus</i> Pocock, 1892	Assam, A & N Isl., Bihar, Maharashtra, Rajasthan, Tamilnadu, Uttar Pradesh, Uttarakhand and West Bengal.	
6.	<i>Asanada indica</i> Jangi and Dass, 1984	Delhi, Haryana, Himachal Pradesh, Kerala, Maharashtra, Rajasthan, Uttar Pradesh and Uttarakhand	Fairly common in Uttarakhand, U.P. and U.P Terai
7.	<i>Otostigmus morsitans</i> Pocock, 1890	Himachal Pradesh, Tamilnadu, Uttarakhand and Uttar Pradesh	First record from Uttarakhand
8.	<i>Otostigmus poonamae</i> Khanna and Tripathi, 1986	Himachal Pradesh and Uttarakhand.	
9.	<i>Otostigmus ruficeps</i> Pocock, 1890	India : Meghalaya, Tamilnadu and Uttarakhand	First Record from Uttarakhand
10.	<i>Otostigmus nudus</i> Pocock, 1890	Himachal Pradesh, Meghalaya, Tamilnadu, Uttarakhand and Uttar Pradesh. (Indian)	
11.	<i>Otostigmus ceylonicus</i> Haase, 1887	Himachal Pradesh, Meghalaya, Maharashtra, Uttarakhand and Uttar Pradesh	
12.	<i>Otostigmus politus politus</i> Karsch, 1881	Assam, Delhi, Himachal Pradesh, Kerala, Maharashtra, Meghalaya, Orissa, Sikkim, Uttarakhand and West Bengal;	
13.	<i>Otostigmus politus quadrispinosus</i> ssp. nov.	Uttarakhand	Subspecies new to science
14.	<i>Otostigmus amballae</i> Chamberlin, 1913	Haryana, Himachal Pradesh, Uttar Pradesh and Uttarakhand	
15.	<i>Otostigmus burn-murdochi</i> Gravely, 1912	Himachal Pradesh	First record from Uttarakhand
16.	<i>Otostigmus splendens</i> , Pocock, 1890	India: Maharashtra, Tamilnadu	First record from Uttarakhand
17.	<i>Ethmostigmus pygomegas</i> (Kohlrausch), 1881	Assam, A & N Isl., Himalayas (?), Uttarakhand, Himachal Pradesh and West Bengal.	First record from Uttarakhand
18.	<i>Rhysida lithobioides shivalikensis</i> Khanna, 1994	Delhi and Uttarakhand	

Sl. No.	Name of the Species	Known Distribution in India	Remarks
19.	<i>Rhysida lithobioides kumaonensis</i> Khanna, 1994	Uttarakhand and U.P. Terai, Distt. Lakhimpur Kheri	
20.	<i>Rhysida crassispina</i> Kraepelin, 1903	Maharashtra, Meghalaya, Uttarakhand and Uttar Pradesh	First record from Uttarakhand
21.	<i>Rhysida nuda nuda</i> (Newport), 1845	Assam, Andhra Pradesh, Haryana, Karnataka, Meghalaya, Maharashtra, Madhya Pradesh, Orissa, Tamilnadu, Tripura and Uttar Pradesh.	
22.	<i>Rhysida nuda immarginata</i> (Porath) 1876	Assam, A & N Isl., Delhi, Gujarat, Madhya Pradesh, Maharashtra, Rajasthan, Uttarakhand, Uttar Pradesh and West Bengal.	
23.	<i>Rhysida longipes longipes</i> (Newport), 1845	Arunachal Pradesh, A & N Isl., Delhi, Goa, Karnataka, Maharashtra, Madhya Pradesh, Uttar Pradesh, Uttarakhand and West Bengal.	
24.	<i>Rhysida longipes punctata</i> ssp. nov	U.P. and Uttarakhand	New subspecies
25.	<i>Rhysida longipes simplicior</i> Chamberlin. 1920	India : Delhi, Tamilnadu and Uttarakhand	
26.	<i>Rhysida stuhlmanni himalayanus</i> Khanna, 1994	Uttarakhand	
27.	<i>Rhysida carinulata</i> (Haase), 1887	Uttarakhand.	
28.	<i>Rhysida longicarinulata</i> , Khanna and Tripathi, 1985	Uttarakhand, Uttar Pradesh and Himachal Pradesh	
29.	<i>Rhysida monalii</i> Khanna and Kumar, 1984	Himachal Pradesh, Jammu and Kashmir, Maharashtra, Uttarakhand, and Uttar Pradesh (Indian).	
30.	<i>Rhysida afra cuprea</i> Kraepelin, 1903	India: Assam, Arunachal Pradesh, Delhi, Himachal Pradesh, Meghalaya, Sikkim and West Bengal.	
31.	<i>Rhysida corbetti</i> Khanna, 1994	Uttarakhand.	
32.	<i>Cryptops doriae</i> Pocock, 1891	Maharashtra and Uttarakhand	

ARANEAE : SPIDER

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INTRODUCTION

The Western Himalayas (Uttarakhand) consists of two well defined regions Kumaun and Garwall Hills. The Kumaun Hill consists of three administrative districts viz (1) Almorah (2) Pithoragarh and (3) Nainital. The Garwall Hills generally consists of five administrative districts viz (1) Dehra Dun (2) Tehri (3) Pauri (4) Uttarkashi and (5) Chamba.

Although there are several published papers on the spiders of Western Himalayas (Cambridge 1885, Stoliczka 1869, Simon 1889, Pocock 1900, Simon 1906, Gravely 1931, Caporiacco 1939, 1935, Sinha 1951, Basu 1964, Tikader 1980, 1982 and Biswas & Biswas 1992, 2003, 2004, 2006, 2007) but so far as the spider fauna of Western Himalayan region is concerned, the published information is indeed scanty. Since, the present work was taken to given an upto-date information regarding the families Theraphosidae, Eresidae, Pholcidae, Theridiidae, Linyphidae, Araneidae, Tetragnathidae, Hersiliidae, Lycosidae, Oxyopidae, Gnaphosidae, Clubionidae, Heteropodidae, Selenopidae, Thomisidae, Salticidae from Western Himalayas in the light of modern taxonomic concept. We are hopeful that the comprehensive account of the spider fauna of Western Himalayas well prove quite useful to the future workers also. The work is based upon the specimens collected by us and from the different parts of the Western Himalayan regions by the survey parties of Northern Regional Station, Dehra Dun (Uttarakhand), the specimens are deposited at National Collection, Northern Regional Station, Dehra Dun ad Head Quarter, Kolkata, Zoological Survey of India.

Although, a total 127 species belonging to 49 genera under 17 families are dealt with of those

109 species in 47 genera under 17 families are recorded first time these areas.

List of known species from Uttarakhand, Western Himalayas stated below.

SYSTEMATIC LIST

Family THERAPHOSIDAE

Genus *Phlogoides* Pocock

1. *Phlogoides himalayensis* Tikader

Genus *Ornithoctonus* Pocock

2. *Ornithoctonus gadgilli* Tikader

Genus *Ischnocolus* Ausserar

3. *Ischnocolus khasiensis* Tikader

Family ERESIDAE

Genus *Stegodyphus* Simon

4. *Stegodyphus sarasinorum* Karsch

Family ULOBORIDAE

Genus *Uloborus* Liatreille

5. *Uloborus danolius* Tikader

Family PHOLCIDAE

Genus *Crossopriza* Simon

6. *Crossopriza lyoni* (Blackwall)

Family THERIDIIDAE

Genus *Achaeearanea* Strand

7. *Achaeearanea durgae* Tikader

Family LINYPHIDAE

Genus *Linyphia* Liatreille

8. *Linyphia sikkimensis* Tikader

Genus *Lephtyphantes* Menge

9. *Lephty phantes rudrai* Tikader

Family ARANEIDAE

Genus *Aranens* Clerck

- 10.
- Araneus mitifica*
- (Simon)

Genus *Argiope* Audouin

11. *Argiope pulchella* Thorell
 12. *Argiope anasaja* Thorell
 13. *Argiope pradhani* Sinha
 14. *Argiope aemula* (Walckenaer)
 15. *Argiope shillongensis* Sinha
 16. *Argiope catenulata* (Doleschall)

Genus *Cyclosa* Menge

17. *Cyclosa simoni* Tikader
 18. *Cyclosa spirifera* Simon

Genus *Larinia* Simon

19. *Larinia chloris* (Audouin)
 20. *Larinia phthisica* (L. Koch)

Genus *Neoscona* Simon

21. *Neoscona nautica* (L. Koch)
 22. *Neoscona mukerjei* Tikader
 23. *Neoscona rumpfi* (Thorell)
 24. *Neoscona theis* (Walckenaer)
 25. *Neoscona shillongensis* Tikader & Bal
 26. *Neoscona odites* (Simon)
 27. *Neoscona pavidia* (Simon)

Genus *Lieucange* White

28. *Lieucange decorata* (Blackwall)
 29. *Lieucange celebesiana* (Walckenaer)
 30. *Lieucange tessellata* (Thorell)

Genus *Nephila* Leach

31. *Nephila maculata* (Fabricius)
 32. *Nephila dirangensis* Biswas & Biswas
 33. *Nephila robusta* Tikader
 34. *Nephila clavata* L. Koch
 35. *Nephila kuhlii* Doleschall
 36. *Nephila malabarensis* (Walckenaer)

Family TETRAGNATHIDAE

Genus *Tetragnatha* Latreille

- 37.
- Tetragnatha andamanensis*
- Tikader

Genus *Eucta* Simon

- 38.
- Eucta javana*
- Thorell

Family HERSILIIDAE

Genus *Hersilia* Audouin

- 39.
- Hersilia savignyi*
- Lucas

Family LYCOSIDAE

Genus *Hippasa* Simon

40. *Hippasa agelenoides* (Simon)
 41. *Hippasa greenalliae* (Blackwall)
 42. *Hippasa holmerae* Thorell
 43. *Hippasa lowndesi* Gravely
 44. *Hippasa mahabaleshwariensis* Tikader & Malhotra
 45. *Hippasa madraspatna* Gravely

Genus *Pardosa* Koch

46. *Pardosa minutus* Tikader & Malhotra
 47. *Pardosa atropalpis* Gravely
 48. *Pardosa mukundi* Tikader & Malhotra
 49. *Pardosa birmanica* Simon
 50. *Pardosa kupupa* (Tikader)
 51. *Pardosa ookleyi* Gravely
 52. *Pardosa burasantiensis* Tikader & Malhotra
 53. *Pardosa rhenockensis* (Tikader)
 54. *Pardosa shyamae* (Tikader)
 55. *Pardosa heterophthalmus* Tikader & Malhotra
 56. *Pardosa leucopalpis* Gravely
 57. *Pardosa annandalei* (Gravely)
 58. *Pardosa sumatrana* (Thorell)
 59. *Pardosa ladakhensis* Tikader

Genus *Arctosa* Koch

60. *Arctosa indicus* Tikader & Malhotra
 61. *Arctosa mulani* (Dyal)

Genus *Lycosa* Latreille

62. *Lycosa himalayensis* Gravely
 63. *Lycosa tista* Tikader
 64. *Lycosa chaperi* Simon
 65. *Lycosa madani* Pocock
 66. *Lycosa phipsoni* Pocock
 67. *Lycosa shillongensis* Tikader & Malhotra
 68. *Lycosa nigrotiabilis* Simon
 69. *Lycosa prolifica* Pocock
 70. *Lycosa indagatrix* Walckenaer

71. *Lycosa iranii* Pocock
72. *Lycosa quadrifer* Gravely
73. *Lycosa pictula* Pocock
74. *Lycosa fuscana* Pocock
75. *Lycosa mahabaleshwariensis* Tikader & Malhotra
76. *Lycosa lambai* Tikader & Malhotra
Genus *Trochosa* Koch
77. *Trochosa punctipes* Gravely
78. *Trochosa himalayensis* Tikader
Family OXYOPIDAE
Genus *Oxyopes* Latreille
79. *Oxyopes shweta* Tikader
Genus *Peucetia* Thorell
80. *Peucetia latikae* Tikader
81. *Peucetia viridana* Stotiezka
Family GNAPHOSIDAE
Genus *Gnaphosa* Latreille
82. *Gnaphosa poonaensis* Tikader & Gajbe
Genus *Scopodes* Chamberlin
83. *Scopodes maitraiae* Tikader & Gajbe
84. *Scopodes kuljitae* Tikader
85. *Scopodes pritae* Tikader
Genus *Geodrassus* Chamberlin
86. *Geodrassus sirmourensis* Tikader & Gajbe
Genus *Drassodes* Westring
87. *Drassodes lubrica* (Simon)
Genus *Sosticus* Chamberlin
88. *Sosticus nainitalensis* Gajbe
Genus *Zelotes* Gistel
89. *Zelotes nainitalensis* Tikader & Gajbe
90. *Zelotes surekhae* Tikader & Gajbe
91. *Zelotes mandlaensis* Tikader & Gajbe
Genus *Haplodrassus* Chamberlin
92. *Haplodrassus sataraensis* Tikader & Gajbe
93. *Haplodrassus dumdumensis* Tikader
Family CLUBIONIDAE
Genus *Clubiona* Latreille
94. *Clubiona drassodes* Cambridge
95. *Clubiona hysgina* Simon
96. *Clubiona shillongensis* Majumder & Tikader
97. *Clubiona chakrabartei* Majumder & Tikader
98. *Clubiona crouxi* Majumder & Tikader
Genus *Cheiracanthium* Koch, C.L.
99. *Cheiracanthium melanostoma* (Thorell)
100. *Cheiracanthium himalayensis* Gravely
101. *Cheiracanthium panriensis* Majumder & Tikader
102. *Cheiracanthium trivialis* (Thorell)
103. *Cheiracanthium sadanai* Tikader
Genus *Oedignatha* Thorell
104. *Oedignatha procerula* Simon
Genus *Apochinomma* Pavesi
105. *Apochinomma dolosum* Simon
Family HETEROPODIDAE
Genus *Spariolenus* Simon
106. *Spariolenus petricola* Gravely
107. *Spariolenus tigris* Simon
Genus *Heteropoda* Latreille
108. *Heteropoda phasma* Simon
109. *Heteropoda kuluensis* Sethi & Tikader
110. *Heteropoda venatoria* Linn.
111. *Heteropoda kandiana* Pocock
112. *Heteropoda bhaikakai* Patel & Patel
Family SELENOPIIDAE
Genus *Selenops* Latreille
113. *Selenops ugamensis* Tikader
Family SALTICIDAE
Genus *Marpissa* Koch
114. *Marpissa dhakuniensis* Tikader
115. *Marpissa calcuttaensis* Tikader
Genus *Myrmarachne* Mac Leay
116. *Myrmarachne orientalis* Tikader
117. *Myrmarachne bengalensis* Tikader
Genus *Plexippus* Koch
118. *Plexippus paykullii* (Audouin)
Genus *Phidippus* Koch
119. *Phidippus indicus* Tikader
120. *Phidippus pateli* Tikader

Genus *Zygoballus* Peckham

121. *Zygoballus pashanensis* Tikader

122. *Zygoballus narmadaensis* Tikader

Family THOMISIDAE

Genus *Thomisus* Walckenaer

123. *Thomisus projectus* Tikader

Genus *Diaea* Thorell

124. *Diaea jaintious* Tikader

Genus *Xysticus* Koch

125. *Xysticus shyamrupus* Tikader

Genus *Camarius* Thorell

126. *Camariens formosus* Thorell

SYSTEMATIC ACCOUNT

Family THERAPHOSIDAE

Key to the genera of the family Theraphosidae

1. Thoracic fovea very deep and strongly procurved *Phlogoides*

Thoracic fovea not very deep and strongly procurved 2

2. Carapace elevated in the cephalic region
..... *Ornithoconus*

Carapace not elevated in the cephalic region
..... 3

3. First pair of legs of male without libial spur .
..... *Ischnocolus*

Genus *Phlogoides* Pocock

1899. *Phlogoides* Pocock, *J. Bombay nat. Hist. Soc.*, 12 : 784.

Type-species : *Phlogoides validus* Pocock.

Distribution : India : West Bengal; Western Himalayas.

1. *Phlogoides himalayensis* Tikader

1976. *Phlogoides himalayensis* Tikader, *J. Bombay nat. Hist. Soc.*, 74 : 306.

Diagnosis : Anterior now of eyes slightly procurved. Cephalothorax provided with deep procurved fovea. Eyes situated in a group on slightly elevated tubercle. Two pairs of spinnerets long with three segments.

Material examined : 1 ♀, Pandukeswar, Dist. Chamoli, Garwall Hills, Uttarakhand, 10.vii.1978,

coll. R.N. Bhargav; 2 ♂, Narkuchtal; Dist. Nainital, Kumaun Hills, Uttarakhand, 24.ix.1979, coll. Arun Kumar; 1 ♂, F.R.H. Ohata, Dist. Chamoli, Garwall Hills, Uttarakhand, 8.ix.1979, coll. Raj Tilak.

Distribution : India : Uttarakhand (Dist. Chamoli, Nainital), New Record; West Bengal (Type-locality : Darjiling).

Genus *Ornithoconus* Pocock

1892. *Ornithoconus* Pocock, *J. Linn. Soc. Zool.*, 24 : 317.

Type-species : *Ornithoconus andersoni* Pocock.

Distribution : India : Mayanmar.

2. *Ornithoconus gadgilli* Tikader

1976. *Ornithoconus gadgilli* Tikader, *J. Bombay nat. Hist. Soc.*, 74 : 307.

Diagnosis : Carapace elevated in cephalic region, thoracic fovea large and scarcely proenrved. Legs strong and stout.

Material examined : 1 ♀, Naogakhal, Dist. Tehri, Garwall Hills, Uttarakhand, 29.iv.1989, coll. Arun Kumar; 1 ♀, Garduala, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 21.i.1989, coll. S.C. Verma; 1 ♀, Somiswar, Dist. Almora Kumaun Hills, Uttarakhand, 20.xii.1985, coll. J.C. Tripathi.

Distribution : India : Uttarakhand (Dists. Almora, Pithoragarh, Tehri), New Record; West Bengal; Meghalaya.

Genus *Ischnocolus* Ausserar

1871. *Ischnocolus* Ausserar, *Ver. z-b, Cres. Wien.*, 24 : 184.

Type-species : *Ischnocolus holocericeus* Ausserar.

Distribution : Mditerranean district of Palaeartic region and oriental region.

3. *Ischnocolus khasiensis* Tikader

1978. *Ischnocolus khasiensis* Tikader, *J. Bombay nat. Hist. Soc.*, 74 : 308.

Diagnosis : Cephalothorax longer than wide, slightly broader in front, middle provided with a deep, short, straight, transverse fovea. Legs long and moderately strong. Metatarsi and tarsi of all legs provided with ventral scopulae.

Material examined : 1 ♀, Jamkhet, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 10.xii.1989, coll. S.C. Verma; 1 ♀, Darsu, Dist. Uttarakashi, Garwall Hills, Uttarakhand, 9.vi.1989, coll. N.K. Sinha; 1 ♀, A.R.H. Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 19.xii.1977, coll. Arun Kumar; 1 ♀, Mussoori, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 22.xi.1985, coll. R.N. Chopra; 1 ♀, Jhulagarh, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 11.xii.1989, coll. S.C. Verma; 1 ♀, Jhariagad, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 21.x.1977, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dists. Dehra Dun, Pithoragarh), New Record; Meghalaya; Mizoram.

Family ERESIDAE
Genus *Stegodyphus* Simon

1873. *Stegodyphus* Simon, *Ann. Soc. Ent. Fr.*, 3(5) : 336.

1981. *Stegodyphus* : Tikader & Biswas, *Rec. zoll. Surv. India, Occ. Pap. No.*, 30(1) : 14.

Diagnosis : Cephalic region large, rounded and high. Posterior lateral eyes remote from the other eyes. Abdomen oval, anterior spinnerets thick.

Type-species : *Stegodyphus lineatus* Latreille

Distribution : Central and South Europe; Western Asia; Chin; India; Myanmar; Sri Lanka; Africa.

4. *Stegodyphus sarasinorum* Karsch

1892. *Stegodyphus sarasinorum* Karsch, *Ent. Z. Berlin*, 36 : 276.

1992. *Stegodyphus sarasinorum* : Biswas & Biswas, *Fauna of West Bengal, Part-III, Araneae : Spiders, State Fauna Series*, 3 : 378.

Diagnosis : Spiders are gregarious in habits. It spins labyrinthine tube, which ends blindly one end and the another end expanded into a broad sheet which however is similar than that of spun by the genus *Hippasa*.

Material examined : 1 ♀, Chamba, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 11.x.1977, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dist. Pithoragarh), New Record; West Bengal; Andhra Pradesh; Maharashtra; Orissa; Punjab; Tamil Nadu.

Family ULOBORIDAE
Genus *Uloborus* Latreille

1806. *Uloborus* Latreille, *Gen. Crust. Ins. etc.*, 1 : 109.

Diagnosis : Anal tubercle prominent in the female, diminished in male. Legs of first pair are much longer and stronger than the rest. Male tibiae of first with six to seven dorsal spines, almost in the form of teeth.

Type-species : *Uloborus walckenaerius* Latreille

Distribution : Cosmopolitan except Australia.

5. *Uloborus danolius* Tikader

1969. *Uloborus danolius* Tikader, *Proc. Indian Acad. Sci.*, 70 : 128.

1992. *Uloborus danolius* : Biswas & Biswas, *Fauna of West Bengal, Part-III, Araneae : Spiders, State Fauna Series*, 3 : 379.

Diagnosis : Cephalothorax nearly as long as wide, two conspicuous longitudinal deep brown broad patches on it. Eyes are black and two rows. Posterior row of eyes are almost equal in size and spaced. Sternum is longer than wide, deep brown and clothed with hair. Legs are clothed with hair and banded black patches. Abdomen is longer than wide and clothed with fine hair and decorated with fine net-like structures. Anterior dorsum of the abdomen provided with a hump. Mid-ventral side with two longitudinal deep brown bands extending from epigastric fold.

Material examined : 5 ♀, Motichur near Rajaji National Park, Dist. Haridwar, Garwall Hills, Uttarakhand, 17.iii.2005, coll. B.K. Biswas & party; 10 ♀, 4 ♂, Mussoori, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 22.x.2005, coll. R. Roy.

Distribution : India : Uttarakhand (Dists. Haridwar, Dehra Dun), New Record; West Bengal; Maharashtra.

Family PHOLCIDAE
Genus *Crossopriza* Simon

1893. *Crossopriza* Simon, *Hist. Nat. Arign.*, 1 : 476.

1992. *Crossopriza* : Biswas & Biswas, *Fauna of West Bengal, Part-III, Araneae : Spiders, State Fauna Series*, 3 : 383.

Diagnosis : Abdomen slightly oval, abruptly declined posteriorly, raised much above the spinnerets. Generally found from the corner of house.

Type-species : *Crossopriza pristina* Simon

Distribution : India, Arabia, Egypt.

6. *Crossopriza lyoni* (Blackwall)

1867. *Pholcus lyoni* Blackwall, *Ann. Mag. Nat. Hist.*, 19(3) : 302.

1992. *Crossopriza lyoni* : Biswas & Biswas, *Fauna of West Bengal*, Part-III, Araneae : Spiders, *State Fauna Series*, 3 : 383.

Diagnosis : The anterior median eyes are smallest, while the other eyes are arranged in two triads. The legs are extremely long and thin and the tarsi flexible. The snares are sheet like or irregular, the spider hanging in an inverted position beneath the web. They are built in collars and other dark locations. The eggs when laid are surrounded by only a few fibers and held by the female in her chelicerae.

Material examined : 10♀, 2♂, Haridwar, Dist. Haridwar, Garwall Hills, Uttarakhand, 17.iii.2005, coll. B.K. Biswas & party; 6♀, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand, 31.x.2003, coll. B.K. Biswas & party; 6♀, Mussoori, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 14.iii.2005, coll. B.K. Biswas & party; 10♀, Mussoori, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 21.x.2005, coll. R. Roy.

Distribution : India : Uttarakhand (Dists. Haridwar, Dehra Dun, Ranikhet), New Record; West Bengal; Punjab; Rajasthan; Uttar Pradesh; Tamil Nadu.

Elsewhere : Myanmar.

Family THERIDIIDAE

Genus *Achaeearanea* Strand

1929. *Achaeearanea* Strand, *Acta. Univ. Latviensis*, 20 : 11.

1963. *Achaeearanea* : Levi, *Bull. Mns. comp. Zool. Harvd.*, 129(3) : 190.

1970. *Achaeearanea* : Tikader, *Rec. zool. Surv. India*, 64(1-4) : 16.

Diagnosis : The median apophysis of the palp broadly attached to the tegulum, with which it may form one sclerite. The cymbium often extends beyond the alveolus. Theridion differs by having

median apophysis and embolus. Unlike Theridion the abdomen of many species higher than long, often with a hump, rarely longer than high.

Type-species : *Achaeearanea trapezoidalis* (Taczanowski).

Distribution : America, India.

7. *Achaeearanea durgae* Tikader

1970. *Achaeearanea durgae* Tikader, *Rec. zool. Surv. India*, 64(3-4) : 17.

Diagnosis : Cephalothorax and abdomen greenish brown, legs light green in colour. Cephalothorax slightly longer than wide, convex, narrowing in front; clothed with fine hair. Clypeus round and deep groove under eyes. Legs robust, clothed with thick hair. Tarsi of IV pair of legs with distinct comb-like setae. Abdomen globular, slightly overlapping the posterior region of cephalothorax in front. Spinners behind the middle of the abdomen with an elevated knob. Abdomen provided with irregular white patches.

Material examined : 2♀, Rajaji National Park, Dist. Haridwar, Garwall Hills, Uttarakhand, 17.iii.2005, coll. Bijan Biswas.

Distribution : India : Uttarakhand (Dist. Haridwar), New Record; West Bengal; Sikkim.

Family LINYPHIDAE

Key to the genera of the family Linyphidae

1. Posterior eyes not closely set. Median ocular area longer than wide *Linyphia*
Posterior eyes closely set. Median ocular longer than wide 2
2. Eyes are fairly large *Lepthyphantes*

Genus *Linyphia* Latreille

1804. *Linyphia* Latreille, *Nouv. Dict. Hist. Nat.*, 24 : 134.

1884. *Linyphia* : Simon, *Ar. Fr.*, 5 : 262.

Type-species : *Linyphia triangularis* Clerck.

Distribution : Europe, Africa, Asia, Australia, America.

8. *Linyphia sikkimensis* Tikader

1970. *Linyphia sikkimensis* Tikader, *Rec. zool. Surv. India*, 64(1-4) : 20.

Diagnosis : Cephalothorax and legs brownish green, abdomen chalk white in colour. Cephalothorax longer than wide, flat, broadest in the middle and anterior row recurved, posterior row straight, lateral eyes small and contiguous, all eyes encircled by black patches. Ocular area provided with deep brown patches, ocular quad longer than wide. Sternum black, heart shaped. Legs long, clothed with fine hair. Abdomen longer than wide, broadest behind the middle. Anterior half of dorsal side provided with two longitudinal broad black lines extending from base to just behind the middle and posteriorly with black bands.

Material examined : 2 ♀, Haridwar, Dist. Haridwar, Garwall Hills, Uttarakhand, 24.iii.2005, coll. Bijan Biswas.

Distribution : India : Uttarakhand (Dist. Haridwar), New Record; Sikkim (Type-locality).

Genus *Lephtyphantes* Menge

1866. *Lephtyphantes* Menge, *Prenss. Spinn.*, 1 : 95.

1895. *Lephtyphantes* : Simon, *Hist. Nat. Araig.*, 1 : 705.

Type- species : *Lephtyphantes nebulosus* Sundevall.

Distribution : Europe, Africa, Asia, Australia, America.

9. *Lephtyphantes rudrai* Tikader

1970. *Lephtyphantes rudrai* Tikader, *Rec. zool. Surv. India*, 64(1-4) : 25.

Diagnosis : Cephalothorax brown, abdomen dirty chalk white and legs green in colour. Cephalothorax longer than wide, flat, finely pubescent, centre depressed, narrow in front, cephalic region slightly raised. Eyes pearly white, surrounded by black patches, anterior strongly recurved, posterior row straight, lateral and anterior medians contiguous but anterior median smaller than others. Sternum triangular, pointed behind, deep brown in colour. Legs long and slender, clothed with hair. Abdomen longer than nearly oval and provided with chalk-white minute patches, with a longitudinal dark brown band mid-dorsally and similar lateral dark brown bars. Central side deep brown.

Material examined : 1 ♀, Ranikhet, Dist. Ranikhet, kumaun Hills, Uttarakhand, 31.x.2003, coll. Bijan Biswas.

Distribution : India : Uttarakhand (Dist. Ranikhet), New Record; Sikkim (Type-locality).

Family ARANEIDAE

Key to the genera of the family Araneidae

1. Thoracic groove transverse; epigyne with distinct scape, often wrinkled, not provided with any lateral lobes *Araneus*
 Thoracic groove not transverse; epigyne without scape and with lateral lobes 2
2. Eyes of anterior row not evenly spaced or medians not closer to each other than laterals *Argiope*
 Eyes of anterior row evenly spaced or medians not closer to each other than laterals 3
3. Posterior median eyes very close, nearly touching; carapace provided with a "U" shaped junction between cephalic and thoracic region *Cyclosa*
 Posterior median eyes not-very close, carapace not having any "U" shaped junction between cephalic and thoracic region 4
4. Abdomen a little pointed mid-longitudinally over the carapace and no caudal projection *Liarinia*
 Abdomen not pointed mid-longitudinally over the carapace and with caudal projection ... 5
5. Thoracic groove, longitudinal epigyne with unwrinkled scape and provided with one or two pairs of lateral lobes *Neoscona*
 Thoracic groove, longitudinal epigyne with wrinkled scape and provided with no lobes 6
6. Femora IV with a double fringe of hair on the pro-lateral surface of the basal half; abdomen ornamented with silvery bands on spots; thoracic furrow deep but not long *Leucauge*
 Femora IV without fringe of hair on the pro-lateral surface of the basal half; abdomen not ornamented; thoracic groove not deep but long 7
7. Carapace with cephalic region convex and elevated; abdomen elongated or oval, non lobate *Nephila*

Genus *Araneus* Clerck

1757. *Araneus* Clerck, *Argn. Succ.*, : 15.
 1900. *Araneus* : Pocock, *Fauna Brit. India, Arachn.*, : 227.
 1921. *Araneus* : Gravely, *Rec. Indian Mus.*, 22(4) : 414.
 1970. *Araneus* : Tikader, *Rec. zool. Surv. India*, 64(1-4) : 30.
 1973. *Araneus* : Levi, *Bull. Mus. comp. Zool. Harv.*, 145(9) : 473.

Type- species : *Araneus angulatus* (Simon).

Distribution : Cosmopolitan.

10. *Araneus mitifica* (Simon)

1886. *Epeira mitifica* Simon, *Act. Soc. Linn. Bordeaux*, 40 : 150.
 1963. *Araneus mitifica* : Tikader, *J. Univ. Poona Sci. & Tech.*, 24 : 43.
 1992. *Araneus mitifica* : Biswas & Biswas, *Fauna of West Bengal, Part-III, Araneae : Spiders, State Fauna Series*, 30 : 352.
 2004. *Araneus mitifica* : Biswas Biswas, *Fauna of Manipur, Part-2, Araneae : Spiders, State Fauna Series*, 10 : 42.

Diagnosis : Cephalothorax longer than wide, narrowing in front clothed with pubescence and hair. Posterior median eyes encircled by black rings. Lateral eyes close and each situated on black tubercles. Chelicerae strong, yellowish, provided with moderate boss. Legs are long and moderately strong, yellowish, distal ends of metatarsi and tarsi with dark brown transverse bands. Abdomen nearly globular but slightly narrow anteriorly than posteriorly. Dorsum provided with a pair of wing shaped large median black patch and two lateral black patches. Two pairs of small but distinct tubercles at the posterior end of the abdomen.

Material examined : 1 ♀, Binta, Dist. Almora, Kumaun Hills, Uttarakhand, 26.ix.2004, coll. M. Ghosh; 2 ♀, Rajaji National Park, Garwall Hills, Uttarakhand, 17.iii.2005, coll. B.K. Biswas & party; 2 ♀, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand, 31.x.2003, coll. B.K. Biswas & party; 1 ♀, Moticlur, Dist. Haridwar, Garwall Hills, Uttarakhand, 17.iii.2005, coll. Bijan Biswas.

Distribution : India : Uttarakhand (Dists. Haridwar, Ranikhet, Almora), New Record; West Bengal; Maharashtra; Manipur; Karnataka.

Elsewhere : Pakistan, Mayanmar.

Genus *Argiope* Audouin

826. *Argiope* Audouin, in Savigny, *Descriptions de J Egypte.*, 1(4) : 121.
 1900. *Argiope* : Pocock, *Fauna Brit. India, Arachn.*, : 220.
 1982. *Argiope* : Tikader, *Fauna of India, Araneae : Spiders*, 2(1) : 111.
 2004. *Argiope* : Biswas & Biswas, *Fauna of Manipur, Part-2, Araneae : Spiders, State Fauna Series*, 10 : 42.

Type- species : *Argiope lobata* (Thorell).

Distribution : Tropical and temperate countries of the world.

Key to the species of the genus *Argiope* Audouin

1. Maxillae rounded in shape, dark brown at the proximal part *pulchella*
 Maxillae not rounded in shape, not dark brown at the proximal part 2
2. Anterior edge of the epigyne provided with a broad and conspicuous lip; median epigynal septum abruptly wide posteriorly
 *anasuja*
 Anterior edge of the epigyne provided with very thin and inconspicuous lip; median epigynal septum gradually wider posteriorly 3
3. Abdomen not blunt anteriorly; dorsum with no pubescence and yellow patches, but nine distinct transverse brown stripes
 *pradhani*
 Abdomen blunt anteriorly; dorsum with pubescence but without distinct transverse brown stripes 4
4. Abdomen broadly oval and conspicuously truncated anteriorly; dorsum provided with black transverse stripes and forming a net work on the posterior half *aemula*
 Abdomen elongated oval with no truncation anteriorly, dorsum without net work of black stripes 5
5. Cephalothorax and legs light yellowish brown in colour *shillongensis*
 Cephalothorax and legs not yellowish brown in colour 6

6. Abdomen anteriorly blunt; dorsum with a median longitudinal portion clothed with silky pubescence and some yellowish palches
..... *catenulata*

11. *Argiope pulchella* Thorell

1881. *Argiope pulchella* Thorell, *Ann. Mus. civ. Genova*, 16 : 74.
1900. *Argiope pulchella* : Pocock, *Fauna of Brit. India Aracn.*, : 221.
1970. *Argiope pulchella* : Tikader, *Rec. zool. Surv. India*, 64(1-4) : 27.
1982. *Argiope pulchella* : Tikader, *Fauna of India, Araneae : Spiders*, 2(1) : 129.
2006. *Argiope pulchella* : Biswas Biswas, *Fauna of Arunachal Pradesh, Part-2, Araneae : Spiders, State Fauna Series*, 13 : 509.

Material examined : 3 ♀, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand, 31.x.2003, coll. B.K. Biswas & party; 2 ♀, Srinagar, Dist. Srinagar, Garwall Hills, Uttarakhand, 18.iii.2005, coll. B.K. Biswas & party; 3 ♀, Mussoori, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 21.x.2005, coll. R. Roy; 3 ♀, Motichur, Dist. Haridwar, Garwall Hills, Uttarakhand, 17.iii.2005, coll. B.K. Biswas & party; 2 ♀, Rajaji National Park, Dist. Haridwar, Garwall Hills, Uttarakhand, 18.iii.2005, coll. Bijan Biswas.

Distribution : India : Uttarakhand (Dists. Haridwar, Dehra Dun, Srinagar, Ranikhet), New Record; West Bengal; Assam; Orissa; Maharashtra; Uttarpradesh, Madhya Pradesh; Arunachal Pradesh; Tamil Nadu.

Elsewhere : Myanmar, Malaya Peninsula.

12. *Argiope anasuja* Thorell

1887. *Argiope anasuja* Thorell, *Ann. Mus. civ. Genova*, 25 : 162.
1900. *Argiope anasuja* : Pocock, *Fauna Brit. India Aracn.*, : 222.
1951. *Argiope anasuja* : Sinha, *Rec. Indian Mus.*, 49 : 74.
1982. *Argiope anasuja* : Tikader, *Fauna of India, Araneae : Spiders*, 2(1) : 127.
1992. *Argiope anasuja* : Biswas Biswas, *Fauna of West Bengal, Part-III, Araneae : Spider, State Fauna Series*, 3 : 454.

Material examined : 1 ♀, Rajaji National Park, Dist. Haridwar, Garwall Hills, Uttarakhand, 24.x.2003, coll. B.K. Biswas & party; 2 ♀, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand, 31.x.2003, coll. Bijan Biswas.

Distribution : India : Uttarakhand (Dists. Haridwar, Ranikhet), New Record; West Bengal; Bihar; Orissa; Maharashtra; Karnataka; Tamil Nadu.

Elsewhere : Sri Lanka, Pakistan.

13. *Argiope pradhani* Sinha

1951. *Argiope pradhani* Sinha, *Rec. Indian Mus.*, 49 : 76.
1982. *Argiope pradhani* : Tikader, *Fauna of India, Araneae : Spiders*, 2(1) : 128.
1995. *Argiope pradhani* : Biswas & Majumder, *Fauna of Meghalaya, Part-2, Araneae : Spiders, State Fauna Series*, 4 : 94.

Material examined : 2 ♀, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand, 31.x.2003, coll. B.K. Biswas & party; 2 ♀, Haridwar, Dist. Haridwar, Garwall Hills, Uttarakhand, 24.x.2003, coll. Bijan Biswas.

Distribution : India : Uttarakhand (Dists. Haridwar, Ranikhet), New Record; Assam; Meghalaya.

Elsewhere : Pakistan.

14. *Argiope aemula* (Walckenaer)

1841. *Epeira aemula* Walckenaer, *Hist. Nat. Ins. Apt.*, 2 : 118.
1877. *Argiope aemula* : Thorell, *Ann. Mus. civ. Genova*, 25 : 164.
1900. *Argiope aemula* : Pocock, *Fauna of Brit. India, Aracn.*, : 223.
1982. *Argiope aemula* : Tikader, *Fauna of India, Araneae : Spiders*, 2(1) : 119.
2003. *Argiope aemula* : Biswas & Biswas, *Fauna of Sikkim, Part-2, Araneae : Spiders, State Fauna Series*, 9 : 86.

Material examined : 2 ♀, Rajaji National Park, Dist. Haridwar, Garwall Hills, Uttarakhand, 17.iii.2005, coll. B.K. Biswas & party; 2 ♀, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand, 31.x.2003, coll. B.K. Biswas & party; 2 ♀, Srinagar, Dist. Srinagar, Garwal Hills, Uttarkhand, 24.iii.2005, coll. B.K. Biswas & party; 1 ♀, Rishikesh, Garwall Hills, Uttarakhand, 25.iii.2005, coll. B.K. Biswas & party.

Distribution : India : Uttarakhand (Dists. Haridwar, Srinagar, Ranikhet), New Record; West Bengal; Maharashtra; Gujarat; Sikkim; Tamil Nadu; Andaman Nicobar Islands.

Elsewhere : Sri Lanka, Indo and Austro-Malaysia.

15. *Argiope shillongensis* Sinha

1951. *Argiope shillongensis* Sinha, *Rec. Indian Mus.*, 49 : 75.
 1982. *Argiope shillongensis* : Tikader, *Fauna of India*, Araneae : Spiders, 2(1) : 117.
 2006. *Argiope shillongensis* : Biswas & Biswas, *Fauna of Arunachal Pradesh*, Part-2, Araneae : Spiders, *State Fauna Series*, 13 : 509.

Material examined : 1 ♀, Rishikesh, Dist. Rishikesh, Garwall Hills, Uttarakhand, 25.iii.2005, coll. B.K. Biswas & party; 2 ♀, Srinagar, Dist. Srinagar, Garwall Hills, Uttarakhand, 21.iii.2005, coll. Bijan Biswas.

Distribution : India : Uttarakhand (Dists. Rishikesh, Srinagar), New Record; West Bengal; Meghalaya; Arunachal Pradesh.

16. *Argiope catenulata* (Doleschall)

1859. *Epeira catenulata* Doleschall, *Act. Soc. Ind. Neerl.*, 5 : 30.
 1900. *Argiope catenulata* : Pocock, *Fauna of Brit. India*, *Anaclin.*, : 223.
 1951. *Argiope catenulata* : Sinha, *Rec. Indian Mus.*, 49 : 74.
 1982. *Argiope catenulata* : Tikader, *Fauna of India*, Araneae : Spiders, 2(1) : 121.
 1992. *Argiope catenulata* : Biswas & Biswas, *Fauna of West Bengal*, Part-III, Araneae Spiders, *State Fauna Series*, 3 : 454.

Material examined : 2 ♀, Rajaji National Park, Dist. Haridwar, Garwall Hills, Uttarakhand, 24.x.2003, coll. B.K. Biswas & party; 3 ♀, Rishikesh, Dist. Rishikesh, Garwall Hills, Uttarakhand, 25.iii.2005, coll. B.K. Biswas & party; 2 ♀, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand, 31.x.2003, coll. B.K. Biswas & party; 2 ♀, Motichur Dist. Haridwar, Garwall Hills, Uttarakhand, 17.iii.2005, coll. Bijan Biswas.

Distribution : India : Uttarakhand (Dists. Haridwar, Rishikesh, Ranikhet), New Record; West Bengal; Andaman Nicobar Islands.

Elsewhere : Myanmar, Sri Lanka, Indo and Austro-Malaysia.

Genus *Cyclosa* Menge

1866. *Cyclosa* Menge, *Schrift. Nat. Ges. Donzig (N.F.)*, 1 : 73.
 1895. *Cyclosa* : Simon, *Hist. Nao. Araign.*, 1(4) : 783.
 1977. *Cyclosa* : Levi, *Bull. Mus. comp. Zool. Harv.*, 148(3) : 73.
 1982. *Cyclosa* : Tikader, *Fauna of India*, Araneae : Spiders, 2(1) : 183.

Type-species : *Cyclosa conica* (Pallas).

Distribution : Cosmopolitan.

Key to the species of the genus *Cyclosa* Menge

1. Abdomen having one antero-median hump on the dorsum *simoni*
 Abdomen without antero-median hump on the dorsum 2
2. One pair of distinct tubercles at the base of the caudal region; scape of the epigyne bent nearly at rightangle to the base
 *spirifera*

17. *Cyclosa simoni* Tikader

1982. *Cyclosa simoni* Tikader, *Fauna of India*, Araneae : Spiders, 2(1) : 203.
 1992. *Cyclosa simoni* : Biswas Biswas, *Fauna of West Bengal*, Part-III, Araneae : Spiders, *State Fauna Series*, 3 : 458.

Material examined : 8 ♀, Raiwala, Dist. Haridwar, Garwall Hills, Uttarakhand, 23.iii.2005, coll. B.K. Biswas & party; 1 ♀, Rishikesh, Dist. Rishikesh, Garwall Hills, Uttarakhand, 25.iii.2005, coll. B.K. Biswas & party.

Distribution : India : Uttarakhand (Dists. Haridwar, Rishikesh), New Record; West Bengal; Sikkim.

18. *Cyclosa spirifera* Simon

1889. *Cyclosa spirifera* Simon, *J. Asiat. Soc. Bengal*, 58 : 337.
 1982. *Cyclosa spirifera* : Tikader, *Fauna of India*, Araneae : Spiders, 2(1) : 19.
 2006. *Cyclosa spirifera* : Biswas & Biswas, *Fauna of Arunachal Pradesh*, Part-2, Araneae : Spiders, *State Fauna Series*, 13 : 510.

Material examined : 2 ♀, Dehra Dun, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 14.iii.2005, coll. B.K. Biswas & party; 3 ♀, Rishikesh, Dist. Rishikesh, Garwall Hills, Uttarakhand, 25.iii.2005, coll. B.K. Biswas & party 2 ♀, Ranikhet, Dist. Ranikhet, Kumaun Hills Uttarakhand, 31.x.2003, coll. B.K. Biswas & party.

Distribution : India : Uttarakhand (Dists. Dehra Dun, Rishikesh, Ranikhet), New Record; West Bengal; Arunachal Pradesh.

Genus *Larinia* Simon

1874. *Larinia* Simon, *Ar. Fr.*, 1 : 115.

1982. *Larinia* : Tikader, *Fauna of India*, Araneae : Spiders, 2(1) : 205.

Type-species : *Larinia lineata* (Lucas).

Distribution : Tropical and sub-tropical countries of the world.

Key to the species of the genus *Larinia* Simon

1. Cephalic region not clearly distinct from thoracic region *chloris*
Cephalic region distinct from thoracic region 2
2. Dorsum of abdomen light yellowish white, provided with some greyish liner and a double of black spots *phtisica*

19. *Larinia chloris* (Audouin)

1825. *Epeira chloris* Audouin, *Descr. de l'Egypte*, 22 : 347.

1906. *Larinia chloris* : Simon, *S.B. Ak. Wiss. Wein.*, 115(1) : 1163.

1982. *Larinia chloris* : Tikader, *Fauna of India*, Araneae : Spiders, 2(1) : 206.

1995. *Larinia chloris* : Biswas & Majumder, *Fauna of Meghalaya*, Part-2, Araneae : Spiders, *State Fauna Series*, 4 : 99.

Material examined : 1 ♀, 1 ♂, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand, 31.x.2003, coll. B.K. Biswas & party; 1 ♀, 1 ♂, Haridwar, Dist. Haridwar, Garwall Hills, Uttarakhand, 15.iii.2005, coll. Bijan Biswas.

Distribution : India : Uttarakhand (Dists. Haridwar, Ranikhet), New Record; West Bengal; Meghalaya; Maharashtra.

Elsewhere : Egypt, Israel, Syria, Uganda.

20. *Larinia phtisica* (L. koch)

1871. *Epeira phtisica* L. koch, *Die. Arachniden Australiens*, 1(1) : 193.

1887. *Larinia phtisica* : Simon, *Ann. Soc. ent. Fr.*, 7(6) : 186.

1982. *Larinia phtisica* : Tikader, *Fauna of India*, Araneae : Spiders, 2(1) : 208.

1987. *Larinia phtisica* : Biswas, *Fauna of Orissa*, Part-1, Araneae : Spiders, *State Fauna Series*, 1 : 269.

1992. *Larinia phtisica* : Biswas & Biswas, *Fauna of West Bengal*, Part-III, Araneae : Spiders, *State Fauna Series*, 3 : 463.

Material examined : 2 ♀, Haridwar, Dist. Haridwar. Garwall Hills, Uttarakhand, 24.x.2003, coll. B.K. Biswas & party; 2 ♀, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand, 31.x.2003, coll. B.K. Biswas & party.

Distribution : India : Uttarakhand (Dists. Haridwar, Ranikhet), New Record; West Bengal; Gujarat.

Elsewhere : Australia, New Guinea.

Genus *Neoscona* Simon

1864. *Neoscona* Simon, *Hist. nat. des Aragin.*, 1 : 261.

1940. *Neoscona* : Comstock, *Spider Book*, : 509.

1971. *Neoscona* : Levi, *Bull. Mus. comp. Zool.*, 14(8) : 465.

1982. *Neoscona* : Tikader, *Fauna of India*, Araneae : Spiders, 2(2) : 230.

Type-species : *Neoscona anabesca* (Walckenaer).

Distribution : Cosmopolitan.

Key to the species of the genus *Neoscona* Walckenaer

1. Abdomen triangular; epigynal scape short; broad and triangular *nautica*
Abdomen sub-triangular, epigynal scape long, narrow 2
2. Cephalic region provided with a conspicuous dark brown "V" shaped patch; epigynal scape with deep constriction *mukerjei*
Cephalic region without "V" shaped patch; epigynal scape without a deep constriction 3

3. Lateral lobes of epigyne very distinct and horn-like and visible from ventral side
..... *rumpfi*
Lateral lobes of epigyne indistinct and blunt and not visible from ventral side 4
4. Abdomen oval in shape, dorsum provided with longitudinal chalk-white patches
..... *theis*
Abdomen elongated, dorsum without longitudinal chalk-white patches 5
5. Carapace provided with two lateral and one median longitudinal brown patches
..... *shillongensis*
Carapace not provided with two lateral and one median longitudinal brown patches 6
6. First pair of lateral lobes of epigyne inconspicuous and second pair of lateral lobes not truncated anteriorly *odites*
First pair of lateral lobes of epigyne conspicuous and second pair of lateral lobes not truncated anteriorly 7
7. "V" shaped brown mark present on the carapace *pavida*

21. *Neoscona nautica* (L. koch)

1875. *Epeira nautica* L. koch, *Aegypt. Abyssin Arachn. Jickeli*, : 17.
1982. *Neoscona nautica* : Tikader, *Fauna of India*, Araneae : Spiders, 2(1) : 242.
2004. *Neoscona nautica* : Biswas & Biswas, *Fauna of Manipur*, Part-2, Araneae : Spiders *State Fauna Series*, 10 : 45.

Material examined : 2 ♀, Dehra Dun, Dist. Dehra Dun; Garwall Hills, Uttarakhand, 14.iii.2005, coll. B.K. Biswas & party; 4 ♀, Motichur, Dist. Haridwar, Garwall Hills, Uttarakhand 17.iii.2005, coll. Bijan Biswas; 2 ♀, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand, 31.x.2003, coll. B.K. Biswas & party; 2 ♀, Rajaji National Park, Dist. Haridwar, Garwall Hills, Uttarakhand, 24.x.2003, coll. B.K. Biswas & party; 1 ♀, Haridwar, Dist. Haridwar, Garwall Hills, Uttarakhand, 30.iii.2005 coll. Bijan Biswas.

Distribution : India : Uttarakhand (Dists. Haridwar, Dehra Dun, Ranikhet), New Record; West Bengal; Orissa; Assam, Gujarat; Maharashtra; Manipur; Meghalaya.

Elsewhere : Myanmar, Pakistan, North America.

22. *Neoscona mukerjei* Tikader

1980. *Neoscona mukerjei* Tikader, *Proc. Indian Acad. Sci.*, 89(3) : 247.
1987. *Neoscona mukerjei* : Biswas, *Fauna of Orissa*, Part-I, Araneae : Spiders, *State Fauna Series*, 1 : 261.
2006. *Neoscona mukerjei* : Biswas & Biswas, *Fauna of Arunachal Pradesh*, Part-2, Araneae : Spiders, *State Fauna Series*, 13 : 510.

Material examined : 4 ♀, 1 ♂, Raiwala, Dist. Haridwar, Garwall Hills, Uttarakhand, 23.iii.2005, coll. B.K. Biswas & party; 2 ♀, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand 31.x.2003, coll. B.K. Biswas & party; 4 ♀, Haridwar, Dist. Haridwar, Garwall Hills, Uttarakhand, 17.iii.2005, coll. Bijan Biswas; 1 ♀, Haridwar, Dist. Bageshwar, Garwall Hills, Uttarakhand, 21.ix.2004, coll. M. Ghosh & party.

Distribution : India : Uttarakhand (Dists. Haridwar, Bageshwar, Ranikhet), New Record; West Bengal; Orissa; Maharashtra; Meghalaya; Tripura; Arunachal Pradesh.

23. *Neoscona rumpfi* (Thorell)

1887. *Araneus rumpfi* Thorell, *Annali. Mus. civ. nat. Genova*, 13 : 296.
1900. *Aranens rumpfi* : Pocock, *Fauna Brit. India, Araclo.*, : 228.
1982. *Neoscona rumpfi* : Tikader, *Fauna of India*, Araneae : Spiders, 2(1) : 253.
1987. *Neoscona rumpfi* : Biswas, *Fauna of Orissa*, Part-I, Araneae : Spiders, *State Fauna Series*, 1 : 262.

Material examined : 1 ♀, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand, 31.x.2003, coll. B.K. Biswas & party; 1 ♀, Rishikesh, Dist. Rishikesh, Garwall Hills, Uttarakhand 24.x.2003, coll. Bijan Biswas.

Distribution : India : Uttarakhand (Dists. Rishikesh, Ranikhet), New Record; West Bengal; Orissa; Maharashtra; Karnataka; Andhra Pradesh; Tamil Nadu.

Elsewhere : Myanmar, Sri Lanka, Pakistan, An Indo Austro-Malayasian species.

24. *Neoscona theis* (Walckenaer)

1841. *Epeira theis* Walckenaer, *Hist. Nat. Ins. Apt.*, 2 : 53.

1981. *Neoscona theis* : Tikader & Biswas, *Rec. zool. Surv. India*, occ. pap. No., 30(1) : 26.

1982. *Neoscona theis* : Tikader, *Fauna of India*, Araneae : Spiders, 2(1) : 269.

Material examined : 1 ♀, Kalsi, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 7.vii.1989, coll. N.K. Sinha; 1 ♀, Pandukaswar, Dist. Chamoli, Kumaun Hills, Uttarakhand 14.ix.1973, coll. Arun Kumar; 1 ♀, Ramgarh, Dist. Nainital, Kumaun Hills, Uttarakhand, 17.x.1975, coll. R.N. Chopra; 4 ♀, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand, 31.x.2003, coll. B.K. Biswas & party; 2 ♀, Rajaji National Park, Dist. Haridwar, Garwall Hills, Uttarakhand, 24.x.2003, coll. Bijan Biswas.

Distribution : India : Uttarakhand (Dists. Haridwar, Dehra Dun, Chamoli, Ranikhet, Nainital), New Record; West Bengal; Orissa; Meghalaya; Gujarat.

Elsewhere : South New Guinea.

25. *Neoscona shillongensis* Tikader & Bal

1981. *Neoscona shillongensis* Tikader & Bal, *Rec. zool. Surv. India*, occ. pap. No., 24 : 34.

1982. *Neoscona shillongensis* : Tikader, *Fauna of India*, Araneae : Spiders, 2(1) : 272.

Material examined : 1 ♀, Seya, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 1.x.1988, coll. R.N. Chopra; 2 ♀, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand 31.x.2003, coll. B.K. Biswas & party; 2 ♀, Haridwar, Dist. Haridwar, Garwall Hills, Uttarakhand, 24.x.2003, coll. Bijan Biswas.

Distribution : India : Uttarakhand (Dists. Haridwar, Dehra Dun, Ranikhet), New Record; Meghalaya; Shillong (Type-locality).

26. *Neoscona odites* (Simon)

1906. *Araneus odites* Simon, *Annls. Soc. ent. Fr.*, 75 : 308.

1982. *Neoscona odites* : Tikader, *Fauna of India*, Araneae : Spiders, 2(1) : 274.

Material examined : 1 ♀, Bajanu, Dist. Almora, Kumun Hills, Uttarakhand, 12.ix.1975, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dist. Almora), New Record; Assam; Sikkim.

27. *Neoscona pavid* (Simon)

1906. *Araneus pavid* Simon, *Annls. Soc. ent. Fr.*, 75 : 309.

1935. *Araneus pavid* : Dyal, *Bull. Zool. Punjab Univ.*, 1 : 184.

1982. *Neoscona pavid* : Tikader, *Fauna of India*, Araneae : Spiders, 2(1) : 276.

Material examined : 1 ♀, Chakrata, Dist. Dhera Dun, Garwall Hills, Uttarakhand, 16.ix.1988, coll. N.K. Sinha.

Distribution : India : Uttarakhand (Dist. Dehra Dun), New Record; West Bengal.

Elsewhere : Pakistan.

Genus *Leucauge* White

1841. *Leucauge* White, *Ann. Mag. nat. Hist.*, 7(1) : 473.

1962. *Leucauge* : Tikader, *J. Linn. Soc.*, 44(300) : 563.

1982. *Leucauge* : Tikader, *Fauna of India*, Araneae : Spiders, 2(1) : 71.

Type-species : *Leucauge hortorum* (Hentz).

Distribution : Tropical and sub-tropical countries of the world.

Key to the species of the genus *Leucauge* White

1. Both paired tubercles and median caudal tubercle highly prominent *decorata*
Both paired tubercles and median caudal tubercle not prominent 2
2. Abdomen uniformly silver white and decorated and long band; mid-anteriorly with a shallow depression *celebesiana*
Abdomen having some silver white specks and not decorated with bands; no depression anteriorly 3
3. Both paired tubercles and median caudal tubercle small and less prominent
..... *tessellata*

28. *Leucauge decorata* (Blackwall)

1864. *Tetragnatha decorata* Blackwall, *Ann. Mag. nat. Hist.*, 14(3) : 44.

1906. *Leucauge decorata* : Simon, *Annls. Soc. ent. Fr.*, 75 : 282.

1982. *Leucauge decorata* : Tikader, *Fauna of India*, Araneae : Spiders, 2(1) : 78.

Material examined : 10 ♀, 4 ♂, Raiwala, Dist. Haridwar, Garwall Hills, Uttarakhand, 23.iii.2005, coll. B.K. Biswas & party; 4 ♀, Motichur, Dist. Haridwar, Garwall Hills, Uttarakhand 17.iii.2005, coll. B.K. Biswas & party; 3 ♀, 2 ♂, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand, 31.x.2003, coll. B.K. Biswas & party; 12 ♀, 2 ♂, Dehra Dun, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 14.iii.2005, coll. B.K. Biswas & party; 4 ♀, 2 ♂, Srinagar, Dist. Srinagar, Garwall Hills, Uttarakhand, 20.iii.2005 coll. B.K. Biswas & party; 2 ♀, Rajaji Natinal Park, Dist. Haridwar, Gurwall Hills, Uttarakhand, 17.iii.2005, coll. Bijan Biswas; 6 ♀, Raiwala, Dist. Haridwar, Garwall Hills, Uttarakhand, 24.iii.2005, coll. Bijan Biswas.

Distribution : India : Uttarakhand (Dists. Haridwar, Dehra Dun, Srinagar, Ranikhet), New Record; West Bengal; Bihar; Orissa; Assam; Meghalaya; Sikkim; Karnataka; Kerala; Uttar Pradesh; Gujarat; Pondicheri; Tamil Nadu.

Elsewhere : Myanmar, Sri Lanka, Pakistan.

29. *Leucauge celebesiana* (Walckenaer)

1841. *Tetragnatha celebesiana* Walckenaer, *Hist. Nat. Ins. Apt.*, 2 : 222.

1982. *Leucauge celebesiana* : Tikader, *Fauna of India*, Araneae : Spiders, 2(1) : 83.

2003. *Leucauge celebesiana* : Biswas & Biswas, *Fauna of Sikkim*, Part-2, Araneae : Spiders, *State Fauna Series*, 9 : 92.

2006. *Leucauge celebesiana* : Biswas & Biswas, *Fauna of Arunachal Pradesh*, Part-2, Araneae : Spiders; *State Fauna Series*, 13 : 512.

Material examined : 2 ♀, Srinagar, Dist. Srinagar, Garwall Hills, Uttarakhand, 21.iii.2005, coll. B.K. Biswas & party; 2 ♀, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand 31.x.2003, coll. B.K. Biswas & party; 3 ♀, Rajaji National Park, Dist. Haridwar, Garwall Hills, Uttarakhand, 17.iii.2005, coll. Bijan Biswas; 10 ♀, 3 ♂, Raiwala, Dist. Haridwar, Garwall Hills, Uttarakhand, 23.iii.2005, coll. B.K. Biswas & party; 3 ♀, Srinagar, Dist. Srinagar, Garwall Hills, Uttarakhand, 20.iii.2005 coll. Bijan Biswas.

Distribution : India : Uttarakhand (Dists. Haridwar, Dehra Dun, Srinagar, Ranikhet), New Record; West Bengal; Assam; Meghalaya; Arunachal Pradesh; Maharashtra; Tamil Nadu.

Elsewhere : Myanmar, Sri Lanka, Chin.

30. *Leucauge tessellata* (Thorell)

1887. *Callinethis tessellata* Thorell, *Annali. Mus. Civ. Genova*, 25 : 135.

1921. *Leucauge tessellata* : Gravely, *Rec. Indian Mus.*, 22(4) : 455.

1982. *Leucauge tessellata* : Tikader, *Fauna of India*, Araneae : Spiders, 2(1) : 80.

2006. *Leucauge tessellata* : Biswas & Biswas, *Fauna of Arunachal Pradesh*, Part-2, Araneae : Spiders; *State Fauna Series*, 13 : 512.

Material examined : 5 ♀, 2 ♂, Srinagar, Dist. Srinagar, Garwall Hills, Uttarakhand, 21.iii.2005, coll. B.K. Biswas & party; 6 ♀, 2 ♂, Raiwala, Dist. Haridwar, Garwall Hills, Uttarakhand 24.iii.2005, coll. B.K. Biswas & party; 10 ♀, 4 ♂, Raiwala, Dist. Haridwar, Garwall Hills, Uttarakhand, 23.iii.2005, coll. B.K. Biswas & party.

Distribution : India : Uttarakhand (Dists. Haridwar, Srinagar), New Record; West Bengal, Assam; Meghalaya; Gujarat; Karnataka; Sikkim; Kerala; Arunachal Pradesh.

Elsewhere : Myanmar, Bhutan.

Genus *Nephila* Leach

1815. *Nephila* Leach, *Zoological Miscellang.* : 153.

1982. *Nephila* : Tikader, *Fauna of India*, Araneae : Spiders, 9(1) : 94.

2003. *Nephila* : Biswas & Biswas, *Fauna of Sikkim*, Part-2, Araneae : Spiders, *State Fauna Series*, 9 : 93.

Type-species : *Nephila maculata* Walckenaer.

Distribution : Tropical nearly all countries of the world.

Key to the species of the genus *Nephila* Leach

1. Abdomen provided with one pair of sub-median longitudinal yellow lines and numerous small pale lines placed laterally *maculata*

Abdomen not provided with one pair of submedian longitudinally yellow and numerous small lines laterally 2

2. Cephalothorax thorax longer than wide; densely clothed with yellowish pubescence, slightly narrow in front *dirangensis*

Cephalothorax broad in front, yellow pubescence not present 3

3. Epigyne provided with transverse concave groove; duct of the spermatheca originate ventro-posteriorly *robusta*

Epigyne not provided with transverse concave groove, ducts not originated ventro-posteriorly 4

4. Carapace provided with "V" shaped yellow patches and the abdomen without dark brown sides *clavata*

Carapace not provided with "V" shaped yellow patches and the abdomen with dark brown sides 5

5. Abdomen long and cylindrical, epigyne provided with transverse concave groove *kuhlli*

6. Abdomen not long and cylindrical epigyne without transverse concave groove *malabarensis*

31. *Nephila maculata* (Fabricius)

1793. *Aranea maculata* Fabricius, *Ent. Syst.*, 2 : 425.

1982. *Nephila maculata* : Tikader, *Fauna of India*, Araneae : Spiders, 2(1) : 97.

2006. *Nephila maculata* : Biswas & Biswas, *Fauna of Arunachal Pradesh*, Part-2, Araneae : Spiders, *State Fauna Series*, 13 : 511.

Material examined : 1 ♀, Binta, Dist. Almora, kumaun Hills, Uttarakhand, 26.ix.2004, coll. M. Ghosh & party; 3 ♀, Haridwar, Dist. Haridwar, Garwall Hills, Uttarakhand 24.x.2003, coll. B.K. Biswas & party; 2 ♀, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand, 31.x.2003, coll. B.K. Biswas & party; 6 ♀, Dehra Dun, Dist. Dehra Dun, Garwall Hills, 20.x.2005, coll. R. Roy.

Distribution : India : Uttarakhand (Dists. Haridwar, Dehra Dun, Ranikhet, Almora), New Record; West Bengal; Assam; Sikkim; Meghalaya;

Maharashtra; Gujarat; Uttar Pradesh; Karnataka; Arunachal Pradesh; Tamil Nadu; Andaman and Nicobar Islands.

Elsewhere : Myanmar, Sri Lanka, Chin, Japan, Australia.

32. *Nephila dirangensis* Biswas & Biswas

2006. *Nephila dirangensis* : Biswas & Biswas, *Fauna of Arunachal Pradesh*, Part-2, Araneae : Spiders, *State Fauna Series*, 13 : 512.

Material examined : 2 ♀, Ranikhet, Dist. Ranikhet, kumaun Hills, Uttarakhand, 31.x.2003, coll. Kajal Biswas; 2 ♀, Rajaji National Park, Dist. Haridwar, Garwall Hills, Uttarakhand 17.iii.2005, coll. Bijan Biswas; 5 ♀, Baijnath, Dist. Kausoni, Bageshwar, Garwall Hills, Uttarakhand, 7.ix.2004, coll. A.K. Sanyal & party; 7 ♀, Goaldham, Dist. Kausoni, Garwall Hills, Uttarakhand, 2.x.2004, coll. A.K. Sanyal & party; 1 ♀, Binta, Dist. Almora, Kumaun Hills, Uttarakhand, 26.ix.2004, coll. M. Ghosh & party.

Distribution : India : Uttarakhand (Dists. Haridwar, Kausoni, Bageshwar, Ranikhet, Almora), New Record; Arunachal Pradesh (Type-locality).

33. *Nephila robusta* Tikader

1962. *Nephila robusta* Tikader, *J. Linn. Soc.*, 44(300) : 566.

1982. *Nephila robusta* : Tikader, *Fauna of India*, Araneae : Spiders, 2(1) : 100.

Material examined : 1 ♀, Chamba, Dist. Pithoragarh, kumaun Hills, Uttarakhand, 11.x.1977, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dist. Pithoragarh), New Record; West Bengal.

34. *Nephila clavata* L. koch

1879. *Nephila clavata* L. koch, *Verh. Zool. bot. Ges. Wien.*, 27 : 741.

1982. *Nephila clavata* : Tikader, *Fauna of India*, Araneae : Spiders, 2(1) : 102.

Material examined : 1 ♀, Seya, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 8.x.1988, coll. Arun Kumar; 1 ♀, Nanakpura, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 29.x.1976, coll. Asket singh; 3 ♀, Chamba forest, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 11.ix.1977, coll. Arun Kumar; 8 ♀, Barinag, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 26.x.1977, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dists. Dehra Dun, Pithoragarh), New Record; West Bengal; Sikkim; Meghalaya; Andaman and Nicobar Islands.

Elsewhere : Myanmar, Bhutan, Thailand, Japan, Chin, Beluchistan.

35. *Nephila kuhlii* Doleschall

1859. *Nephila kuhlii* Doleschall, *Acta. Soc. Ind. Neerb.*, 5(5) : 27.

1982. *Nephila kuhlii* : Tikader, *Fauna of India*, Araneae : Spiders, 2(1) : 104.

Material examined : 1 ♀, Chamba forest, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 11.x.1977, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dist. Pithoragarh), New Record; West Bengal.

Elsewhere : Myanmar, Bhamo and eastwards to Celebes.

36. *Nephila malabarensis* (Walckenaer)

1837. *Epeira malabaronsis* Walckenaer, *Hist. Nat. Ins. Apt.*, 1 : 103.

1982. *Nephila malabarensis* : Tikader, *Fauna of India*, Araneae : Spiders, 2(1) : 95.

Material examined : 1 ♀, Chamba forest, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 16.xii.1980, coll. S.C. Verma; 1 ♀, Pahela, Dist. Almora, Kumaun Hills, Uttarakhand, 23.ix.1973, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dist. Pithoragarh, Almora), New Record; Bihar; Maharashtra; Tamil Nadu; Andaman and Nicobar Islands.

Elsewhere : Myanmar, Thailand, New Guinea.

Family TETRAGNATHIDE

Key to the genera of the family Tetragnathidae

1. Abdomen long-and narrow and bears the spinnerets near its end *Tetragnatha*
Abdomen short and broad and not bears the spinnerets near its end 2
2. Spinnerets present beyond its end
..... *Eucta*

Genus *Tetragnatha* Latreille

1804. *Tetragnatha* Latreille, *Nouv. Diet. D'Hist. Nat.*, 24 : 135.

1900. *Tetragnatha* : Pocock, *Fauna of Brit. India, Arachn.*, : 214.

1977. *Tetragnatha* : Tikader, *Rec. zool. Surv. India*, 72 : 275.

Type-species : *Tetragnatha extens* Linn.

Distribution : Tropical countries of the world.

37. *Tetragnatha andamanensis* Tikader

1977. *Tetragnatha andamanensis* Tikader, *Rec. zool. Surv. India*, 72 : 75.

1992. *Tetragnatha andamanensis* : Biswas & Biswas, *Fauna of West Bengal*, Part-III, Araneae : Spiders, *State Fauna Series*, 3 : 448.

2004. *Tetragnatha andamanensis* : Biswas & Biswas, *Fauna of Manipur*, Part-2, Araneae : Spiders, *State Fauna Series*, 10 : 41.

Material examined : 2 ♀, Raiwala, Dist. Haridwar, Garwall Hills, Uttarakhand, 23.iii.2005, coll. B.K. Biswas & party; 7 ♀, 3 ♂, Srinagar, Dist. Srinagar, Garwall Hills, Uttarakhand 20.iii.2005, coll. B.K. Biswas & party; 2 ♂, 1 ♀, Haridwar, Dist. Haridwar, Garwall Hills, Uttarakhand, 17.iii.2005, coll. Bijan Biswas; 10 ♀, 2 ♂, Dehra Dun, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 14.iii.2005, coll. B.K. Biswas & party; 3 ♀, Rajaji National Park, Dist. Haridwar, Garwall Hills, Uttarakhand, 24.x.2003, coll. B.K. Biswas & party; 2 ♂, Rishikesh, Dist. Rishikesh, Garwall Hills, Uttarakhand, 24.x.2003, coll. B.K. Biswas & party; 3 ♂, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand, 31.x.2003, coll. B.K. Biswas & party; 4 ♂, 2 ♀, Mussoori, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 21.x.2005, coll. R. Roy.

Distribution : India : Uttarakhand (Dists. Haridwar, Dehra Dun, Srinagar, Rishikesh, Ranikhet), New Record; West Bengal; Tripura; Manipur; Andaman and Nicobar Islands.

Genus *Eucta* Simon

1881. *Eucta* Simon, *Ar. Fr.*, 5 : 5.

1970. *Eucta* : Tikader, *Rec. zool. Surv. India*, 64(1-4) : 37.

1977. *Tetragnatha* : Tikader, *Rec. zool. Surv. India*, 72 : 275.

Type-species : *Eucta gallica* Simon.

Distribution : India, Europe, Japan, Malayasia.

38. *Eucta javana* Thorell

1895. *Eucta javana* Thorell, *Spiders of Myanmar*, : 146.

1981. *Eucta javana* : Tikader & Biswas, *Rec. zool. Surv. India*, occ. pap. No. 30(1) : 46.

1992. *Eucta javana* : Biswas & Biswas, *Fauna of West Bengal*, Part-III, Araneae : Spiders, *State Fauna Series*, 3 : 447.

Material examined : 14 ♀, Raiwala, Dist. Haridwar, Garwall Hills, Uttarakhand, 23.iii.2005, coll. B.K. Biswas & party; 2 ♀, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand 31.x.2003, coll. B.K. Biswas & party; 2 ♀, Rishikesh, Dist. Rishikesh, Garwall Hills, Uttarakhand, 24.x.2003, coll. B.K. Biswas & party.

Distribution : India : Uttarakhand (Dists. Haridwar, Rishikesh, Ranikhet), New Record; West Bengal; Orissa; Bihar; Karnataka; Tamil Nadu; Meghalaya; Sikkim.

Elsewhere : Mayanmar, Java.

Family HERSILIIDAE Genus *Hersilia* Audouin

1826. *Hersilia* Audouin, *Derocr. Egypta Arach'n*, : 114.

1992. *Hersilia* : Biswas & Biswas, *Fauna of West Bengal*, Part-III, Araneae : Spiders, *State Fauna Series*, 3 : 381.

Diagnosis : Ocular quadrangle parallel sided; head flat, angular laterally; clypeus usually very high, prominent, protarsi of I, II and IV legs are bi-segmented.

Type-species : *Hersilia caudata* Audouin.

Distribution : Africa, Madagascar, Oriental region.

39. *Hersilia savignyi* Lucas

1836. *Hersilia savignyi* Lucas, *Mag. zool.*, 8 : 10.

1992. *Hersilia savignyi* : Biswas & Biswas, *Fauna of West Bengal*, Part-III, Araneae : Spiders, *State Fauna Series*, 3 : 382.

Diagnosis : Colour varying from quite pale to nearly black on the upper side, generally banded; abdomen with black rim, transverse stripe and a median longitudinal black bar in front, legs and palpi banded.

Material examined : 2 ♀, Rajaji National Park, Dist. Haridwar, Garwall Hills, Uttarakhand, 17.iii.2005, coll. B.K. Biswas & party; 3 ♀, Mussoori, Dist. Dehra Dun, Garwall Hills, Uttarakhand 21.x.2005, coll. R. Roy.

Distribution : India : Uttarakhand (Dists. Haridwar, Dehra Dun), New Record; West Bengal; Assam; Maharashtra; Uttar Pradesh; Tamil Nadu.

Elsewhere : Mayanmar, Sri Lanka.

Family LYCOSIDAE

Key to the genera of the family Lycosidae

1. Posterior spinnerets distinctly longer than anterior; sternum generally provided with mid-longitudinal dark marking *Hippasa*
Posterior spinnerets not distinctly longer than anterior; sternum without longitudinal dark marking 2
2. Cephalic region not much elevated from the thoracic region; tibia IV dorsally without proximal spine *Pardosa*
Cephalic region much elevated from thoracic region; superior claws long and slender and not toothed 3
3. Carapace glabrous; tarsus I provided with dorsal bristle *Arctosa*
Carapace no glabrous; tarsus I not provided with dorsal bristle 4
4. Labium always longer than wide, metatarsi IV never longer than tibia plus patella together *Lycosa*
Labium always wider than long; metatarsi IV usually longer than tibia plus patella together 5
5. Cephalic region much elevated than the thoracic region, tibia IV dorsally with proximal spine *Trochosa*

Genus *Hippasa* Simon

1885. *Hippasa* Simon, *Bull. Soc. Zool. Fr.*, 10 : 31.

1951. *Hippasa* : Sinha, *Rec. Indian Mus.*, 48(2) : 11.

Type-species : *Hippasa agelenoides* (Simon).

Distribution : Madagascar; Africa; Arabia; Malayasia; India.

Key to the species of the genus *Hippasa* Simon

1. Plate of vulva strongly invaginated in front and hence posteriorly provided with two distinct transverse process *agelenoides*

Plate of the vulva not strongly invaginated in front and hence posteriorly without two distinct transcate process 2

2. Epigyne covered by strongly chitinous plate thus forming a pair of elevated triangular plate *greenalliae*

Epigyne not covered by strongly chitinous plate and not forming a pair of elevated triangular plate 3

3. Plate of the vulva produced posteriorly into a tongue-like process *holmerae*

Plate of the vulva not produced posteriorly into a tongue-like process 4

4. Vulva invaginated mid-anteriorly; posterior margin provided with median notch *loundesi*

Vulva not invaginated mid-anteriorly; posterior margin not provided with median notch 5

5. Abdomen provided with an anterior mid dorsal lens shaped marking *mahabaleshwarensis*

Abdomen not provided with an anterior-mid dorsal lens shaped marking 6

6. Sternum uniform coloured *madraspata*

40. *Hippasa agelenoides* (Simon)

1884. *Pirata agelenoides* Simon, *Ann. Mus. civ. stor. Nat. Genova*, 20 : 334.

1951. *Hippasa agelenoides* : Sinha, *Rec. Indian Mus.*, 48(2) : 16.

1980. *Hippasa agelenoides* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, 1(2) : 293.

Material examined : 2 ♀, Raipur, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 8.vi.1986, coll. S. Lal.

Distribution : India : Uttarakhand (Dist. Dehra Dun), Kerala; Karnataka; Uttar Pradesh; Uttarakhand (Dehra Dun), Maharashtra; Tamil Nadu.

Elsewhere : Myanmar.

41. *Hippasa greenalliae* (Blackwall)

1867. *Lycosa greenalliae* Blackwall, *Ann. Mag. Nat. Hist.*, 19(3) : 387.

1980. *Hippasa greenalliae* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, 1(2) : 277.

Material examined : 1 ♀, Motichava, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 20.v.1979, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dist. Dehra Dun), New Record; West Bengal; Orissa; Maharashtra, Sikkim; Tamil Nadu.

42. *Hippasa holmerae* Thorell

1895. *Hippasa holmerae* Thorell, *Spiders of Myanmar* : 218.

1951. *Hippasa holmerae* : Sinha, *Rec. Indian Mus.*, 48(2) : 17.

1980. *Hippasa holmerae* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, 1(2) : 295.

Material examined : 1 ♀, Kolchi, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 10.vi.1976, coll. Arun Kumar, 2 ♀, Raipur, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 8.vi.1976, coll. S. Lal.

Distribution : India : Uttarakhand (Dist. Dehra Dun), West Bengal; Sikkim; Manipur; Uttarakhand (Dehra Dun); Uttar Pradesh.

Elsewhere : Myanmar, Chin, Yunnan, Singapore.

43. *Hippasa loundesi* Gravely

1924. *Hippasa loundesi* Gravely, *Rec. Indian Mus.*, 26 : 594.

1951. *Hippasa loundesi* : Sinha, *Rec. Indian Mus.*, 48(2) : 14.

1980. *Hippasa loundesi* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, 1(2) : 280.

Material examined : 1 ♀, Kolchi, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 10.vi.1976, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dist. Dehra Dun), New Record; Tamil Nadu.

44. *Hippasa mahabaleshwarensis* Tikader & Malhotra

1980. *Hippasa mahabaleshwarensis* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, 1(2) : 285.

Material examined : 2 ♀, Anarkuchiatal, Dist. Nainital, Kumaun Hills, Uttarakhand, 17.ii.1971, coll. R.N. Chopra; 1 ♀, Sassendri forest, Dist. Dehra Dun, Garwall Hills, Uttaranchal, 24.ix.1975, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dists. Dehra Dun, Nainital), New Record; Gujarat, Maharashtra; Tamil Nadu.

45. *Hippasa madraspatana* Gravely

1924. *Hippasa madraspatana* Gravely, *Rec. Indian Mus.*, 26 : 595.

1951. *Hippasa madraspatana* : Sinha, *Rec. Indian Ins.*, 48(2) : 18.

1980. *Hippasa madraspatana* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, 1(2) : 289.

Material examined : 1 ♀, Raipur, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 8.vi.1976, coll. Arun Kumar; 1 ♀, Nankuchital, Dist. Nainital, kumawn Hills, Uttaranchal, 24.ix.1975, coll. S. Lal.

Distribution : India : Uttarakhand (Dists. Dehra Dun, Nainital), New Record; Gujarat; Maharashtra; Tamil Nadu.

Genus *Pardosa* Koch

1848. *Pardosa* Koch, *Die. Arachnide*, 14 : 100.

1935. *Pardosa* : Dyal, *Bull. Dept. Zool. Punjab Univ. Lahore*, 1 : 144.

1951. *Pardosa* : Sinha, *Rec. Indian Mus.*, 48(2) : 45.

Key to the species of the genus *Pardosa* Koch

1. Sternum provided with conspicuous dark brown "V" shaped marking *minutus*
Sternum not provided with conspicuous dark brown "V" shaped marking 2
2. Dorsum of abdomen pale with few small dark brown spots *atropalpis*
Dorsum of abdomen not pale and without small brown spots 3
3. Abdomen mid-dorsally provided with a broad longitudinal pale band and light brown irregular patches. Sub lateral sides with black patches and pale spots *mukundi*
Abdomen with no such pattern dorsally 4
4. Proximal end of chelicerae not pale and uniform in colour. Patella of all legs not provided with a longitudinal black streak dorsally *birmanica*
Proximal end of chelicerae pale and colour not uniform. Patella of all legs provided with a longitudinally black streak 5

5. Sternum uniform dark brown in colour. Legs reddish brown, coxae of all legs provided with dark brown patches *kupupa*
Sternum pale. Legs pale, coxae of legs not provided with patches 6
6. Anterior row of eyes straight and femora of legs without any patches *ookleyi*
Anterior row of eyes not straight and femora of legs with patches 7
7. Anterior row of eyes slightly recurved and femora of legs with greenish brown transverse patches *burasantiensis*
Femora of all legs not provided with greenish transverse patches 8
8. Ventral side of abdomen uniform pale and dorsal side with greenish black and pale patches *renockensis*
Ventral side of abdomen not uniform pale and dorsal side with brown patches 9
9. Abdomen ventrally provided with sub-lateral longitudinal irregular greenish brown patches *shyamae*
Abdomen ventrally not provided with sub-lateral longitudinal irregular greenish brown patches 10
10. Abdomen ventrally provided with two lateral irregular brown patches on the sides any spinnerets *heterophthalmus*
Abdomen without lateral irregular brown patches on the sides of spinnerets 11
11. Legs without greenish brown patches; chelicerae weak *leucopalpis*
Legs with greenish brown patches and chelicerae strong 12
12. Ocular area black and hairy and maxillae provided with inconspicuous scopulae *annandalei*
Ocular area pale and not hairy and maxillae without scopulae 13
13. Ocular area grey and hairy and maxillae provided with conspicuous scopulae *sumatrana*

Ocular area not grey and without hairy and maxillae without scopulae 14

14. Femora of all legs provided with irregular greenish brown patches and sternum black .
.....*ladakhensis*

46. *Pardosa minutus* Tikader & Malhotra

1976. *Pardosa minutus* Tikader & Malhotra, *Proc. Indian Acad. Sci.*, **83**(3) : 126-128.

1980. *Pardosa minutus* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, **1**(2) : 319.

Material examined : 1 ♀, Hanumanti, Dist. Pauri, Garwall Hills, Uttarakhand, 22.iv.1959, coll. Arun Kumar; 1 ♀, Dhol Kand, Dist. Dehra Dun, Garwal Hills, Uttarakhand, 7.v.1987, coll. R.N. Chopra.

Distribution : India : Uttarakhand (Dists. Dehra Dun, Pauri), New Record; Himachal Pradesh.

47. *Pardosa atropalpis* Gravely

1924. *Pardosa atropalpis* Gravely, *Rec. Indian Mus.*, **26** : 610.

1951. *Pardosa atropalpis* : Sinha, *Rec. Indian Mus.*, **48**(2) : 46.

1980. *Pardosa atropalpis* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, **1**(2) : 325.

Material examined : 2 ♀, Somesior, Dist. Almora, Kumaun Hills, Uttarakhand, 9.ix.1978, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dist. Almora), New Record; West Bengal; Bihar; Karnataka; Andhra Pradesh; Tamil Nadu.

48. *Pardosa mukundi* Tikader & Malhotra

1980. *Pardosa mukundi* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, **1**(2) : 326.

Material examined : 1 ♀, Baring, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 26.x.1977, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dist. Pithoragarh), New Record; Maharashtra.

49. *Pardosa birmanica* Simon

1884. *Pardosa birmanica* Simon, *Ann. Mus. civ. stor. nat. Genova*, **20** : 333.

1972. *Pardosa birmanica* : Sadana, *Ent. Monthly Mag.*, **107** : 226.

1980. *Pardosa birmanica* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, **1**(2) : 329.

Material examined : 1 ♀, F.R.H. Geshimath, Dist. Chamoli, Garwall Hills, Uttarakhand, 16.x.1985, coll. R.N. Chopra; 1 ♀, Pharlolwala, Dist. Dehra Dun, Gawall Hills, Uttarakhand, 17.ii.1972, coll. R.N. Chopra; 1 ♀, Bhowali, Dist. Nainital, Kumaun Hills, Uttarakhand, 27.x.1977, coll. Arun Kumar; 1 ♀, Sonaghat, Dist. Almora, Kumaun Hills, Uttarakhand, 17.i.1989, coll. G.S. Arora; 1 ♀, Chanduk, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 27.i.1988, coll. A. Hussain; 2 ♀, Molichur, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 20.v.1979, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dists. Dehra Dun, Chamoli, Pithoragarh, Nainital, Almora), Uttarakhand; Uttar Pradesh; West Bengal; Orissa; Punjab; Bihar; Madhya Pradesh; Maharashtra; Rajasthan; Meghalaya; Andhra Pradesh; Tamil Nadu.

Elsewhere : Mayanmar, Java, Alexandria, Pakistan.

50. *Pardosa kupupa* (Tikader)

1970. *Lycosa kupupa* Tikader, *Rec. zool. Surv. India*, **64**(1-4) : 66.

1980. *Pardosa kupupa* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, **1**(2) : 333.

Material examined : 1 ♀, Lasnagar, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 27.x.1979, coll. J.C. Tripathi; 1 ♀, Sassrndrig forest, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 17.ii.1992, coll. R.N. Chopra; 1 ♀, Darchula, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 27.ii.1985, coll. A. Hussain.

Distribution : India : Uttarakhand (Dist. Dehra Dun, Pithoragarh), New Record; Sikkim.

51. *Pardosa ookleyi* Gravely

1924. *Pardosa ookleyi* Gravely, *Rec. Indian Mus.*, **26** : 610.

1980. *Pardosa ookleyi* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, **1**(2) : 337.

Material examined : 2 ♀, Harbertpur, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 9.ii.1983, coll. P.T. Bhutia; 2 ♀, Sassrndrig forest, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 17.ii.1992, coll.

R.N. Chopra; 1 ♀, Darchula, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 17.ii.1972, coll. R.N. Chopra.

Distribution : India : Uttarakhand (Dists. Dehra Dun, Pithoragarh), Bihar; Gujarat; Karnataka; Punjab; Tamil Nadu.

Elsewhere : Pakistan.

52. *Pardosa burasantiensis* Tikader & Malhotra

1976. *Pardosa burasantiensis* Tikader & Malhotra, *Proc. Indian Acad. Sci.*, 83(3) : 130-131.

1980. *Pardosa burasantiensis* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, 1(2) : 338.

Material examined : 1 ♀, Harbertpur, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 9.ii.1983, coll. P.T. Bhutia.

Distribution : India : Uttarakhand (Dist. Dehra Dun), New Record; West Bengal.

53. *Pardosa rhenockensis* (Tikader)

1970. *Lycosa rhenockensis* Tikader, *Rec. zool. Surv. India*, 64(1-4) : 68.

1980. *Pardosa rhenockensis* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, 1(2) : 392.

Material examined : 1 ♀, Nakarinala, Dist. Uttarkashi, Garwall Hills, Uttarakhand, 7.vii.1989, coll. N.K. Sinha.

Distribution : India : Uttarakhand (Dist. Uttarkashi), New Record; Sikkim; Gujarat.

54. *Pardosa shyamae* (Tikader)

1970. *Lycosa shyamae* Tikader, *Rec. zool. Surv. India*, 64(1-4) : 67.

1980. *Pardosa shyamae* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, 1(2) : 343.

Material examined : 1 ♀, Nankuchiatal, Dist. Nainital, Kumaun, Hills, Uttarakhand, 24.ix.1975, coll. Arun Kumar; 1 ♀, Harbertpur, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 9.ii.1983, coll. P.T. Bhutia; 2 ♀, Land down, Dist. Pauri, Garwall Hills, Uttarakhand, 21.iv.1989, coll. Arun Kumar; 1 ♀, F.R.H. Geshimath, Dist. Chamoli, Garwall Hills, Uttarakhand, 16.x.1985, coll. R.N. Chopra.

Distribution : India : Uttarakhand (Dists. Dehra Dun, Nainital, Chamoli; Pauri), New Record; West Bengal.

55. *Pardosa heterophthalmus* (Simon)

1889. *Acroniops heterophthalmus* Simon, *Hist. Nat. des Araignees*, 2 : 362.

1980. *Pardosa heterophthalmus* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, 1(2) : 345.

Material examined : 1 ♀, Raju National Park, Dist. Saharanpur, Garwall Hills, Uttarakhand, 29.ix.1957, coll. J.C. Tripathi; 1 ♀, Moundal, Dist. Chamoli, Garwall Hills, Uttarakhand, 25.x.1985, coll. R.N. Chopra; 2 ♀, Naogakhal, Dist. Pauri, Garwall Hills, Uttarakhand, 24.iv.1959, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dists. Saharanpur, Chamoli, Pauri), New Record; Tamil Nadu.

Elsewhere : Java.

56. *Pardosa leucopalpis* Gravely

1924. *Pardosa leucopalpis* Gravely, *Rec. Indian Mus.*, 26 : 610.

1951. *Pardosa leucopalpis* : Sinha, *Rec. Indian Mus.*, 48(2) : 47.

1980. *Pardosa leucopalpis* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, 1(2) : 349.

Material examined : 1 ♀, Hanuoranti, Dist. Pauri, Garwall Hills, Uttarakhand, 22.iv.1959, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dist. Pauri), New Record, Orissa; Andhra Pradesh; Kerala.

Elsewhere : Pakistan, Sri Lanka.

57. *Pardosa annandalei* (Gravely)

1924. *Lycosa annandalei* Gravely, *Rec. Indian Mus.*, 26 : 606.

1951. *Pardosa annandalei* : Sinha, *Rec. Indian Mus.*, 48(2) : 38.

1980. *Pardosa annandalei* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, 1(2) : 351.

Material examined : 2 ♀, Pandukeshwar, Dist. Chamoli, Garwall Hills, Uttarakhand, 20.x.1985, coll. R.N. Chopra; 1 ♀, Kasree, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 8.i.1987, coll. Raj Tilak; 1 ♀, Darchula, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 6.xi.1996, coll. Asket Sing.

Distribution : India : Uttarakhand (Dists. Dehra Dun, Chamoli, Pithoragarh), New Record; West Bengal; Assam; Bihar; Manipur; Gujarat; Maharashtra; Karnataka; Madhya Pradesh; Kerala; Andhra Pradesh; Tamil Nadu.

Elsewhere : Myanmar, Bangla Desh, Pakistan.

58. *Pardosa sumatrana* (Thorell)

1890. *Lycosa sumatrana* Thorell, *Ann. Mus. Stor. nat. Genava*, 30 : 136.

1951. *Pardosa sumatrana* : Sinha, *Rec. Indian Mus.*, 48(2) : 33.

1980. *Pardosa sumatrana* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, 1(2) : 353.

Material examined : 1 ♀, Pardwala, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 17.ii.1972, coll. R.N. Chopra; 1 ♀, Padukeswar, Dist. Chamoli, Garwall Hills, Uttarakhand, 20.x.1985, coll. R.N. Chopra; 1 ♀, Karco, Dist. Dhera Dun, Garwall Hills, Uttarakhand, 8.i.1957, coll. Raj Tilak; 1 ♀, Kalsi, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 7.vii.1989, coll. N.K. Sinha; 1 ♀, Darchula, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 27.xi.1985, coll. A. Hussain; 1 ♀, Kasree, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 22.i.1987, coll. R.N. Chopra; 1 ♀, Harbentpur, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 22.i.1987, coll. R.N. Chopra; 1 ♀, Harbentpur, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 9.ii.1983, coll. P.T. Bhutia; 1 ♀, Khandli forest, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 7.ii.1983, coll. P.T. Bhutia; 3 ♀, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand, 31.x.2003 coll. Bijan Biswas; 2 ♀, Rudrapryag, Dist. Rudrapryag, Garwall Hills, Uttarakhand, 9.x.2004, coll. P. Mukhopadhyay.

Distribution : India : Uttarakhand (Dists. Dehra Dun, Chamoli, Pithoragarh, Rudrapryag, Ranikhet), New Record; West Bengal; Bihar; Madhya Pradesh; Andhra Pradesh; Himachal Pradesh; Maharashtra; Kerala; Karnataka; Rajasthan; Arunachal Pradesh; Tamil Nadu.

Elsewhere : Pakistan, Bangla Desh, Sri Lanka, Sumatra.

59. *Pardosa ladakhensis* Tikader

1977. *Pardosa ladakhensis* Tikader, *J. Bombay nat. Hist. Soc.*, 74(1) : 144.

1980. *Pardosa Ladakhensis* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, 1(2) : 360.

Material examined : 1 ♀, Kalsi, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 22.v.1979, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dist. Dehra Dun), New Record; Jammu & Kashmir.

Genus *Arctosa* Koch

1847. *Arctosa* Koch, *Die. Arachnide*, 14(3) : 94.

1972. *Arctosa* : Kaston, *How to know the spiders*, : 198.

1980. *Arctosa* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, 1(2) : 368.

Type species : *Arctosa cinerea* (Fabricus).

Distribution : India, America, New England, Europe.

Key to the species of the genus *Arctosa* Koch

1. Ventral side of the femora of all legs provided with greenish brown broad transverse band *indicus*
Ventral side of the femora of all legs pale in colour and not transverse band 2
2. Patches at the bases of second and third row of eyes contiguous and legs provided with conspicuous brownish green patches *mulani*

60. *Arctosa indicus* Tikader & Malhotra

1980. *Arctosa indicus* Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, 1(2) : 371.

Material examined : 1 ♀, Kalsi, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 11.i.1972, coll. A.T. Biswas.

Distribution : India : Uttarakhand (Dist. Dehra Dun), New Record; Maharashtra.

61. *Arctosa mulani* (Dyal)

1935. *Pardosa mulani* Dyal, *Bull. Deptt. Zool. Punjab Univ.*, 1 : 146.

1980. *Arctosa mulani* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, 1(2) : 373.

1995. *Arctosa mulani* : Biswas & Majumder, *Fauna of Meghalaya; Part-2 Araneae : Spiders, State Fauna Series*, 4 : 107.

Material examined : 1 ♀, Barchina, Dist. Almora, Kumaun Hills, Uttarakhand, 11.xi.1976, coll. Asket Sing; 2 ♀, Turganath, Dist. Chamoli, Garwall Hills, Uttarakhand, 29.v.1989, coll. N.K. Sinha; 2 ♀, Senva Lake, Dist. Pithoragarh, Kumaun

Hills, Uttarakhand, 19.ii.1989, coll. S.R. Varsney; 8 ♀, Gakhand, Dist. Pauri, Garwall Hills, Uttarakhand, 27.iv.1989, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dists. Pithoragarh, Chamoli, Pauri, Almora), New Record; Maharashtra.

Elsewhere : Pakistan.

Genus *Lycosa* Latreille

1804. *Lycosa* Latreille, *Nouae. Dist. d' Hist. Nat.*, 24 : 135.

1924. *Lycosa* : Gravely, *Rec. Indian Mus.*, 26 : 588.

1970. *Lycosa* : Tikader, *Rec. zool. Surv. India*, 64(1-4) : 63.

1980. *Lycosa* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, 1(2) : 377.

Type species : *Lycosa tarantula* Ressi

Distribution : All over the world.

Key to the species of the genus *Lycosa* Latreille

1. Carapace provided with a median broad pale band extending from bases of the second row of eyes to the base of cephalothorax
..... *himalayensis*
Carapace not provided with a median broad pale band from bases of the second row of eyes to the base of cephalothorax 2
2. Coxae of all legs provided with brown patches, dorsal side of abdomen also with small pale patches *tista*
Coxae of all legs without brown patches, dorsal side of abdomen also without small pale patches 3
3. Ventral side of the abdomen provided with a broad dark brown patches extending from the epigastric fold to the base of the spinnerets *chaperi*
Ventral side of the abdomen without brown patches and not extending to the base of the spinnerets 4
4. Ventral side of abdomen uniformly pale colour. Tips of palps dark brown in female
..... *madani*
Ventral side of abdomen not uniform and tips of palps not dark brown in female 5

5. Carapace much longer, labium dark brown at basal region and abdomen pale dorsally
..... *phipsoni*
Carapace round at the thoracic region abruptly narrow at the cephalic region
..... 6
6. Moderately big spiders, sternum and eoxae dark brown. Ventral side of patella of all legs dark brown *shillongensis*
Moderately small spiders, sternum and coxae pale in colour 7
7. Coxae of all legs dark brown ventrally and extremities of ventral side of IV tibiae provided with broad dark brown band
..... *nigrotibialis*
Coxae of all legs not dark brown ventrally and extremities of central side of IV tibiae not provided with dark brown band 8
8. Sternum pale brown and ventral side of abdomen with three longitudinal broad, dark brown conspicuous band *prolifera*
Sternum dark brown and ventral side of abdomen uniform dark brown to black 9
9. Dorsal side of abdomen uniform pale and without any patch *indagatrix*
Dorsal side of abdomen not uniformly pale coloured 10
10. Tibiae, metatarsi and tarsi I and II pale ventrally *iranii*
Tibiae, metatarsi and tarsi I and II dark ventrally 11
11. Abdomen antero-mid-dorsally provided with a lens-shaped brown marking
..... *quadrifer*
Abdomen antero-mid-dorsally provided with a long brown marking 12
12. Vento-lateral side of abdomen with two longitudinal rows of irregular dark brown patches *pictula*
Vento-lateral side of abdomen without two longitudinal rows of irregular dark brown patches 13
13. Posterior quadrangle of the eyes not as long as wide *fusca*

Posterior quadrangle of the eyes not as long as wide 14

14. Sternum provided with mid-longitudinally a conspicuous broad black band
.....*mahabalesharensis*

Sternum without mid-longitudinally a conspicuous broad black band 15

15. Tibiae I, II, III and IV provided with a pair of brown longitudinal streak at the pro and retrolateral side of the extremities
.....*lambai*

62. *Lycosa himalayensis* Gravely

1924. *Lycosa himalayensis* Gravely, *Rec. Indian Mus.*, 26 : 603

1951. *Lycosa himalayensis* : Sinha, *Rec. Indian Mus.*, 48(2) : 30.

1980. *Lycosa himalayensis* : Tikader & Malhotra, *Fauna of India*, Araneae : Spiders, 1(2) : 382.

Material examined : 1 ♀, Narikuchiatal, Dist. Nainital, Kumaun Hills, Uttarakhand, 24.xi.1975, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dist. Nainital), New Record; West Bengal; Assam.

63. *Lycosa tista* Tikader

1970. *Lycosa tista* Tikader, *Rec. zool. Surv. India*, 64(1-4) : 67.

1980. *Lycosa tista* : Tikader & Malhotra, *Fauna of India*, Araneae : Spiders, 1(2) : 384.

Material examined : 1 ♀, Senva Lake, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 9.xii.1989, coll. S.R. Varsaney; 1 ♀, Lachhiwala, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 21.ii.1986, coll. J.C. Tripathi; 1 ♀, F.R.S. Mohund, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 28.ix.1989, coll. J.C. Tripathi; 2 ♀, Pardwala, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 19.ix.1987, coll. J.C. Tripathi; 1 ♀, Baijnath, Dist. Almora, Kumaun Hills, Uttarakhand, 7.ix.1978, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dists. Dehra Dun, Pithoragarh, Almora), New Record; Sikkim.

64. *Lycosa chaperi* Simon

1885. *Lycosa chaperi* Simon, *Bull. Soc. Zool. Fr.*, 10 : 8.

1900. *Lycosa chaperi* : Pocock, *Fauna of Brit. India*, Arachn., : 254.

1924. *Lycosa chaperi* : Gravely, *Rec. Indian Mus.*, 26 : 589.

1980. *Lycosa chaperi* : Tikader & Malhotra, *Fauna of India*, Araneae : Spiders, 1(2) : 387.

Material examined : 3 ♀, Kolsi, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 29.v.1978, coll. Raj Tilak; 2 ♀, Narkuchiatal, Dist. Nainital, Kumaun Hills, 24.ix.1975, coll. Arun Kumar; 1 ♀, Bageshwar, Dist. Almora, Kumaun Hills, Uttarakhand, 13.i.1980, coll. G.S. Arora; 1 ♀, Gakhand, Dist. Pauri, Garwall Hills, Uttarakhand, 21.xi.1976, coll. Asket Sing.

Distribution : India : Uttarakhand (Dists. Dehra Dun, Nainital, Almora), New Record; Andhra Pradesh; Punjab.

65. *Lycosa madani* Pocock

1901. *Lycosa madani* Pocock, *J. Bombay nat. Hist. Soc.*, 13(3) : 486.

1951. *Lycosa madani* : Sinha, *Rec. Indian Mus.*, 48(2) : 27.

1980. *Lycosa madani* : Tikader & Malhotra, *Fauna of India*, Araneae : Spiders, 1(2) : 396.

Material examined : 1 ♀, Pardwala, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 17.ii.1972, coll. R.N. Chopra.

Distribution : India : Uttarakhand (Dist. Dehra Dun), New Record; Bihar; Orissa; Maharashtra; Kerala; Karnataka; Andhra Pradesh.

66. *Lycosa phipsoni* Pocock

1899. *Lycosa phipsoni* Pocock, *J. Bombay nat. Hist. Soc.*, 12 : 751.

1924. *Lycosa phipsoni* : Gravely, *Rec. Indian Mus.*, 26 : 590.

1980. *Lycosa phipsoni* : Tikader & Malhotra, *Fauna of India*, Araneae : Spiders, 1(2) : 398.

Material examined : 1 ♀, Bibiwala forest, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 29.iv.1995, coll. R.N. Chopra; 1 ♀, Kolsi, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 29.v.1978, coll. Raj Tilak; 1 ♀, Senva Lake, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 9.xii.1989, coll. S.R. Varsaney.

Distribution : India : Uttarakhand (Dists. Dehra Dun, Pithoragarh), New Record; Maharashtra.

67. *Lycosa shillongensis* Tikader & Malhotra

1980. *Lycosa shillongensis* Tikader & Malhotra, *Fauna of India*, Araneae : Spiders, 1(2) : 403.

Material examined : 1 ♀, Barinag, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 26.xi.1977, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dist. Pithoragarh), New Record; Meghalaya.

68. *Lycosa nigrotiabilis* Simon

1884. *Lycosa nigrotiabilis* Simon, *Ann. Mus. Stor. Nat., Genova*, 20 : 330.

1924. *Lycosa nigrotiabilis* : Gravely, *Rec. Indian Mus.*, 26 : 600.

1964. *Lycosa nigrotiabilis* : Tikader, *Rec. Indian Mus.*, 59(3) : 266.

1980. *Lycosa nigrotiabilis* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, 1(2) : 405.

Material examined : 1 ♀, Kolsi, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 11.i.1972, coll. M.K. Biswas; 1 ♀, Rudraprayag, Dist. Garwall Hills, Uttarakhand, 9.x.2004, coll. P. Mukhopadhyay; 1 ♀, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand, 31.x.2003, coll. Bijan Biswas.

Distribution : India : Uttarakhand (Dists. Dehra Dun, Ranikhet, Rudraprayag), New Record; West Bengal; Bihar; Gujarat; Himachal Pradesh; Assam; Sikkim.

Elsewhere : Myanmar, Pakistan, Beluchistan, Afghanistan, Sam, Arakan.

69. *Lycosa prolifica* Pocock

1901. *Lycosa prolifica* Pocock, *J. Bombay nat. Hist. Soc.*, 13(3) : 486.

1951. *Lycosa prolifica* : Sinha, *Rec. Indian Mus.*, 48(2) : 23.

1980. *Lycosa prolifica* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, 1(2) : 409.

Material examined : 1 ♀, Senva Lake, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 9.xii.1989, coll. S.R. Varsaney; 2 ♀, Bageswar, Dist. Almora, Kumaun Hills, Uttarakhand, 31.xi.1977, coll. Arun Kumar; 1 ♀, Khandali forest, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 17.x.1975, coll. R.N. Bhazgar; 2 ♀, F.R.S. Mohund, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 28.ix.1987, coll. J.C. Tripathi.

Distribution : India : Uttarakhand (Dists. Dehra Dun, Almora), Maharashtra (Type-locality), Uttar Pradesh, Uttarakhand; Punjab.

70. *Lycosa indagatrix* Walckenaer

1837. *Lycosa indagatrix* Walckenaer, *Ins. Apt.*, 1 : 339.

1924. *Lycosa indagatrix* : Gravely, *Rec. Indian Mus.*, 26 : 599.

1951. *Lycosa indagatrix* : Sinha, *Rec. Indian Mus.*, 48(2) : 20.

1980. *Lycosa indagatrix* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, 1(2) : 411.

Material examined : 2 ♀, Lansdown, Dist. Pauri, Garwall Hills, Uttarakhand, 2.iv.1989, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dist. Pauri), New Record; Andhra Pradesh; Tamil Nadu.

Elsewhere : Sri Lanka.

71. *Lycosa iranii* Pocock

1901. *Lycosa iranii* Pocock, *J. Bombay nat. Hist. Soc.*, 13(3) : 485.

1924. *Lycosa iranii* : Gravely, *Rec. Indian Mus.*, 26 : 589.

1980. *Lycosa iranii* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, 1(2) : 415.

Material examined : 1 ♀, Kasree, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 22.i.1977, R.N. Chopra.

Distribution : India : Uttarakhand (Dist. Dehra Dun), New Record; Maharashtra.

72. *Lycosa quadrifer* Gravely

1924. *Lycosa quadrifer* Gravely, *Rec. Indian Mus.*, 26 : 608.

1951. *Lycosa quadrifer* : Sinha, *Rec. Indian Mus.*, 48(2) : 42.

1980. *Lycosa quadrifer* : Tikader & Malhotra, *Fauna of India, Araneae : Spiders*, 1(2) : 422.

Material examined : 1 ♀, Sassendring forest, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 17.ii.1992, R.N. Chopra; 1 ♀, Darchula, Dist. Pithoragarh, Kumaun Hills, 27.ii.1985, coll. A. Hussain; 1 ♀, Kasree, Dist. Dehra Dun Garwall Hills, Uttarakhand, 22.i.1987, coll. R.N. Chopra; 1 ♀, Lansdown, Dist. Pauri, Garwall Hills, Uttarakhand, 21.iv.1989, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dists. Dehra Dun, Pithoragarh, Pauri), New Record; Kerala, Karnataka, Tamil Nadu.

Elsewhere : Sri Lanka.

73. *Lycosa pictula* Pocock

1901. *Lycosa pictula* Pocock, *J. Bombay nat. Hist. Soc.*, 13(3) : 486.

1924. *Lycosa pictula* Gravely, *Rec. Indian Mus.*, 26 : 590.

1980. *Lycosa pictula* : Tikader & Malhotra, *Fauna of India*, Araneae : Spiders, 1(2) : 424.

Material examined : 1 ♀, Senva Lake, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 9.xii.1989, coll. S.R. Varsaney.

Distribution : India : Uttarakhand (Dist. Pithoragarh), New Record; Maharashtra.

74. *Lycosa fuscana* Pocock

1901. *Lycosa fuscana* Pocock, *J. Bombay nat. Hist. Soc.*, 13(3) : 485.

1924. *Lycosa fuscana* : Gravely, *Rec. Indian Mus.*, 26 : 589.

1980. *Lycosa fuscana* : Tikader & Malhotra, *Fauna of India*, Araneae : Spiders, 1(2) : 428.

Material examined : 1 ♀, Twaghat, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 15.xii.1989, coll. S.C. Verma.

Distribution : India : Uttarakhand (Dist. Pithoragarh), New Record; Maharashtra.

75. *Lycosa mahabaleshwariensis* Tikader & Malhotra

1980. *Lycosa mahabaleshwariensis* : Tikader & Malhotra, *Fauna of India*, Araneae : Spiders, 1(2) : 429.

Material examined : 1 ♀, Darchinia, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 27.xi.1988, coll. A. Hussain, 1 ♀, Kolsi, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 7.vii.1988, coll. N.K. Sinha; 1 ♀, Julangha, Dist. Pithoragarh, Kumaun Hills, Uttaranchal, 6.xi.1976, coll. Asket Sing; 1 ♀, Raipur, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 8.vii.1976, coll. S. Lal.

Distribution : India : Uttarakhand (Dists. Dehra Dun, Pithoragarh), New Record; Maharashtra.

76. *Lycosa lambai* Tikader & Malhotra

1980. *Lycosa lambai* : Tikader & Malhotra, *Fauna of India*, Araneae : Spiders, 1(2) : 431.

Material examined : 1 ♀, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand, 31.x.2003, coll. Bijan Biswas.

Distribution : India : Uttarakhand (Dist. Ranikhet), New Record; Maharashtra.

Genus *Trochosa* Koch

1847. *Trochosa* Koch, *Die Arachniden*, 14(3) : 95.

1972. *Trochosa* : Kaston, *How to know the spiders*, 1 : 197.

Type species : *Trochosa rubicola* (De Geer)

Distribution : India, America, New England, Europe.

Key to the species of the genus *Trochosa* Koch

1. Dorsum provided with two longitudinal rows of dark brown patches *punctipes*
Dorsum without such type of brown patches 2
2. Carapace provided with sidely irregular patches *himalayensis*

77. *Trochosa punctipes* (Gravely)

1924. *Lycosa punctipes* Gravely, *Rec. Indian Mus.*, 26 : 603.

1951. *Lycosa punctipes* : Sinha, *Rec. Indian Mus.*, 48(2) : 31.

1980. *Trochosa punctipes* : Tikader & Malhotra, *Fauna of India*, Araneae : Spiders, 1(2) : 436.

Material examined : 1 ♀, Bansor, Dist. Almora, Kumaun Hills, Uttarakhand, 13.i.1980, G.S. Arora.

Distribution : India : Uttarakhand (Dist. Almora), New Record, West Bengal; Bihar; Karnataka; Tamil Nadu.

78. *Trochosa himalayensis* Tikader & Malhotra

1980. *Trochosa himalayensis* Tikader & Malhotra, *Fauna of India*, Araneae : Spiders, 1(2) : 437.

Distribution : India : Uttarakhand (Dist. Pauri), Uttarakhand; Uttar Pradesh.

Family OXYOPIDAE**Key to the genera of the family Oxyopidae**

1. Cephalothorax high and convex; posterior lateral eyes strongly procurved *Oxyopes*
- Cephalothorax not high and convex, posterior lateral eyes weak and recurved 2
2. Cephalothorax broad with sharp fovea; anterior now strongly recurved *Peuceitia*

Genus *Oxyopes* Latreille

1804. *Oxyopes* Latreille, *Hist. Nat. Arach. France*, 14(7) : 144.

1900. *Oxyopes* : Pocock, *Fauna of Brit. India Arachn.*, : 255.

Type species : *Oxyopes heterophthalmus* Latreille

Distribution : Cosmopolitan.

79. *Oxyopes shweta* Tikader

1970. *Oxyopes shweta* Tikader, *Rec. zool. Surv. India*, 64(1-4) : 78.

1992. *Oxyopes shweta* : Biswas & Biswas, *Fauna of West Bengal, Part-III, Araneae : Spiders, State Fauna Series*, 3 : 434.

Diagnosis : Cephalothorax and legs are light brownish green, abdomen chalk-white. Cephalic region longer than wide, high, clothed with fine hair, posterior lateral side of thorax provided with patches of deep brown, short and blunt hair, centre of thorax provided with a prominent fovea. Clypeus long and provided with two black lines extending from anterior median eye to near the base of fang of chelicerae. Sternum oval, pointed behind, clothed with fine hair. Legs long, strong, covered with fine hair and spines. Abdomen long, narrowing behind, antero median with a lance-shaped brown patch. Dorsum with minute net-like chalk white patches. Male almost similar like female but smaller in size.

Material examined : 2 ♀, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand, 31.x.2003, coll. Bijan Biswas; 2 ♀, Rajaji National Park, Dist. Haridwar, Garwall Hills, Uttarakhand, 24.x.2003, coll. B.K. Biswas & party; 6 ♀, 1 ♂, Raiwala, Dist. Haridwar, Garwall Hills, Uttaranchal, 23.iii.2005, coll. B.K. Biswas & party, 5 ♀, Kolsi, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 29.v.1978, coll. Raj Tilak.

Distribution : India : Uttarakhand (Dists. Haridwar, Dehra Dun, Ranikhet), New Record; West Bengal; Meghalaya; West Sikkim.

Genus *Peucetia* Thorell

1869. *Peucetia* Thorell, *On European Spiders, Upsala*, 7 : 196.

1970. *Peucetia* : Tikader, *Rec. zool. Surv. India*, 64(1-4) : 79.

Type species : *Peucetia viridis* Blackwall

Distribution : Cosmopolitan except Australia.

Key to the species of the genus *Peucetia* Thorell

1. Clypeus long and provided with four black lines extending from ocular area to near the base of fang of chelicerae *latikae*
Clypeus without four black lines extending from ocular area to near the base of fang of chelicerae 2
2. Abdomen provided with a longitudinal deep brown line with lateral branches on mid dorsally *viridana*

80. *Peucetia latikae* Tikader

1970. *Peucetia latikae* Tikader, *Rec. zool. Surv. India*, 64(1-4) : 80.

1992. *Peucetia latikae* : Biswas & Biswas, *Fauna of West Bengal, Part-III, Araneae : Spiders, State Fauna Series*, 3 : 435.

Material examined : 3 ♀, Haridwar, Dist. Haridwar, Garwall Hills, Uttarakhand, 17.iii.2005, coll. B.K. Biswas & party; 1 ♀, Rajaji National Park, Dist. Haridwar, Garwall Hills, Uttarakhand, 17.iii.2005, coll. Bijan Biswas.

Distribution : India : Uttarakhand (Dist. Haridwar), New Record; West Bengal; Sikkim.

81. *Peucetia visidana* Stoliczka

1869. *Peucetia viridana* Stoliczka, *J. Asia. Soc. Bengal*, 38 : 220.

1981. *Peucetia viridana* : Tikader & Biswas, *Rec. zool. Surv. India, Occ. Pap. No.*, 30(1) : 65.

Material examined : 2 ♀, Haridwar, Dist. Haridwar, Garwall Hills, Uttarakhand, 17.iii.2005, coll. B.K. Biswas & party.

Distribution : India : Uttarakhand (Dist. Haridwar), New Record; West Bengal; Orissa; Pondichery; Tamil Nadu.

Elsewhere : Sri Lanka.

Family GNAPHOSIDAE

Key to the genera of the family Gnaphosidae

1. The inner margin of the chelicerae with a wide serrated lamina. Maxillae and labium both are rounded *Gnaphosa*
Inner margin of chelicerae no serration. Maxillae and labium not rounded 2

2. Inner margin of chelicerae with one tooth; bulb of the palpus of male with stout median apophysis *Scopodes*
Inner margin of the chelicerae with two teeth; bulb of the male palpus without median apophysis 3
3. Inner margin of furrow of chelicerae with a single tooth *Geodrassus*
Inner margin of furrow of chelicerae with more than two to three teeth 4
4. Posterior median eyes much nearer to each other than the laterals *Drassodes*
Posterior median eyes not nearer to each other than the laterals 5
5. Eye rows close together but equidistantly separated with each other; posterior median eyes well separated *Sosticus*
Eye rows not close together; posterior median eyes not separated 6
6. Anterior row of eyes straight; the eyes are equidistant; medians are small
..... *Zelotes*
Posterior row of eyes not straight; eyes are not equidistant; medians are big size 7
7. Chelicerae provided with three teeth on upper margin and two teeth on lower margin; posterior median eyes large and oblique, close but well separated from the laterals
..... *Haplodrassus*

Genus *Gnaphosa* Latreille

1804. *Gnaphosa* Latreille, *Nouv. Dict. Hist. Nat.*, 24 : 134.
1966. *Gnaphosa* : Tikader, *Rec. Indian Mus.*, 59(4) : 439.
1975. *Gnaphosa* : Platnick & Shadab, *Bull. Am. Mus. nat. Hist.*, 155 : 1-66.

Type species : *Gnaphosa lucifuga* (Walckenaer)

Distribution : Europe, Asia, Africa, America.

82. *Gnaphosa poonaensis* Tikader & Gajbe

1973. *Gnaphosa poonaensis* Tikader & Gajbe, *Proc. Indian Acad. Sci.*, 77(5) : 188.
1982. *Gnaphosa poonaensis* : Tikader, *Fauna of India, Araneae* : Spiders, 2(2) : 332.

Diagnosis : Cephalothorax longer than wide, narrowing in front, slightly convex, posterior middle provided with inconspicuous fovea. Eyes early white except the anterior median. Sternum heart shaped. Legs relatively long, stout clothed with hair and some spines. Abdomen nearly elliptical, clothed with brown hair. Spinnerets very prominent.

Material examined : 2 ♀, Thulaghat, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 17.x.1989, coll. G.S. Arora; 1 ♀, Baring, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 12.vi.1976, coll. Asket-Sing.

Distribution : India : Uttarakhand (Dist. Pithoragarh), New Record; Maharashtra; Rajasthan; Uttar Pradesh; Himachal Pradesh.

Genus *Scopodes* Chamberlin

1922. *Scopodes* Chamberlin, *Proc. biol. Soc. Wash.*, 35 : 156.
1940. *Scopodes* : Comstock, *The Spider Book*, New York, : 328.

Type species : *Scopodes catharius* Chamberlin

Distribution : India, America, Claremont.

Key to the species of the genus *Scopodes* Chamberlin

1. Abdomen oval in shape, dorsum provided with small white spots; outer margin of the chelicerae provided with three teeth
..... *maitraiae*
Abdomen elliptical in shape, dorsum without white spots; outer margin of the chelicerae provided with two teeth 2
2. Carapace provided with some spine-like hair and the dorsum provided "V" shaped brown patches *kuljitae*
Carapace without spine-like hair and dorsum without "V" shaped brown patches 3
3. Outer margin of chelicerae armed with two large teeth *pritae*

83. *Scopodes maitraiae* Tikader & Gajbe

1977. *Scopodes maitraiae* Tikader & Gajbe, *Rec. zool. Surv. India*, 73(1-4) : 14.
1982. *Scopodes maitraiae* : Tikader, *Fauna of India, Araneae* : Spiders, 2(2) : 365.

Material examined : 1 ♀, Bibiwala forest, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 27.ii.1986, coll. R.N. Chopra.

Distribution : India : Uttarakhand (Dist. Dehra Dun), New Record; Maharashtra.

84. *Scopodes kuljitae* Tikader

1982. *Scopodes kuljitae* Tikader, *Fauna of India*, Araneae : Spiders, 2(2) : 367.

Material examined : 1 ♀, Satadal, Dist. Nainital, Kumaun Hills, Uttarakhand, 27.ii.1986, coll. G.S. Arora.

Distribution : India : Uttarakhand (Dist. Nainital), New Record; West Bengal; Maharashtra; Karnataka.

85. *Scopodes pritae* Tikader

1982. *Scopodes pritae* Tikader, *Fauna of India*, Araneae : Spiders, 2(2) : 369.

Material examined : 1 ♀, Satadal, Dist. Nainital, Kumaun Hills, Uttarakhand, 2.i.1979, coll. G.S. Arora.

Distribution : India : Uttarakhand (Dist. Nainital), New Record; Maharashtra.

Genus *Geodrassus* Chamberlin

1922. *Geodrassus* Chamberlin, *Proc. biol. Soc. Wash.*, 35 : 159.

1977. *Geodrassus* : Tikader & Gajbe, *Rec. zool. Surv. India*, 73 : 71.

Type species : *Geodrassus gosiutus* (Chamberlin)

Distribution : Utah, America, India.

86. *Geodrassus sirmourensis* Tikader & Gajbe

1977. *Geodrassus sirmourensis* Tikader & Gajbe, *Rec. zool. Surv. India*, 73(1-4) : 71.

1982. *Geodrassus sirmourensis* : Tikader, *Fauna of India*, Araneae : Spiders, 2(2) : 386.

Diagnosis : Cephalothorax and legs are reddish-green, abdomen brown in colour. Cephalothorax longer than wide, broad in front, clothed with fine thick black hair. Pattern of radiating streaks diverse from a conspicuous fovea to the sides. Eyes are pearly white except anterior median, posterior now of eyes slightly longer than the anterior row. Medians are oval, larger than laterals and much

closer to each other than to the adjacent laterals. Chelicerae moderately strong, inner and outly margin provided with one tooth and three teeth respectively. Sternum heart shaped, pointed behind, clothed with fine thick hair. Legs formulare are 4123. Abdomen longer than wide, nearly elliptical, clothed with thick hair. Presence of sigilla and "U" shaped white marking at the posterior end. Spinnerets are prominent.

Material examined : 1 ♀, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand, 31.x.2003, coll. B.K. Biswas & party.

Distribution : India : Uttarakhand (Dist. Ranikhet), New Record; Himachal Pradesh (Type-locality).

Genus *Drassodes* Westring

1851. *Drassodes* Westring, *Goteborgs. K. Vetensk.-O. Vitterh Somh. Handl.*, 2 : 25-62.

1962. *Drassodes* : Tikader, *Proc. First Cong. Zool.*, : 570.

1977. *Drassodes* : Tikader, *Rec. zool. Surv. India*, 72(1-4) : 186.

87. *Drassodes lubrica* (Simon)

1905. *Mulicymnis lubrica* Simon, *Annls. Soc. ent. Fr.*, 74 : 162.

1957. *Camillina lubrica* : Bonnet, *Bib. Aranim.*, 2(3) : 2986.

1982. *Drassodes lubrica* : Tikader, *Fauna of India*, Araneae : Spiders, 2(2) : 406.

Diagnosis : Cephalothorax and legs pale yellowish, abdomen greyish yellow; longer than wide, blunt in front; cephalic region small, thoracic region provided with a fine fovea. Eye region compact; posterior median eyes largest and elliptical. Sternum oval in shape, pale yellow in colour, clothed with hair. Chelicerae small with small boss. Legs long and thin, clothed with hair and spines. Abdomen elongated oval, anterior end provided with thick layer of large hair, clothed with small hair.

Material examined : 1 ♀, Kasrow, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 8.i.1987, coll. Raj Tilak.

Distribution : India : Uttarakhand (Dist. Dehra Dun), New Record; Tamil Nadu.

Genus *Sostieus* Chamberlin

1922. *Sosticus* Chamberlin, *Proc. biol. soc. Wash.*, 35 : 160.

1987. *Sosticus* : Biswas, *Fauna of Orissa*, Part-1, Araneae : Spiders, *State Fauna Series*, 1 : 263.

Type speices : Sosticus insularis (Banks)

Distribution : India, America.

88. *Sosticus nainitalensis* Gajbe

1979. *Sosticus nainitalensis* Gajbe, *Bull. zool. Surv. India*, 2(1) : 70.

1982. *Sosticus nainitalensis* : Tikader, *Fauna of India*, Araneae : Spiders, 2(2) : 432.

Diagnosis : Cephalothorax deep brown, legs brown, abdomen deep brown to black. Cephalic region longer than wide, oval, clothed with pubescence and middle provided with short fovea. Eye rows distinctly separated, pearly white except anterior medians which are black, posterior row of eyes slightly longer than the anterior row. The median ocular quadrangle longer than broad and wider behind than in front. Chelicerae moderately strong, vertical, inner margin provided with two small and outer margin with three teeth. Legs are relatively long and thin, clothed with hair and spines. Abdomen longer than nearly elliptical, clothed with thick pubescence. Dorsum of the abdomen provided with three transverse white bands. Ventral side lighter than the dorsal.

Material examined : 1 ♀, Haridwar, Dist. Haridwar, Garwall Hills, Uttarakhand, 24.iii.2003, coll. B.K. Biswas & party.

Distribution : India : Uttarakhand (Dist. Haridwar), Nainital (Type locality).

Genus *Zelotes* Gistel

1848. *Zelotes* Gistel, *Nat. Thierr.*, : 11.

1948. *Zelotes* : Kaston, *Spider of connectent*, : 354-357.

1976. *Zelotes* : Tikader & Gajbe, *Proc. Indian Acad. Sci.*, 83(3) : 109-122.

Type speices : Zelotes subterranea (Koch)

Distribution : Oriental and temperate zone of the world.

Key to the species of the genus *Zelotes* Gistel

1. Abdomen dorsally without black patches; inner margin of chelicerae without any tooth *nainitalensis*

Abdomen dorsally with black patches, inner margin of chelicerae with tooth 2

2. Cephalothorax and legs reddish-green; chelicerae provided with two teeth inner and four teeth outer margin *surekhae*

Posterior median eyes slightly larger than the posterior lateral eyes 3

3. Posterior median eyes slightly smaller than the posterior lateral eyes *mandlaensis*

89. *Zelotes nainitalensis* Tikader & Gajbe

1976. *Zelotes nainitalensis* Tikader & Gajbe, *Proc. Indian Acad. Sci.*, 83(3) : 119-121.

1982. *Zelotes nainitalensis* : Tikader, *Fauna of India*, Araneae : Spiders, 2(2) : 479.

Material examined : 1 ♀, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand, 31.x.2003, coll. B.K. Biswas & party; 1 ♀, Somiswas, Dist. Almora, Kumaun Hills, Uttarakhand, 20.xii.1985, coll. J.C. Tripathi.

Distribution : India : Uttarakhand (Dists. Ranikhet, Almora).

90. *Zelotes surekhae* Tikader & Gajbe

1976. *Zelotes surekhae* Tikader & Gajbe, *Proc. Indian Acad. Sci.*, 83(3) : 116-117.

1982. *Zelotes surekhae* : Tikader, *Fauna of India*, Araneae : Spiders, 2(2) : 481.

Material examined : 1 ♀, Ganduala, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 21.i.1989, coll. S.C. Verma; 1 ♀, Naogakhal, Dist. Tehri, Garwall Hills, Uttarakhand, 24.iv.1989, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dists. Pithoragash, Tehri), New Record; Maharashtra.

91. *Zelotes mandlaensis* Tikader & Gajbe

1976. *Zelotes mandlaensis* Tikader & Gajbe, *Proc. Indian Acad. Sci.*, 83(3) : 112-113.

1982. *Zelotes mandlaensis* : Tikader, *Fauna of India*, Araneae : Spiders, 2(2) : 500.

Material examined : 1 ♀, Bibiwala forest, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 27.ii.1986, R.N. Chopra.

Distribution : India : Uttarakhand (Dist. Dehra Dun), New Record; Madhya Pradesh.

Genus *Haplodrassus* Chamberlin

1922. *Haplodrassus* Chamberlin, *Proc. biol. Soc. Wash.*, **35** : 161.

1975. *Haplodrassus* : Platnick & Shadab, *PAnn. Mus. Novit.*, **2583** : 5.

Type speices : *Haplodrassus hiemalis* (Emerton)

Distribution : India, America, New York.

Key to the species of the genus
Haplodrassus Chamberlin

1. Abdomen provided with white "V" shaped marking *sataragensis*
Abdomen without white "V" shaped marking 2
2. Cephalothorax provided with "W" shaped conspicuous deep brown marking just above the fovea *dumdumensis*

92. *Haplodrassus sataragensis* Tikader & Gajbe

1977. *Haplodrassus sataragensis* Tikader & Gajbe, *Rec. zool. Surv. India*, **73**(1-4) : 70.

1982. *Haplodrassus sataragensis* : Tikader, *Fauna of India, Araneae* : Spiders, **2**(2) : 466.

Material examined : 2 ♀, Jhulughat, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 21.i.1989, coll. S.C. Verma.

Distribution : India : Uttarakhand (Dist. Pithoragarh), New Record; Maharashtra.

93. *Haplodrassus dumdumensis* Tikader

1982. *Haplodrassus dumdumensis* Tikader, *Fauna of India, Araneae* : Spiders, **2**(2) : 468.

Material examined : 2 ♀, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand, 4.iv.1977, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dist. Ranikhet), New Record; West Bengal (Type-locality).

Family CLUBIONIDAE

Key to the genera of the family Clubionidae

1. Cephalothorax with permanent fovea; anterior legs shorten than posterior eyes *Clubiona*

Cephalothorax with inconspicuous fovea; anterior legs longer than posterior legs 2

2. Lateral eyes both anterior and posterior close to each other, posterior row of eyes strongly recurved *Cheiracanthium*

Lateral eyes both anterior and posterior not close to each other, posterior row of eyes strongly recurved 3

3. Abdomen oblonged in shape; abdominal sheild not folded transversely *Oedignatha*
Abdomen elongated; abdominal sheild plane 4
4. Abdomen oval in shape; abdominal sheild folded transversely *Apochinomma*

Genus *Clubiona* Latreille

1804. *Clubiona* Latreille, *Nouv. Die. Hist. nat.*, **24** : 154.

1981. *Clubiona* : Tikader & Biswas, *Rec. zool. Surv. India*, occ. pap. No. **30**(1) : 68.

Type species : *Clubiona pallidula* Clerck.

Distribution : All tropical countries of the world.

Key to the species of the genus *Clubiona*
Laterille

1. Abdomen spinddle-shaped, the posterior half with "V" shaped ornamentatin *dnassodes*
Abdomen oval shaped, the posterior half without "V" shaped ornamentation 2
2. Sternum oval in shape not pointed; four pairs of black dots situated near the coxae *hysgina*
Sternum heart-shaped provided with four pairs of dots 3
3. Labium yellowish brown in colour, not broader anteriorly, provided with six long black spines *shillongensis*
Labium reddish brown in colour, broader anteriorly, without six long black spines 4
4. Anterior row of eyes slightly recurved, silvery white in colour; maxillae longer than wide, reddish brown in colour *chakrabartei*
Maxillary lobe pale yellow in colour, constricted 5

5. Eyes of the posterior medians separated from each other *crouxi*
6. Eyes of the posterior medians close to each other *tikaderi*

94. *Clubiona drassodes* Cambridge

1874. *Clubiona drassodes* Cambridge, *Proc. Zool. Soc., London*, : 414.
1931. *Clubiona drassodes* : Gravely, *Rec. Indian Mus.*, **33**(3) : 262.
1992. *Clubiona drassodes* : Biswas & Biswas, *Fauna of West Bengal, Part-III, Araneae : Spiders, State Fauna Series*, **3** : 417.

Material examined : 1 ♀, Bidiwala forest, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 27.ii.1976, coll. R.N. Chopra.

Distribution : India : Uttarakhand (Dist. Dehra Dun), New Record; West Bengal; Maharashtra; Karnataka; Andaman and Nicobar Islands.

95. *Clubiona hyssina* Simon

1889. *Clubiona hyssina* Simon, *J. Asiatic Soc.*, **58**(2) : 343.
1991. *Clubiona hyssina* : Majumder & Tikader, *Rec. zool. Surv. India, Occ. Pap. No.*, **102** : 37.

Distribution : India : Uttarakhand (Deota, Jaunasur).

96. *Clubiona shillongensis* Majumder & Tokader

1991. *Clubiona shillongensis* : Majumder & Tikader, *Rec. zool. Surv. India, occ. pap. No.* **102** : 39.

Material examined : 1 ♀, Merarek Hill, Dist. Pithoragarh, Kumaun Hills, Uttarakhand, 21.i.1981, coll. G.S. Arora.

Distribution : India : Uttarakhand (Dist. Pithoragarh), New Record; West Bengal; Meghalaya; Tamil Nadu.

97. *Clubiona chakrabortei* Majumder & Tikader

1991. *Clubiona chakrabortei* Majumder & Tikader, *Rec. zool. Surv. India, Occ. Pap. No.*, **102** : 41.

Material examined : 1 ♀, Naogakhal, Dist. Tehri, Garwall Hills, Uttarakhand, 24.iv.1989, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dist. Tehri).

98. *Clubiona crouxi* Caporiaeco

1935. *Clubiona crouxi* Caporiaeco, *Mem. Soc. ent. Ital.*, **13** : 218.
1991. *Clubiona crouxi* : Majumder & Tikader, *Rec. zool. Surv. India, Occ. Pap. No.*, **102** : 52.

Distribution : India : Uttarakhand Maharashtra.

99. *Clubiona tikaderi* Majumder & Tikader

1991. *Clubiona tikaderi* : Majumder & Tikader, *Rec. zool. Surv. India, occ. pap. No.* **102** : 53.

Material examined : 1 ♀, Karnpryag, Dist. Chamoli, Garwall Hills, Uttarakhand, 8.ii.1979, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dist. Chamoli), New Record; Maharashtra.

Genus *Cheinacanthum* Koch, C.L.

1939. *Cheinacanthum* Koch, C.L., *Die. Arach. Sechster Band.*, : 9.
1981. *Cheinacanthum* : Tikader & Biswas, *Rec. zool. Surv. India, Occ. Pap. No.*, **30**(1) : 69.

Type species : *Cheiracanthium punctorium* Villers.

Distribution : All tropical parts of the world.

**Key to the species of the genus
Cheiracanthum Koch, C.L.**

1. Tibia of the male palp with short retrolateral apophysis, slightly sinous at its tip
..... *melanostoma*
Tibial apophysis of mal palp long, slender, more sinous at its tip 2
2. Vulva with large cavity, copulatory opening situated on either side of the cavity
..... *himalayensis*
Vulva without large cavity, copulatory opening situated between the cavity 3
3. Chelicerae more or less parallel, inner and outer margin provided with four and five teeth
..... *pauriensis*
Chelicerae narrower anteriorly, inner and outer margin provided with two teeth on each 4
4. Male palpal organ broad anteriorly, membrane of the organ well developed
..... *trivialis*

Male palpal organ narrow anteriorly,
membrane of the organ not well developed
..... 5

5. Eyes of the anterior row shorter than the
posterior row, slightly recurved, medians
smaller than laterals *sadanai*

100. *Cheiracanthium melanostoma* (Thorell)

1895. *Eutitha melanostoma* Thorell, *Spider of Mayanmar* : 44.
1981. *Cheiracanthium melanostoma* : Tikader & Biswas,
Rec.zool, Surv. India, occ. pap. No. 30(1) : 71.
1992. *Cheiracanthium melanostoma* : Biswas & Biswas, *Fauna
of West Bengal, Part-III, Araneae : Spiders, State Fauna
Series, 3* : 419.

Material examined : 1 ♀, Ranikhet, Dist.
Ranikhet, Kumaun Hills, Uttarakhand, 31.x.2003,
coll. B.K. Biswas & party.

Distribution : India : Uttarakhand (Dist.
Ranikhet), New Record; West Bengal; Meghalaya;
Gujarat; Maharashtra; Karnataka; Rajasthan.

Elsewhere : Myanmar, Sri Lanka.

101. *Cheiracanthium himalayensis* Gravely

1931. *Cheiracanthium himalayensis* Gravely, *Rec. Indian Mus.*,
33(3) : 264.
1992. *Cheiracanthium himalayensis* : Biswas & Biswas, *Fauna
of West Bengal, Part-III, Araneae : Spiders, State Fauna
Series, 3* : 419.

Material examined : 1 ♀, Paradakshin, Dist.
Chamoli, Garwall Hills, Uttarakhand, 11.ix.1979, coll.
Arun Kumar.

Distribution : India : Uttarakhand (Dist.
Chamoli), West Bengal; Gujarat; Maharashtra.

102. *Cheiracanthium pauriensis* Majumder & Tikader

1991. *Cheiracanthium pauriensis* Majumder & Tikader, *Rec.
zool. Surv. India, occ. pap. No. 102* : 75.
1992. *Cheiracanthium pauriensis* : Biswas & Biswas, *Fauna
of West Bengal, Part-III, Araneae : Spiders, State Fauna
Series, 3* : 421.

Material examined : 1 ♀, Marorakhal, Dist.
Pithoragarh, Kumaun Hills, Uttarakhand, 21.i.1989,
coll. G.S. Arora.

Distribution : India : Uttarakhand (Dists.
Pithoragarh, Pauri), West Bengal.

103. *Cheiracanthium trivialis* (Thorell)

1895. *Eutitha trivialis* Thorell, *Spider of Mayanmar* : 49.
1981. *Cheiracanthium trivialis* : Tikader & Biswas, *Rec. zool.
Surv. India, Occ. Pap. No.*, **30(1)** : 71.
1992. *Cheiracanthium trivialis* : Biswas & Biswas, *Fauna of
West Bengal, Part-III, Araneae : Spiders, State Fauna
Series No.*, **3** : 421.

Material examined : 1 ♀, Kalinia, Dist. Nainital,
Kumaun Hills, Uttarakhand, 30.x.1976, coll. Asket
Sing.

Distribution : India : Uttarakhand (Dist.
Nainital), New Record; West Bengal; Maharashtra;
Madhya Pradesh.

104. *Cheiracanthium sadanai* Tikader

1976. *Cheiracanthium sadanai* Tikader, *J. Bombay nat. Hist.
Soc.*, **76** : 175.
1991. *Cheiracanthium sadanai* : Majumder & Tikader, *Rec.
zool. Surv. India, Occ. Pap. No.*, **102** : 90.

Material examined : 1 ♀, Ranikhet, Dist.
Ranikhet, Kumaun Hills, Uttarakhand, 31.x.2003,
coll. B.K. Biswas & party.

Distribution : India : Uttarakhand (Dist.
Ranikhet), New Record; Punjab; Gujarat.

Genus *Oedignatha* Thorell

1897. *Oedignatha* Thorell, *Ann. Mus. civ. stor. Nat. Genova*,
18 : 209.
1934. *Oedignatha* : Reimoser, *Proc. zool. Soc.*, London, **1** : 15.
1991. *Oedignatha* : Majumder & Tikader, *Rec. zool. Surv.
India, Occ. Pap. No.*, **102** : 114.

Type species : *Oedignatha scrobiculata*
Thorell.

Distribution : India, Sri Lanka, Java, Kratakau,
Penang.

105. *Oedignatha procerula* Simon

1897. *Oedignatha procerula* Simon, *Mem. Soc. Zool. Fr.*,
19(2) : 261.
1991. *Oedignatha procerula* : Majumder & Tikader,
Rec. zool. Surv. India, Occ. Pap. No., **102** : 114.

Diagnosis : Cephalothorax longer than wide, provided with cephalic shield. Anterior row of eyes slightly recurved, posterior row procurved. Abdomen longer than wide.

Distribution : India : Uttarakhand (Dehra Dun).

Genus *Apochinomma* Pavesi

1881. *Apochinomma* Pavesi, *Ann. Mus. civ. stor. Nat. Genova*, **16** : 546.

1991. *Apochinomma* : Majumder & Tikader, *Rec. zool. Surv. India, Occ. Pap. No.*, **102** : 158.

Type species : *Apochinomma formicaeformis* Pavesi.

Distribution : India, Myanmar, Sri Lanka, America.

106. *Apochinomma dolosum* Simon

1897. *Apochinomma dolosum* Simon, *Mem. Soc. Zool. France*, **19**(2) : 1344.

Diagnosis : Cephalothorax more longer than broad, provided with prominent fovea. Anterior row of eyes recurved, posterior row slightly procurved. Abdomen oval in shape. Abdominal shield folded transversely.

Distribution : India : Uttarakhand (Dehra Dun).

Family HETEROPODIDAE

Key to the genera of the family Heteropodidae

1. Maxillae with distinct median longitudinal crest *Spariolenus*
2. Maxillae without distinct median longitudinal crest *Heteropoda*

Genus *Spariolenus* Simon

1980. *Spariolenus* Simon, *Act. Soc. Linn. Bord.*, **34** : 227.

1988. *Spariolenus* : Sethi & Tikader, *Rec. zool. Surv. India, Occ. Pap. No.*, **93** : 6.

Type species : *Spariolenus tigris* Simon.

Distribution : India, Sri Lanka, Malacca.

Key to the species of the genus *Spariolenus* Simon

1. Carapace wider than long, thoracic region rounded; abdomen pear-shaped; epigynum simple and less sclerotised; with three pairs of sigilla on the dorsum *petricola*

2. Carapace longer than wide, thoracic region elongated; abdomen pentagonal in shape; epigynum complicated and highly sclerotised; with two pairs of sigilla on the dorsum *tigris*

107. *Spariolenus petricola* Gravely

1931. *Spariolenus petricola* Gravely, *Rec. Indian Mus.*, **33**(3) : 250.

1988. *Spariolenus petricola* : Sethi & Tikader, *Rec. zool. Surv. India, occ. pap. No.* **93** : 7.

Material examined : 2 ♀, Sangaon forest, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 1.x.1988, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dist. Dehra Dun), New Record; Goa; Orissa; Madhya Pradesh.

108. *Spariolenus tigris* Simon

1980. *Spariolenus tigris* Simon, *Act. Soc. Linn. Bord.*, **34** : 281.

1988. *Spariolenus tigris* : Sethi & Tikader, *Rec. zool. Surv. India, Occ. Pap. No.*, **93** : 7.

Material examined : 3 ♀, Chief ground forest, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 8.x.1988, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dist. Dehra Dun), New Record; West Bengal; Bihar; Maharashtra.

Elswhere : Pakistan.

Genus *Heteropoda* Latreille

1804. *Heteropoda* Latreille, *New. Die. Hist. nat.*, **24** : 135.

1977. *Heteropoda* : Tikader, *Rec. zool. Surv. India*, **72** : 189.

Type species : *Heteropoda venatoria* Linn.

Distribution : From India eastward to Australia.

Key to the species of the genus *Heteropoda* Latreille

1. Abdomen elongated with small hair *phasma*
Abdomen rounded, clothed with large hair ..
..... 2
2. Lateral lobes of epigynum widely divergent anteriorly *kuluensis*
Lateral lobe of epigynum divergent posteriorly
..... 3

3. Dorsum provided with two pairs of sigilla; labium provided with lateral notch on each side *venatoria*

Dorsum not provided with two pairs of sigilla; labium without lateral notch 4

4. Ocular quad longer than wide and wider behind *kandiana*

Ocular quad wider than long and longer behind 5

5. Abdomen elliptical in shape; dorsum provided with dark brown patches *bhaikakai*

6. Abdomen roundish oval; dorsum provided with dark coloured curved transverse marking *plebeja*

109. *Heteropoda phasma* Simon

1897. *Heteropoda phasma* Simon, *Men. Soc. Zool. France*, 10(2) : 258.

1988. *Heteropoda phasma* : Sethi & Tikader, *Rec. zool. Surv. India, Occ. Pap. No.*, 93 : 12.

Material examined : 1 ♀, Nankchia, Dist. Nainital, Kumaun Hills, Uttarakhand, 24.x.1995, coll. Arun Kumar; 1 ♀, Echindghat, Dist. Chamoli, Garwall Hills, Uttarakhand, 16.ix.1970, coll. Arun Kumar; 1 ♀, Gobindghat, Dist. Chamoli, Garwall Hills, Uttarakhand, 19.x.1995, coll. R.N. Chopra.

Distribution : India : Uttarakhand (Dists. Nainital, Chamoli), Assam; South India.

110. *Heteropoda kuluensis* Sethi & Tikader

1988. *Heteropoda kuluensis* Sethi & Tikader, *Rec. zool. Surv. India, Occ. Pap. No.*, 93 : 13.

Material examined : 1 ♀, Mandesh, Dist. Almora, Kumaun Hills, Uttarakhand, 4.iii.1975, coll. R.N. Chopra.

Distribution : India : Uttarakhand (Dist. Almora), New Record; Haryana.

111. *Heteropoda venatoria* Linn

1766. *Heteropoda venatoria* Linn. *Syst. Nat.*, 12 : 1035.

1988. *Heteropoda venatoria* : Sethi & Tikader, *Rec. zool. Surv. India, Occ. Pap. No.*, 93 : 16.

Material examined : 1 ♀, Songhat, Dist. Almora, Kumaun Hills, Uttarakhand, 24.ix.1995, coll. Arun Kumar; 1 ♀, Landsdam, Dist. Pauri, Garwall Hills,

Uttarakhand, 21.iv.1989, coll. Arun Kumar; 2 ♀, Pandakaswar, Dist. Chamoli, Garwall Hills, Uttarakhand, 14.ix.1997, coll. Rajtilak.

Distribution : India : Uttarakhand (Dists. Almora, Pauri, Chamoli), New Record; West Bengal; Tamil Nadu.

112. *Heteropoda kandiana* Pocock

1899. *Heteropoda kandiana* Pocock, *J. Bombay nat. Hist. Soc.*, 12 : 744-753.

1988. *Heteropoda kandiana* : Sethi & Tikader, *Rec. zool. Surv. India, Occ. Pap. No.*, 93 : 26.

Material examined : 1 ♀, Hardwarsina, Dist. Bageshwar, Kumaun Hills, Uttarakhand, 28.ix.2004, coll. M. Ghosh & party.

Distribution : India : Uttarakhand (Dist. Bageshwar), New Record; West Bengal; Orissa; Assam.

Elsewhere : Sri Lanka.

113. *Heteropoda bhaikakai* Patel & Patel

1973. *Heteropoda bhaikakai* Patel & Patel, *Oriental Insect*, 7(1) : 132.

1988. *Heteropoda bhaikakai* : Sethi & Tikader, *Rec. zool. Surv. India, Occ. pap. No.*, 93 : 29.

Material examined : 1 ♀, Kaduhal, Dist. Pauri, Garwall Hills, Uttarakhand, 4.v.1989, coll. Arun Kumar.

Distribution : India : Uttarakhand (Dist. Pauri), New Record; Gujarat.

Family SELENOPIIDAE

Genus *Selenops* Latreille

1804. *Selenops* Latreille, *Tubseau methodique des. Insect. hist. nat.*, 24 : 1-200.

1819. *Selenops* : Latreille, *Nouv. Dict. Hist. Nat.*, 30 : 576.

Diagnosis : The members of the family have very flat bodies and are found under stones and flattened against rocks along the cracks of which they run very rapidly. They are easily recognised by the eye arrangement having six eyes in the front row; the posterior median eyes have moved laterally and forwarded.

Type species : *Selenops radiatus* Latreille.

Distribution : India, America, Africa, Europe.

114. *Selenops ugamensis* Tikader

1969. *Selenops ugamensis* Tikader, *Proc. Indian Acad. Sci.*, 5(1-4) : 252.

Diagnosis : Cephalothorax wider than long. Arrangement of eyes unusual. Abdomen longer than wide.

Material examined : 2 ♀, Pandakaswar, Dist. Chamoli, Garwall Hills, Uttarakhand, 20.x.1985, coll. R.N. Chopra.

Distribution : India : Uttarakhand (Dist. Chamoli), New Record; Mysore.

Elsewhere : Africa, America.

Family SALTICIDAE

Key to the genera of the family Salticidae

1. Cephalothorax rectangular in shape not pointed behind *Marpissa*
Cephalothorax elongated and pointed behind 2
2. Chelicerae robust and prominent; nearly as long as cephalothorax *Myrmarachne*
Chelicerae not robust and prominent; not longer than cephalothorax 3
3. Labium little longer than wide; coxae of the I leg separated by less than the width of the labium *Plexippus*
Labium not longer than wide; coxae of I leg not separated by less than width of the labium 4
4. Eyes are small in proportion to the spiders *Phidippus*
Eyes are not small in proportion to the spiders 5
5. The first legs are haviest than the rest *Zygoballus*

Genus *Marpissa* Koch

1845. *Marpissa* Koch, *Die. Arachn.*, 13 : 56.

1992. *Marpissa* : Biswas & Biswas, *Fauna of West Bengal*, Part-III, Araneae : Spiders, *State Fauna Series*, 3 : 388.

2004. *Marpissa* : Biswas & Biswas, *Fauna of Manipur*, Part-2, Araneae : Spiders, *State Fauna Series*, 10 : 27.

Type species : *Marpissa muscosa* Clerck.

Distribution : Cosmopolitan.

Key to the species of the genus *Marpissa* Koch

1. Ocular region dark than the rest portion of the cephalothorax *dhakuriensis*
Ocular region lighter than the rest portion of the cephalothorax 2
2. Cephalothorax light brown in colour, rectangular in shape *calcuttaensis*

115. *Marpissa dhakuriensis* Tikader

1974. *Marpissa dhakuriensis* Tikader, *Proc. Indian Acad. Sci.*, 79(5) : 206.

1992. *Marpissa dhakuriensis* : Biswas & Biswas, *Fauna of West Bengal*, Part-III, Araneae : Spiders, *State Fauna Series*, 3 : 391.

Material examined : 1 ♀, Rajaji National Park, Dist. Haridwar, Garwall Hills, Uttarakhand, 24.x.2003, coll. B.K. Biswas & party; 1 ♀, Rajaji National Park, Dist. Haridwar, Garwall Hills, Uttarakhand, 17.iii.2005, coll. Bijan Biswas; 1 ♀, Mussoori, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 21.x.2005, coll. R. Roy.

Distribution : India : Uttarakhand (Dists. Haridwar, Dehra Dun), New Record; West Bengal.

116. *Marpissa calcuttaensis* Tikader

1974. *Marpissa calcuttaensis* Tikader, *Proc. Indian Acad. Sci.*, 79(5) : 212.

1992. *Marpissa calcuttaensis* : Biswas & Biswas, *Fauna of West Bengal*, Part-III, Araneae : Spiders, *State Fauna Series*, 3 : 391.

Material examined : 2 ♀, Motichur, Dist. Haridwar, Garwall Hills, Uttarakhand, 17.iii.2005, coll. B.K. Biswas & party.

Distribution : India : Uttarakhand (Dist. Haridwar), New Record; West Bengal.

Genus *Myrmarachne* Mac Leay

1839. *Myrmarachne* Mac Leay, *Ann. Mag. Nat. Hist.*, 2 : 10.

1992. *Myrmarachne* : Biswas & Biswas, *Fauna of West Bengal*, Part-III, Araneae : Spiders, *State Fauna Series*, 3 : 393.

Type species : *Myrmarachne melanocephalus* Mac Leay.

Distribution : Oriental and sub-tropical regions of the world.

**Key to the species of the genus
Myrmarachne Mac Leay**

1. Typical ant-like spider *orientalis*
Not ant-like spider 2
2. Small constriction present between cephalic and thoracic junction and the anterior part of the cephalic region convex *bengalensis*

117. *Myrmarachne orientalis* Tikader

1973. *Myrmarachne orientalis* Tikader, *Proc. Indian Acad. Sci.*, 70(2) : 60.

1992. *Myrmarachne orientalis* : Biswas & Biswas, *Fauna of West Bengal*, Part-III, Araneae : Spiders, *State Fauna Series* No. 3 : 394.

Material examined : 2♂, 2♀, Haridwar, Dist. Haridwar, Garwall Hills, Uttarakhand, 20.x.2003, coll. B.K. Biswas & party.

Distribution : India : Uttarakhand (Dist. Haridwar), New Record; West Bengal.

118. *Myrmarachne bengalensis* Tikader

1973. *Myrmarachne bengalensis* Tikader, *Proc. Indian Acad. Sci.*, 70(2) : 65.

1992. *Myrmarachne bengalensis* : Biswas & Biswas, *Fauna of West Bengal*, Part-III, Araneae : Spiders, *State Fauna Series*, 3 : 394.

Material examined : 2♀, Dehra Dun, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 15.iii.2005, coll. B.K. Biswas & party.

Distribution : India : Uttarakhand (Dist. Dehra Dun), New Record; West Bengal.

Genus *Plexippus* Koch

1846. *Plexippus* Koch, *Die. Arachn.*, 13 : 107.

1967. *Plexippus* : Tikader, *Proc. Indian Acad. Sci.*, 66(4) : 110.

1992. *Plexippus* : Biswas & Biswas, *Fauna of West Bengal*, Part-III, Araneae : Spiders, *State Fauna Series*, 3 : 397.

Type species : *Plexippus paykullii* (Audouin).

Distribution : Cosmopolitan.

119. *Plexippus paykullii* (Audouin)

1825. *Attus paykullii* Audouin, *Descr. Egypte 2nd Ed.*, 22 : 172.

1992. *Plexippus paykullii* : Biswas & Biswas, *Fauna of West Bengal*, Part-III, Araneae : Spiders, *State Fauna Series*, 3 : 397.

Diagnosis : Cephalothorax dark brown or black, legs olive brown, abdomen deep brown in colour. Cephalic region longer than wide, convex, clothed with fine grey black hair. Anterior row of eyes recurved and anterior middle eyes very large and milky white, anterior lateral eyes pearly white and smaller than middle eyes by about half. A pale longitudinal patch on the middle of thorax and centre provided with fovea. Sternum oval and narrowed in front clothed with hair. Abdomen longer than wide, narrowing posteriorly. Mid-dorsal with a longitudinal light patch extending from base to near end of abdomen.

Material examined : 2♀, 1♂, Haridwar, Dist. Haridwar, Garwall Hills, Uttarakhand, 17.iii.2005, coll. B.K. Biswas & party; 2♀, 1♂, Rajaji National Park, Dist. Haridwar, Garwall Hills, Uttarakhand, 17.iii.2005, coll. Bijan Biswas; 2♀, Rishikesh, Dist. Rishikesh, Garwall Hills, Uttarakhand, 25.x.2003, coll. B.K. Biswas & party; 2♀, Dehra Dun, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 15.iii.2005, coll. B.K. Biswas & party; 1♀, 1♂, Kankhel, Dist. Haridwar, Garwall Hills, Uttarakhand, 16.iii.2005, coll. B. K. Biswas & party; 2♀, 1♂, Raiwala, Dist. Haridwar, Garwall Hills, Uttarakhand, 23.iii.2005, coll. B.K. Biswas & party.

Distribution : India : Uttarakhand (Dists. Haridwar, Dehra Dun, Rishikesh, Ranikhet), New Record; West Bengal; Orissa; Bihar; Maharashtra; Meghalaya; Uttarpradesh; Madhya Pradesh; Sikkim; Kerala; Karnataka; Andaman and Nicobar Island.

Elsewhere : Africa, Europe, Sri Lanka and in all of the warmer regions of the world.

Genus *Phidippus* Koch

1846. *Phidippus* Koch, *Die. Arachn.*, 73 : 125.

1992. *Phidippus* : Biswas & Biswas, *Fauna of West Bengal*, Part-III, Araneae : Spiders, *State Fauna Series*, 3 : 395.

Type species : *Phidippus variagatus* (Lucas).

Distribution : All tropical and sub-tropical countries.

Key to the species of the genus *Phidippus* Koch

1. Cephalothorax brownish red, pointed behind *indicus*
Cephalothorax pale orange, not pointed behind 2
2. Legs I and II more robust than III and IV; tibiae and metatarsi I and II provided with four and three pairs of ventral spines *pateli*

120. *Phidippus indicus* Tikader

1974. *Phidippus indicus* Tikader, *Proc. India Acad. Sci.*, 79(3) : 122.
1992. *Phidippus indicus* : Biswas & Biswas, *Fauna of West Bengal, Part-III, Araneae : Spiders, State Fauna Series*, 3 : 396.

Material examined : 2 ♀, 1 ♂, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand, 31.x.2003, coll. B.K. Biswas & party.

Distribution : India : Uttarakhand (Dist. Ranikhet), New Record; West Bengal; Gujarat.

121. *Phidippus pateli* Tikader

1974. *Phidippus pateli* Tikader, *Proc. India Acad. Sci.*, 79(3) : 124.
1992. *Phidippus pateli* : Biswas & Biswas, *Fauna of West Bengal, Part-III, Araneae : Spiders, State Fauna Series*, 3 : 396.

Material examined : 2 ♀, 2 ♂, Raiwala, Dist. Haridwar, Garwall Hills, Uttarakhand, 23.iii.2005, coll. B.K. Biswas & party.

Distribution : India : Uttarakhand (Dist. Haridwar), New Record; West Bengal; Maharashtra; Gujarat.

Genus *Zygoballus* Peckham

1885. *Zygoballus* Peckham, *Proe. Nat. Hist. Soc. Wish.*, 1 : 82.
1948. *Zygoballus* : Kaston, *Spiders of Connecticut*, : 496.
1975. *Zygoballus* : Tikader, *Proc. Indian Acad. Sci.*, 81(4) : 150.

Type species : *Zygoballus rufipes* Peckham.

Distribution : India, America.

Key to the species of the genus *Zygoballus* Peckham

1. Body length more and with two small grey spots *pashanensis*
Body length much less and no such spots 2
2. Two pairs of sigilla present *narmadaensis*

122. *Zygoballus pashanensis* Tikader

1975. *Zygoballus pashanensis* Tikader, *Proc. Indian Acad. Sci.*, 81(4) : 151.

Material examined : 2 ♀, Rajaji National Park, Dist. Haridwar, Garwall Hills, Uttarakhand, 24.x.2003, coll. B.K. Biswas & party.

Distribution : India : Uttarakhand (Dist. Haridwar), New Record; West Bengal; Maharashtra.

123. *Zygoballus narmadaensis* Tikader

1975. *Zygoballus narmadaensis* Tikader, *Proc. Indian Acad. Sci.*, 81(4) : 151.
1992. *Zygoballus narmadaensis* : Biswas & Biswas, *Fauna of West Bengal, Part-III, Araneae : Spiders, State Fauna Series*, 3 : 401.

Material examined : 2 ♀, Rajaji National Park, Dist. Haridwar, Garwall Hills, Uttarakhand, 24.x.2003, coll. B.K. Biswas & party 1 ♀, Motichur, Dist. Haridwar, Garwall Hills, Uttarakhand, 17.iii.2005, coll. B.K. Biswas & party.

Distribution : India : Uttarakhand (Dist. Haridwar), New Record; West Bengal; Madhya Pradesh.

Family THOMISIDAE

Key to the genera of the family Thomisidae

1. Abdomen widened and truncated behind *Thomisus*
Abdomen not widened and truncated behind 2
2. Body covered with conspicuous spines *Diaea*
Body not covered with conspicuous spines 3
3. Anterior median eyes closer to the lateral than to each other *Xysticus*

Anterior median eyes not closer to the lateral than to each other 4

4. Cephalic region as wider as thoracic region ..
..... ***Camaricus***

Genus ***Thomisus*** Walckenaer

1805. *Thomisus* Walckenaer, *Tabl. Aron.*, : 28.

1980. *Thomisus* : Tikader, *Fauna of India*, Araneae : Spiders, 1(1) : 30.

1981. *Thomisus* : Tikader & Biswas, *Rec. zool. Surv. India*, occ. pop. No. 30(1) : 75.

Type species : *Thomisus albus* (Gmelin).

Distribution : Europe, Africa, Asia, Australia, America.

124. ***Thomisus projectus*** Tikader

1960. *Thomisus projectus* Tikader, *J. Bombay Nat. Hist. Soc.*, 57 : 182.

1980. *Thomisus projectus* : Tikader, *Fauna of India*, Araneae : Spiders, 1(1) : 40.

1992. *Thomisus projectus* : Biswas & Biswas, *Fauna of West Bengal*, Part-III, Araneae : Spiders, *State Fauna Series*, 3 : 409.

Diagnosis : Cephalothorax nearly pentagonal, greenish with transverse yellow band on the ocular area; narrowing slightly in front. Anterior median eyes slightly smaller than the anterior lateral eyes. First pair with three spines above on femur; II with small black spot sub apically on tibiae in front; metatarsi I and II with six pairs of ventral spines; III and IV without spot and spines. Abdomen broadest at the mid-posterior half with prominent transverse muscular corrugation.

Material examined : 1 ♀, Ranikhet, Dist. Ranikhet, Kumaun Hills, Uttarakhand, 31.x.2003, coll. B.K. Biswas & party.

Distribution : India : Uttarakhand (Dist. Ranikhet), New Record; West Bengal.

Genus ***Diaea*** Thorell

1869. *Diaea* Thorell, *Eur. Spid. Ete.*, : 184.

1980. *Diaea* : Tikader, *Fauna of India*, Araneae : Spiders, 1(1) : 105.

Type species : *Diaea dorsata* (Fabricius).

Distribution : Europe, Africa, Asia, America.

125. ***Diaea jaintious*** Tikader

1966. *Diaea jaintious* Tikader, *Proc. Indian Acad. Sci.*, 64(1) : 59.

Material examined : 1 ♀, Pandukeswar, Dist. Garwall Hills, Uttarakhand, 10.viii.1978, coll. R.N. Bhargav.

Distribution : India : Uttarakhand (Dist. Chamoli), New Record; Meghalaya.

Genus ***Xysticus*** Koch

1853. *Xysticus* Koch, *H. Schaeff. Deutschl. Ins.*, : 35.

1980. *Xysticus* : Tikader, *Fauna of India*, Araneae : Spiders, 1(1) : 107.

Type species : *Xysticus critatus* (Clerck).

Distribution : Europe, Africa, Asia, America.

126. ***Xysticus shyamrupus*** Tikader

1966. *Xysticus shyamrupus* Tikader, *Proc. Indian Acad. Sci.*, 64(1) : 57.

1980. *Xysticus shyamrupus* : Tikader, *Fauna of India*, Araneae : Spiders, 1(1) : 113.

Diagnosis : Cephalothorax wider than long, cephalic region slightly high. Eyes black, lateral eyes large, provided with conspicuous tubercles. Abdomen oval slightly wider than long.

Material examined : 1 ♀, Kolsi, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 11.i.1972, coll. M.K. Biswas.

Distribution : India : Uttarakhand (Dist. Dehra Dun), New Record; Meghalaya.

Genus ***Camaricus*** Thorell

1887. *Camaricus* Thorell, *Ann. Mus. Civ. Stor. nat. Genova*, 5(2) : 261.

1980. *Camaricus* : Tikader, *Fauna of India*, Araneae : Spiders, 1(1) : 174.

Type species : *Camaricus maugei* (Walckenaer)

Distribution : Tropical Africa, India, Malaysia.

127. ***Camaricus formosus*** Thorell

1887. *Camaricus formosus* Thorell, *Ann. Mus. Civ. Stor. Nat. Genova*, 5(2) : 261.

1980. *Camaricus formosus* : Tikader, *Fauna of India*, Araneae : Spiders, 1(1) : 175.

1992. *Camaricus formosus* : Biswas & Biswas, *Fauna of West Bengal*, Part-III, Araneae : Spiders, *State Fauna Series*, 3 : 404.

Diagnosis : Cephalothorax high enough with deep brown patches and central fovea. Posterior row of eyes situated adjacent to lateral eyes. Chelicerae moderate. Sternum heart shaped. Abdomen longer than wide, widest behind the middle.

Material examined : 1 ♀, Kolsi, Dist. Dehra Dun, Garwall Hills, Uttarakhand, 29.v.1978, coll. Raj Tilak.

Distribution : India : Uttarakhand (Dist. Dehra Dun), New Record; West Bengal; Karnatak; Maharashtra; Andaman and Nicobar Islands.

SUMMARY

About 500 examples of spider have been studied and identified. Total 127 species belonging to 49 genera under 17 families are dealt with here of those 17 families 48 genera 109 species form new records for the state. Keys to all the families are followed. All the relevant literatures pertaining to these families are received under history.

ACKNOWLEDGEMENT

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IXODID TICKS (ACARI : IXODIDAE)

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INTRODUCTION

The Ixodid ticks consist of a number of species under the class Acarina, which are known as causative agent of various medical and veterinary diseases in man and domestic animals. They are occurring throughout the world and live as parasite on the bodies of the domestic and wild animals and in vegetation.

Since the days of Linnaeus (1746-1767) this group of acarines attracted the attention of scientists and they studied different aspects of this ticks.

The Indian tick was first recorded by Linnaeus (1758) through description of *Acarus elephantius*. Latter in 1767 he described another Indian species *Acarus indicus*.

Sharif (1928) first made extensive studies on Indian ticks. He studied the Ixodidae occurring in India and recorded altogether 9 genera and 45 species, 4 subspecies and 6 varieties. Several workers studied taxonomy, ecology, biology, host and tick relationship, etc. of ixodid ticks in India. The details have been incorporated in Sanyal and De (1991, 1995).

Considering the immense medical and veterinary importance ixodid ticks in different states of India have been studied. Of these the ixodids of the state of Uttarakhand, a recently originated state including the hilly regions of Uttar Pradesh, is considered to be well studied by the acarologists like Kaiser and Hoogstraal (1964), Hoogstraal *et al.* (1966, 1972), Dhanda and Bhat (1968a, 1968b, 1970, 1971), Hoogstraal and Kamath (1970), Miranpuri *et al.* (1975) and Geeverghese and Dhanda (1987). Sharif (1928) studied the collection of ticks in the Indian Museum

and described one new species *Haemaphysalis sundrai* and recorded 9 other species from different districts of Uttarakhand.

The present work includes the collection of ixodid ticks made from Uttarakhand by the authors and also the species which have not been studied by the authors but are reported from the state by earlier workers, to prepare a comprehensive account of ixodid ticks known from Uttarakhand state.

A complete list of 47 species under 8 genera of ixodid ticks known from Uttarakhand has been incorporated in this paper. The hosts of tick species and their distribution in Uttarakhand also have been incorporated. The specimens studied by the present authors are deposited in the National Zoological Collection.

SYSTEMATIC ACCOUNT

Materials and methods : The specimens were collected both by 'Hand picking' and 'flag-dragging' methods. The details of these two methods have been given in Sanyal and De (1992).

General morphology and terminology : For details of general morphological features and terminology usually followed in the study of ixodid ticks Sanyal and De (1992) may be consulted.

LIST OF TAXA

Family IXODIDAE

Genus *Aponomma* Neumann, 1831

1. *Aponomma gervaisi* (Lucas, 1847)

Genus *Boophilus* Curtice, 1891

2. *Boophilus microplus* (Canestrini, 1887)
3. *Boophilus* sp.

Genus *Dermacentor* Koch, 1844

4. *Dermacentor auratus* Supino, 1897
5. *Dermacentor astrosignatus*
6. *Dermacentor* sp.

Genus *Haemaphysalis* Koch, 1844.

7. *Haemaphysalis anomala* Warburton, 1913
8. *Haemaphysalis bispinosa* Neumann, 1897
9. *Haemaphysalis birmaniae* Supino, 1897
10. *Haemaphysalis canestrini* Supino, 1897
11. *Haemaphysalis corhumpunctata*
Hoogstraal & Varma, 1962
12. *Haemaphysalis flava* Neumann, 1897
13. *Haemaphysalis garhwalensis* Dhanda & Bhat, 1968
14. *Haemaphysalis himalaya* Hoogstraal, 1966
15. *Haemaphysalis howletti* Warburton, 1913
16. *Haemaphysalis hystricis* Supino, 1897
17. *Haemaphysalis indoflava* Dhanda & Bhat, 1968
18. *Haemaphysalis kashmirensis* Hoogstraal & Varma, 1962
19. *Haemaphysalis indica* Warburton, 1910
20. *Haemaphysalis minuta* Kohls, 1950
21. *Haemaphysalis montgomeryi* Nuttall, 1912
22. *Haemaphysalis ornithophila* Hoogstraal & Kohls, 1959
23. *Haemaphysalis paraturturis* Hoogstraal, Trapido & Rebello, 1963
24. *Haemaphysalis sundrai* Sharif, 1928
25. *Haemaphysalis turturis* Nuttall & Warburton, 1915
26. *Haemaphysalis warburtoni* Nuttall
27. *Haemaphysalis* sp.

Genus *Hyalomma* Koch, 1844

28. *Hyalomma aegypticum* (Linn., 1758)
29. *Hyalomma anatolicum anatolicum*
Koch, 1888
30. *Hyalomma brevipunctata* Sharif, 1928
31. *Hyalomma detritum* Schulze, 1919
32. *Hyalomma kumari* Sharif, 1928
33. *Hyalomma marginatum isaaci* Sharif, 1928
34. *Hyalomma turanicum* Pomerantzev, 1946

35. *Hyalomma* sp.Genus *Ixodes* Latreille, 1795

36. *Ixodes acutitarsus* (Karsch, 1880)
37. *Ixodes granulatus*, Supino, 1897
38. *Ixodes japonensis* Neumann, 1904
39. *Ixodes ovatus* Neumann, 1899
40. *Ixodes kaschmiricus* Pomerantzev, 1948
41. *Ixodes turdus*
42. *Ixodes* sp.

Genus *Nosomma* Schulze, 1919

43. *Nosomma monstrosum* (Nuttall & Warburton, 1908)

Genus *Rhipicephalus* Koch, 1844

44. *Rhipicephalus haemaphysaloides* Supino, 1897
45. *Rhipicephalus sanguineus* (Latreille, 1806)
46. *Rhipicephalus turanicus* Pomerantzev, 1940
47. *Rhipicephalus* sp.

Genus *Aponomma* Neumann, 1831

1. *Aponomma gervaisi* (Lucas, 1847)

Hosts : *Naja tripudians*, *varanus* sp.

Distribution : Uttarakhand (Nainital, Almora, Tehri dists.).

Genus *Boophilus* Curtice, 1891

2. *Boophilus microplus* (Canestrini, 1887)

Material examined : Almora dist. – 13(F), Sony, from cow, 7.ix.2003; Baidyanathdist. – 2(F), Bhattagaon, from cow, 28.x.2004; Dehradun dist. – 2(F), 2(N), Baijawala, from cow, 1.iv.2006; 4(F), from cow, 2.iv.2006.

Hosts : Cattle, goat, sheep, vegetation.

Distribution : Uttarakhand (Dehradun, Nainital, Almora dists.).

3. *Boophilus* sp.

Hosts : Cattle, vegetation.

Distribution : Uttarakhand (Nainital dist.).

Genus *Dermacentor* Koch, 1844

4. *Dermacentor auratus* Supino, 1897

Hosts : Deer, sheep, vegetation.

Distribution : Uttarakhand (Dehradun, Nainital dists.).

5. *Dermacentor astrosignatus*

Hosts : Goat.

Distribution : Uttarakhand (Nainital, Tehri, Pithoragarh dists.).

6. *Dermacentor* sp.

Hosts : Goat, Sheep.

Distribution : Uttarakhand (Dehradun, Nainital, Almora dists.).

Genus *Haemaphysalis* Koch, 1844.

7. *Haemaphysalis anomala* Warburton, 1913

Hosts : Buffalo, cattle, goat, *Centropus s. sinensis*, *Rattus rattus gangutrianus*, *Rattus r. rufescens*, vegetation.

Distribution : Uttarakhand (Dehradun, Nainital, Uttarkashi, Pithoragarh dists.).

8. *Haemaphysalis bispinosa* Neumann, 1897

Material examined : Almora dist.- 2(F), Chaubatia, from goat, 6.ix.2003, coll. A.K. Sanyal & B.J. Sarkar; Dehradun dist.- 7(F), Kempty falls, Musouri, from goat, 28.x.2004, coll. A.K. Sanyal & B.J. Sarkar; 5(F), 1(M), Bajawala, 2.iv.2006, coll. B.J. Sarkar.

Hosts : Goat.

Distribution : Uttarakhand (Dehradun, Almora dists.).

9. *Haemaphysalis birmaniae* Supino, 1897

Hosts : Cattle, barking deer, vegetation.

Distribution : Uttarakhand (Dehradun, Chamoli, Nainital dists.).

10. *Haemaphysalis canestrini* Supino, 1897

Hosts : *Felis pardus fusca*, *Canis* sp., palm civet.

Distribution : Uttarakhand (Nainital dist.).

**11. *Haemaphysalis cornumpunctata*
Hoogstraal & Varma, 1962**

Hosts : Buffalo, cattle, goat, horse, sheep, rodent.

Distribution : Uttarakhand (Uttarkashi dist.).

12. *Haemaphysalis flava* Neumann, 1897

Hosts : Sheep, dog, fox, jackal.

Distribution : Uttarakhand (Nainital dist.).

**13. *Haemaphysalis garhwalensis*
Dhanda & Bhat, 1968**

Hosts : Goat, sheep, cattle.

Distribution : Uttarakhand (Chamoli, Pithoragarh, Uttarkashi dists.).

14. *Haemaphysalis himalaya* Hoogastraal, 1966

Hosts : Himalayan thar, goral, Indian muntjac, deer, cattle.

Distribution : Uttarakhand (Dehradun, Almora, Chamoli, Pithoragarh dists.).

15. *Haemaphysalis howletti* Warburton, 1913

Hosts : Birds, mongoose, squirrel.

Distribution : Uttarakhand (Dehradun, Tehri dists.).

16. *Haemaphysalis hystricis* Supino, 1897

Hosts : Dog, rodents, man, vegetation.

Distribution : Uttarakhand (Dehradun dist.).

**17. *Haemaphysalis indoflava*
Dhanda & Bhat, 1968**

Hosts : Dog, jackal, fox, bullock, *Sus cristatus*, man, vegetation.

Distribution : Uttarakhand (Chamoli, Nainital dists.).

**18. *Haemaphysalis kashmirensis*
Hoogastraal & Varma, 1962**

Hosts : Goat, sheep, lizard, rodent.

Distribution : Uttarakhand (Almora, Chamoli, Pithoragarh, Uttarkashi dists.).

19. *Haemaphysalis indica* Warburton, 1910

Hosts : Cattle, jackal, mongoose.

Distribution : Uttarakhand (Nainital dist.).

20. *Haemaphysalis minuta* Kohls, 1950

Hosts : Goat, sheep, rodent.

Distribution : Uttarakhand (Almora, Dehradun, Nainital dists.).

21. *Haemaphysalis montgomeryi* Nuttall, 1912

Hosts : Bull, goat, sheep.

Distribution : Uttarakhand (Dehradun, Pauri, Tehri, Almora, Pithoragarh, Chamoli, Uttarkashi dists.).

22. *Haemaphysalis ornithophila*
Hoogstraal & Kohls, 1959

Hosts : Birds.

Distribution : Uttarakhand (Nainital, Chamoli dists.).

23. *Haemaphysalis paraturturis* Hoogstraal, Trapido & Rebello, 1963

Hosts : Cattle, goat, bird, rodent.

Distribution : Uttarakhand (Dehradun, Nainital, Tehri dists.).

24. *Haemaphysalis sundrai* Sharif, 1928

Hosts : Sheep.

Distribution : Uttarakhand (Nainital, Uttarkashi dists.).

25. *Haemaphysalis turturis* Nuttall & Warburton, 1915

Hosts : Cattle, goat, rodent.

Distribution : Uttarakhand (Nainital dist.).

26. *Haemaphysalis warburtoni* Nuttall

Hosts : Goat.

Distribution : Uttarakhand (Dehradun dist.).

27. *Haemaphysalis* sp.

Hosts : Rodents.

Distribution : Uttarakhand (Almora, Nainital, Pauri, Pithoragarh dists.).

Genus *Hyalomma* Koch, 1844

28. *Hyalomma aegypticum* (Linn., 1758)

Hosts : Buffalo, goat, sheep, cattle.

Distribution : Uttarakhand (Nainital dist.).

29. *Hyalomma anatolicum anatolicum*
Koch, 1888

Material examined : Dehradun dist.- 1(M), Bajawala, from cow, 2.iv.2006, coll. B.J.Sarkar.

Hosts : Cattle, buffalo, goat, sheep, rodents.

Distribution : Uttarakhand (Dehradun, Nainital, Almora dists.).

30. *Hyalomma brevipunctata* Sharif, 1928

Hosts : Buffalo, cattle, goat, dog.

Distribution : Uttarakhand (Dehradun, Nainital, Pauri, Tehri, Almora dists.).

31. *Hyalomma detritum* Schulze, 1919

Hosts : Cattle, buffalo, goat, dog.

Distribution : Uttarakhand (Nainital, Tehri, Uttarkashi dists.).

32. *Hyalomma kumari* Sharif, 1928

Hosts : Cattle, goat, barking deer, sheep, horse.

Distribution : Uttarakhand (Nainital dist.).

33. *Hyalomma marginatum isaaci* Sharif, 1928

Hosts : Cattle, buffalo, sheep, goat, dog, birds, man.

Distribution : Uttarakhand (Dehradun, Nainital, Almora, Uttarkashi dists.).

34. *Hyalomma turanicum* Pomerantzev, 1946

Hosts : Buffalo.

Distribution : Uttarakhand (Nainital dist.).

35. *Hyalomma* sp.

Host : Not known.

Distribution : Uttarakhand (Nainital dist.).

Genus *Ixodes* Latreille, 1795

36. *Ixodes acutitarsus* (Karsch, 1880)

Host : Cattle, goat, dog, small mammals, vegetation.

Distribution : Uttarakhand (Chamoli, Pithoragarh dists.).

37. *Ixodes granulatus* Supino, 1897

Host : Small mammals.

Distribution : Uttarakhand (Dehradun, Nainital, Pauri, Tehri, Almora, Pithoragarh, Chamoli, Uttarkashi dists.).

38. *Ixodes japonensis* Neumann, 1904

Host : Barking deer, shrew, sheep, vegetation.

Distribution : Uttarakhand (Nainital dist.).

39. *Ixodes ovatus* Neumann, 1899

Host : Cattle, goat, sheep, dog, man.

Distribution : Uttarakhand (Dehradun, Nainital, Almora, Tehri, Pithoragarh, Chamoli, Uttarkashi dists.).

40. *Ixodes kaschmiricus* Pomerentzev, 1948

Host : Cattle, sheep, buffalo, goat, man.

Distribution : Uttarakhand (Uttarkashi dist.)

41. *Ixodes turdus*

Host : Not known.

Distribution : Uttarakhand (Nainital dist.).

42. *Ixodes* sp.

Host : Not known.

Distribution : Uttarakhand (Dehradun, Nainital, Pauri, Almora, Tehri, Pithoragarh, Chamoli, Uttarkashi dists.).

Genus *Nosomma* Schulze, 1919

43. *Nosomma monstrosum* (Nuttall & Warburton, 1908)

Host : Buffalo, cattle, dog, rodents.

Distribution : Uttarakhand (Nainital, Almora, Pithoragarh, Chamoli, Uttarkashi dists.).

Genus *Rhipicephalus* Koch, 1844

44. *Rhipicephalus haemaphysaloides* Supino, 1897

Material examined : Dehradun dist. – 2(F), Bajawala, from cow, 2.iv.2006, coll. B.J. Sarkar.

Host : Cattle, dog, Himalayan thar, sheep.

Distribution : Uttarakhand (Nainital dist.)

45. *Rhipicephalus sanguineus* (Latrielle, 1806)

Hosts : Cattle, dog, goat, fox, rodents.

Distribution : Uttarakhand (Nainital, Almora, Pauri, Pithoragarh, Chamoli, Uttarkashi dists.).

46. *Rhipicephalus turanicus* Pomerentzev, 1940

Hosts : Cattle, dog, goat, sheep, buffalo.

Distribution : Uttarakhand (Nainital, Tehri, Pithoragarh dists.).

47. *Rhipicephalus* sp.

Hosts : Sheep, small mammals.

Distribution : Uttarakhand (Nainital, Almora, Chamoli dists.).

DISCUSSION

The foregoing account clearly indicates that the ixodid tick genera of Uttarakhand was extensively studied by several scientists. This attention to ixodids of Uttarakhand might be due to attraction to the Himalayas and Himalayan fauna. The workers collected tick specimens from a number of domestic and wild animals as well as from man and vegetation. But unfortunately due to strict prohibition of capturing and killing of wild animals, the present authors had to collect specimen only from domestic animals which yielded only a very few species of ixodid ticks. However, the data presented in the paper show that of the 8 genera *Haemaphysalis* occupies the highest position in respect of number of species. *Boophilus microplus* may be considered as the common and abundant species in the state. The species like *Haemaphysalis (Allophysalis) warburtoni*, *Hyalomma turanicum* and *Ixodes turdus* are endemic to the state.

SUMMARY

The paper presents an overview of the ixodid ticks known from Uttarakhand state, India. A total number of 47 species under 8 genera hitherto known from the state have been recorded. All the species reported here are already known from the state and three species are mentioned here as endemic to the state. The hosts and distribution of the tick species in Uttarakhand have also been incorporated in the paper.

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ORIBATID MITES (ACARI : ORIBATEI)

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INTRODUCTION

The cryptostigmatid or oribatid mites, commonly called as "moss" or "beetle" mites are one of the most abundant acarine fauna inhabiting almost all possible habitats on the earth. These mites are of much importance because of their beneficial and harmful activities in nature. They promote soil fertility through humification of organic matter. Oribatids are also used as biological agent for control of pest and in regulating soil nematode population. These mites are known as transmitter of various helminth diseases to domestic animals. There are a few oribatid species that feed on higher plants and some carries fungal spores. There are oribatid mites present in house dust cause respiratory allergic diseases to man.

The present work is based on collection of oribatid mites from different districts in Uttarakhand during 2003 to 2006 done by the authors and their associates. This work is the first attempt to explore the oribatid mite diversity in Uttarakhand as there was no record of earlier work in the State.

MATERIALS AND METHODS

The oribatid mites were collected from various habitats in different localities in the State. The samples mainly litter, soil and humus were collected with the help of iron spathe from upper 5-10 cm of soil profile and kept in polythene bags till those were processed for extraction of mites by using modified Tullgren funnels. The extracted specimens were collected in glass vials containing 70% alcohol. The oribatid specimens after sorted out from their associated fauna were kept into a vial containing an equal volume of 70% alcohol and lactic acid for desclerotization as suggested by J.

Balogh (1965, 1972) and J. Balogh and S. Mahunka (1983). Temporary slides as advocated by Grandjean (1949), Balogh (1965, 1972) and Balogh and Mahunka (1983) were prepared for taxonomic study. For identification the keys prepared by Balogh (1965, 1972), Balogh and Mahunka (1983), Balogh and Balogh (1988, 1990), Subias and Balogh (1989) and Subias (2004) have been followed.

The specimens studied in the present work are deposited, after final examination, in the National Zoological Collection, Zoological Survey of India, Kolkata.

GENERAL MORPHOLOGY AND TERMINOLOGY

The degree of diversity in regard to morphological characters in oribatid mites is very high. The features usually consider for identification vary greatly in this group of mites and these are named differently depending on the body forms and utility. For understanding of these morphological characters Sanyal (1992, 2000) may be consulted.

LIST OF ORIBATID TAXA

Family ENIOCHTHONIIDAE

Genus *Hypochthoniella* Berlese

1. *Hypochthoniella* sp.

Family LOHMANNIIDAE

Genus *Javacarus* Balogh

2. *J. kuhneli* Balogh

Family EUPHTHRACARIDAE

Genus *Acrotritia* Jacot

3. *A. ardua* (Koch) var. *otaheitensis* Hammer

- Genus *Euphthiracarus* Ewing
 4. *E. meghalayensis* Sanyal
 Family PHTHIRACARIDAE
 Genus *Hoplophorella* Berlese
 5. *H. (Hoplophorella) vitrina* (Berlese)
 Genus *Hoplophthiracarus* Jacot
 6. *H. tropicus* Mondal and Kundu
 Genus *Phthiracarus* Perty
 7. *P. claviger* Pearce
 Family TRHYPOCHTHONIIDAE
 Genus *Allonothrus* Hammen
 8. *A. (Allonothrus) indicus* Bhaduri and Raychaudhuri
 Genus *Archegozetes* Grandjean
 9. *A. longisetosus* Aoki
 Genus *Trhypochthonius* Berlese
 10. *Trhypochthonius* sp.
 Family MALACONOTHRIDAE
 Genus *Malaconothrus* Berlese
 11. *M. (Malaconothrus) dipankari* Saha and Sanyal
 Family NOTHRIDAE
 Genus *Nothrus* Koch
 12. *N. gracilis* Hammer
 13. *N. oblongus* Hammer
 Family CAMISIIDAE
 Genus *Heminothrus (Platynothrus)* Berlese
 14. *H. (P.)* sp.
 Family NANHERMANNIIDAE
 Genus *Cyrthermannia* Balogh
 15. *C. vicinicornuta* Aoki
 Genus *Masthermannia* Berlese
 16. *M. mammillaris* Berlese
 Family HERMANNIELLIDAE
 Genus *Hermanniella* Berlese
 17. *Hermanniella* sp.
 Genus *Issaniella* Grandjean
 18. *Issaniella* sp.
 Family NEOLIODIDAE
 Genus *Neoliodes* Berlese
 19. *N. ocellatus* Pearce
 Family GYMNODAMAEDAE
 Genus *Gymnodamaeus* Kulczynski
 20. *G. adpressus* (Aoki and Fujikawa)
 Family DAMAEIDAE
 Genus *Metabelba* Grandjean
 21. *M. obtusus* Hammer
 Family ASTEGISTIDAE
 Genus *Cultroribula* Berlese
 22. *Cultroribula* sp.
 Family LIACARIDAE
 Genus *Birsteiniius* Krivolutsky
 23. *Birsteiniius* sp.
 Family AMEROBELBIDAE
 Genus *Mongaillardia* Grandjean
 24. *Mongaillardia* sp.
 Family OPPIIDAE
 Genus *Brachioppia* Hammer
 25. *B. cuscensis* Hammer
 Genus *Brachioppiella* Hammer
 26. *B. periculosa* Hammer
 Genus *Oppiella* Jacot
 27. *O. (Oppiella) nova* (Oudemans)
 Genus *Ramusella* Hammer
 28. *R. (Ramusella) chulumaniensis* (Hammer)
 Family TECTOCEPHEIDAE
 Genus *Tectocephus* Berlese
 29. *T. velatus velatus* (Michael)
 30. *T. velatus sarekensis* Tragardh
 Family SCUTOVERTICIDAE
 Genus *Scutovertex* Michael
 31. *S. laminipes* Hammer
 Family PHENOPELOPIDAE
 Genus *Eupelops* Ewing
 32. *E. acromis minor* Chakraborti, Bhaduri and Raychaudhuri
 Genus *Peloptulus* Berlese
 33. *P. foveolatus* Hammer
 Family UNDULORIBATIDAE
 Genus *Unduloribates* Balogh
 34. *U. hebes* Aoki

Family AUSTRACHTERIIDAE

Genus *Hypozetes* Balogh

- 35.
- H. laysanensis*
- Aoki

Genus *Lamellobates* Hammer

- 36.
- L. (Lamellobates) palustris*
- Hammer

Family ACHIPTERIIDAE

Genus *Plakoribates* Popp

- 37.
- P. scutatus*
- Hammer

Family ORIBATELLIDAE

Genus *Oribatella* Banks

- 38.
- O. unispinata*
- Hammer

Family CERATOZETIDAE

Genus *Murcia* Koch

- 39.
- M. rausensis*
- (Aoki)

Genus *Zetomimus* Hull

- 40.
- Zetomimus*
- sp.

Family PUNCTORIBATIDAE

Genus *Pelopsis* Hull

- 41.
- Pelopsis*
- sp.

Family MOCHLOZETIDAE

Genus *Nesiotizetes* Jacot

- 42.
- Nesiotizetes*
- sp.

Family CALOPPIIDAE

Genus *Chaunoproctus* Pearce

- 43.
- C. minor*
- (Balogh)

Family LIEBSTADIIDAE

Genus *Reductobates* Balogh and Mahunka

- 44.
- R. latiohumeralis*
- Hammer

Family SCHELORIBATIDAE

Genus *Perscheloribates* Hammer

- 45.
- P. (Perscheloribates) albialatus*
- (Hammer)

Genus *Scheloribates* Berlese

- 46.
- S. huancayensis*
- Hammer

- 47.
- S. parvus*
- Pletzen

- 48.
- S. thermophilus*
- Hammer

Family PROTORIBATIDAE

Genus *Protoribates* Berlese

- 49.
- P. (P.) capucinus*
- Berlese

- 50.
- P. (Protoribates) natalensis*
- (Pletzen)

- 51.
- P. (Triaungius) seminudus*
- (Hammer)

Genus *Setoxylobates* Balogh and Mahunka

- 52.
- S. (Setoxylobates) foveolatus*
- Balogh and Mahunka

Family HAPLOZETIDAE

Genus *Indoribates* Jacot

- 53.
- Indoribates (Haplozetes)*
- sp.

Genus *Paraxylobates* Balogh and Mahunka

- 54.
- Paraxylobates*
- sp.

Genus *Peloribates* Berlese

- 55.
- P. intermedius*
- Mondal

Family GALUMNIDAE

Genus *Galumna* Heyden

- 56.
- G. crenata*
- Deb and Raychaudhuri

- 57.
- G. flabellifera orientalis*
- Aoki

SYSTEMATIC ACCOUNT

Family ENIOCHTHONIIDAE Grandjean, 1947

Genus *Hypochthoniella* Berlese1910. *Hypochthoniella* Berlese, *Redia*, 6 : 218.1. *Hypochthoniella* sp.

Material examined : Pithoragarh dist. : 2 nymphs, Jeolcote, 12.ix.2003, from soil, coll. A.K. Sanyal.

Remarks : The specific identification could not be possible due to presence of only two damaged specimens.

Family LOHMANNIIDAE Berlese, 1916

Genus *Javacarus* Balogh1961. *Javacarus* Balogh, *Acta Zool. Acad. Sci. Hung.*, 7 : 24.2. *Javacarus kuhnelti* Balogh1961. *Javacarus kuhnelti* Balogh, *Acta Zool. Acad. Sci. Hung.*, 7 : 31.

Diagnosis : Prodorsum having tubercles of small in size; sculptured rostrum, prodorsal setae lanceolate; sensillus with seven secondary branches; beaded line formed of light spots on notogaster; notogastral setae lanceolate without midrib; genital setae ten pairs.

Material examined : Uttarkashi dist. : 1 ♀, Janaki chatti (Hanuman chatti), 14.iv.2006, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Uttarkashi), Andhra Pradesh, Arunachal Pradesh, Mizoram, Orissa, Maharashtra, Tripura, West Bengal.

Elsewhere : Australia, Egypt, Fiji Islands, Indonesia, Malaysia, Philippines, Tahiti Islands.

Family EUPHTHIRACARIDAE Jacot, 1930

Key to the genera of Euphthiracaridae

- 1(2) One interlocking triangle in the middle of the anogenital region; interlamellar setae originated far from bothridium; notogaster rarely sculptured *Acrotrititia* Jacot, 1923
- 2(1) Two interlocking triangle present; setae a_1 long, erect, pilose; notogaster sculptured ...
..... *Euphthiracar*us Ewing, 1917

Genus *Acrotrititia* Jacot

1923. *Acrotrititia* Jacot, *J. Sci. Arts*, 1 : 162.

3. *Acrotrititia otaheitensis* (Hammer)

1972. *Acrotrititia otaheitensis* (Hammer), *Biol. Skr. Dan. Vid. Selsk.*, 19(3) : 12.

Diagnosis : Anterior part of aspis with minute granules, aspis with single lateral carina on each side; weakly barbed rostral setae, pseudostigmatic organ dilated distally into a flat head set with coarse bristles on its surface; notogaster finely punctated; lamellar and interlamellar setae thick, strongly barbed; notogastral setae 14 pairs, strong, apically barbed; genital setae nine pairs; a_3 very minute; one or three claws.

Material examined : Chamoli dist. : 7 ♀ ♀, Gopeswar Mondal, 31.x.2004, from soil, coll. A.K. Sanyal; Hardwar dist., 1 ♀, Mayapur, 9.xi.2004, from soil, coll. A.K. Sanyal; Uttarkashi dist., 1 ♀, Chamba, I.C.F.R.I. campus, 4.iv.2006, from soil under apple tree, coll. A.K. Sanyal, 1 ♀, Kutal village, 7.iv.2006, from soil, coll. A.K. Sanyal, 1 ♀, Janaki chatti (Hanuman chartti), 14.iv.2006, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Chamoli, Hardwar, Uttarkashi), Kerala, Meghalaya, Manipur, Mizoram, Sikkim, Tripura, West Bengal.

Elsewhere : Tahiti Island.

Genus *Euphthiracar*us Ewing

1917. *Euphthiracar*us Ewing, *Ann. ent. Soc. Amer.*, 10 : 132.

4. *Euphthiracar*us (*Euphthiracar*us) *meghalayensis* Sanyal

1988. *Euphthiracar*us *meghalayensis* Sanyal, *Rec. zool. Surv. India*, 85(2) : 225.

Diagnosis : Aspis with two lateral carinae on each side, upper one slightly irregular and strong; rostral setae long, smooth, lamellar setae long, finely barbed; interlamellar setae stout, long, finely barbed; sensillus with apical portion weakly thickened and minutely serrated; notogaster sculptured with papillae; notogastral setae 14 pairs, long, minutely barbed; genito-anal region with papillae; genital setae eight pairs, minutely barbed; leg tridactylous.

Material examined : Pithoragarh dist. : 1 ♀, Jeolcote, 12.ix.2003, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Pithoragarh), Arunachal Pradesh, Meghalaya.

Family PHTHIRACARIDAE Perty, 1841

Key to the genera of Phthiracaridae

- 1(4) Two pairs of median setae on inner margin of ano-adanal plates
- 2(3) Interlamellar setae decumbent, similar in shape to lamellar setae
..... *Phthiracar*us Perty, 1841
- 3(2) Interlamellar setae erect and usually much longer and thicker than lamellar setae
..... *Hoplophthiracar*us Jacot, 1933
- 4(1) Three pairs of medial setae inserted near each other on inner margin of ano-adanal plates; two pairs of lateral setae
..... *Hoplophorella* Berlese, 1923

Genus *Hoplophorella* Berlese

1923. *Hoplophorella* Berlese, *Redia*, 25 : 260.

5. *Hoplophorella* (*Hoplophorella*) *vitrina* (Berlese)

1913. *Hoplophorella* (*Hoplophorella*) *vitrina* (Berlese), *Redia*, 9 : 102.

1965. *Hoplophorella scapellata* Aoki, *Nat. Life Southeast Asia*, 4 : 131.

Diagnosis : Colour yellowish brown; rostral setae robust, thick, rough, directed inwards; lamellar setae spiniform, minute; interlamellar setae

lanceolate, rough; sensillus long, narrow, inflated in middle with fine spines; $c_1 < c_1 - d_1$; genital setae 6(4+2); ad_2 foliate, ad_1 and ad_3 spiniform, short, smooth.

Material examined : Pithoragarh dist. : 1 ♀, Jeolcote, 12.ix.2003, from soil, coll. A.K. Sanyal; Terhi Garwal dist. : 1 ♀, Rishikesh, Bharat Ashram, 6.xi.2004, from soil, coll. A.K. Sanyal, 1 ♀, Rishikesh, Lakshanjola, 7.xi.2004, from soil, coll. A.K. Sanyal; Hardwar dist. : 1 ♀, Mayapur, 9.xi.2004, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Pithoragarh, Terhi Garwal, Hardwar), Andhra Pradesh, Assam, Arunachal Pradesh, Bihar, Gujarat, Kerala, Manipur, Mizoram, Orissa, Rajasthan, Sikkim, Tripura, West Bengal.

Elsewhere : Antilles, Australia, Bismark Islands, Brazil, Chad, Jamaica, Panama, Papua New Guinea, Peru, Saba, St. Eustacius, St. Martin, Uganda, Venezuela, Zaire.

Genus *Hoplophthiracarus* Jacot

1933. *Hoplophthiracarus* Jacot, *J. Elisha Mitchel Sci. Soc.*, 48 : 239.

6. *Hoplophthiracarus tropicus* Mondal and Kundu

1988. *Hoplophthiracarus tropicus* Mondal and Kundu, *Rec. zool. Surv. India*, 85(1) : 111.

Diagnosis : Aspis foveolated; rostral setae smooth, short; lamellar setae finely barbed distally; interlamellar setae long, stout, distally barbed; sensillus slender, distally wide, anteriorly with uneven rounded brim; notogaster punctated with irregularly round ornamentation; fifteen pairs notogastral setae, distal one third barbed, tips blunt; genital setae nine pairs, fine, smooth.

Material examined : Chamoli dist. : 1 ♀, Gopeswar Mondal, 31.x.2004, from soil, coll. A.K. Sanyal; Hardwar dist. : 1 ♀, Mayapur, 9.xi.2004, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Chamoli, Hardwar), West Bengal.

Genus *Phthiracarus* Perty

1841. *Phthiracarus* Perty, Allgemeine Naturges chichte, als philosophische and Humanitatzwissenschaft fur Naturforscher, Philosophen and das hoher gebildete publikum, F₂, Bern.

7. *Phthiracarus claviger* Pearce

1906. *Phthiracarus claviger* Pearce, *Journ. Roy. Micr. Soc.*, 271.

Diagnosis : Colour light brown; coarsely areolated; aspis with carina; sensillus moderately long, thin, slightly clavate; a few fine setae on notogaster; legs monodactylous.

Material examined : Pithoragarh dist. : 1 ♀, Jeolcote, 12.ix.2003, from soil, coll. A.K. Sanyal; Dehradun Dist. : 1 ♀, Mussouri, 28.x.2004, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Pithoragarh, Dehradun), Sikkim, West Bengal.

Family TRHYPOCHTHONIIDAE Willmann, 1931

Key to the genera of Trhypochthoniidae

- 1(2) Legs monodactyle; seven pairs of genital setae *Archegozetes* Grandjean, 1931
- 2(1) Legs tridactyle
- 3(4) Notogastral setae spatulate; notogastral surface foveolate; and setae two pairs
..... *Allonothrus* Hammer, 1953
- 4(3) Notogastral setae setiform; notogastral surface smooth; anal setae one pair
..... *Trhypochthonius* Berlese, 1904

Genus *Allonothrus* Hammen

1953. *Allonothrus* Hammen, *Proc. Acad. Sci. Amst.*, 56C : 244.

8. *Allonothrus (Allonothrus) indicus* Bhaduri and Raychaudhuri

1968. *Allonothrus indicus* Bhaduri and Raychaudhuri, *Oriental Ins.*, 2(2) : 195.

Diagnosis : Prodorsum irregularly punctate; strongly curved lateral ridges on prodorsum; rostral setae simple, barbed; lamellar, interlamellar and notogastral setae fan-shaped; sensillus long, narrow, thickened towards the end, distal part with fine setae; ten pairs of genital setae, setose.

Material examined : Tehri Garwal dist. : 2 ♀ ♀, Rishikesh, Bharat Ashram, 6.xi.2004, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Tehri Garwal), Manipur, West Bengal.

Genus *Archegozetes* Grandjean

1931. *Archegozetes* Grandjean, *Bull. Mus. Hist. Nat. Paris*, 3(2) : 144.

9. *Archegozetes longisetosus* Aoki

1965. *Archegozetes longisetosus* Aoki, *Nat. Life Southeast Asia*, 4 : 147.

Diagnosis : Prodorsum punctate; prodorsal and notogastral setae long, fine, densely beset with fine bristles; sensillus long, fine, densely beset with bristles, d_1 longer than their mutual distance; genital setae seven pairs, $4a$ about $\frac{1}{2}$ as long as $4b$; sharp solenidia on palp.

Material examined : Pithoragarh dist. : 1 ♀, Jeolcote, 12.ix.2003, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Pithoragarh), Andhra Pradesh, Arunachal Pradesh, Assam, Gujarat, Meghalaya, Mizoram, Kerala, Orissa, Sikkim, Tripura, West Bengal.

Elsewhere : Malaysia, South America, Tahiti Island, Thailand.

Genus *Trhypochthonius* Berlese

1904. *Trhypochthonius* Berlese, *Redia*, 2 : 27.

10. *Trhypochthonius* sp.

Material examined : Tehri Garwal dist. : 1 ♀, Ranichori, Khatiyar village, 5.iv.2006, from soil, coll. A.K. Sanyal.

Remarks : The specimens were not in good condition. Hence, the identification up to species level was not possible.

Family MALACONOTHRIDAE Berlese, 1916

Genus *Malaconothrus* Berlese

1904. *Malaconothrus* Berlese, *Redia*, 2 : 24.

11. *Malaconothrus* (*Malaconothrus*) *dipankari* Saha and Sanyal

1996. *Malaconothrus* (*Malaconothrus*) *dipankari* Saha and Sanyal, *Entomon*, 21(1) : 107.

Diagnosis : Rostral setae smooth, thin; lamellar and interlamellar setae fine, smooth, long; neck region with polygonal markings, notogaster densely foveolated with minute punctations; notogastral setae fifteen pairs, smooth, long, fine, ventral surface foveolated; genital setae five pairs; no anal

setae; adanal setae three pairs, smooth; legs monodactylous.

Material examined : Tehri Garwal dist. : 1 ♀, Ranichori, Khatiyar village, 5.iv.2006, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Tehri Garwal), Tripura.

Family NOTHRIDAE Berlese, 1896

Genus *Nothrus* Koch

1836. *Nothrus* Koch, *Deutschlands crustaceen, Myriapoden und Arachniden*, 2 : 17.

Key to the species of *Nothrus*

- 1(2) Legs monodactyle; notogastral setae transparent; notogaster with light rounded to polygonal spots, almost reticulate
..... *gracilis* Hammer, 1961
- 2(1) Legs tridactyle; setae p_1 much longer than setae h_1 ; setae c_1 shorter than the distance $c_1 - c_1$ *oblongus* Hammer, 1961

12. *Nothrus gracilis* Hammer

1961. *Nothrus gracilis* Hammer, *Biol. Skr. Dan. Vid. Selesk.*, 13(1) : 28.

Diagnosis : Hysterosoma with parallel lateral border; short rostral setae, stiff; lamellar setae on apophyses, connected by thin straight line, thick, bushy, tips bent downwards; interlamellar setae broad, flat, feathered; sensillus equally thick throughout, with minute bristles; notogastral setae transparent, delicate, hardly discernible; K , PN_1 and PN_2 situated on short apophyses.

Material examined : Pithoragarh dist. : 7 ♀ ♀, Jeolcote, 12.ix.2003, from soil, coll. A.K. Sanyal; Chamoli dist. : 2 ♀ ♀, Gopeswar Mondal, 30.x.2004, from soil, coll. A.K. Sanyal, 1 ♀, 31.x.2004, from soil, coll. A.K. Sanyal, 1 ♀, Badrinath, 4.xi.2004, from moss, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Pithoragarh, Chamoli), Arunachal Pradesh, Gujarat, Mizoram, West Bengal.

Elsewhere : Peru.

13. *Nothrus oblongus* Hammer

1961. *Nothrus oblongus* Hammer, *Biol. Skr. Dan. Vid. Selsk.*, 13(1) : 27.

Diagnosis : Very long hysterosoma with slightly convex lateral borders; rostral setae short, thick; lamellar setae on short apophyses, thick, bushy; sensillus equally thick throughout with minute scales; transverse pits in the longitudinal grooves between pseudostigmata, broad mesh of punctation around the pit – the whole appears like a honeycomb; notogastral setae extremely short, asymmetric, slender, smooth proximally, distally thick, laterally set with scales; PN_1 on short apophyses.

Material examined : Chamoli dist. : 11 ♀♀, Badrinath, 4.xi.2004, from soil, coll. A.K. Sanyal; Tehri Garwal dist. : 1 ♀, Rishikesh, Bharat Ashram, 6.xi.2004, from soil, coll. A.K. Sanyal, 4 ♀♀, Pandukeswar, 7.xi.2004, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Chamoli, Tehri Garwal), West Bengal.

Elsewhere : Peru.

Genus *Heminothrus* (*Platynothrus*) Berlese

1913. *Heminothrus* (*Platynothrus*) Berlese, *Redia*, 9 : 99.

14. *Heminothrus* (*Platynothrus*) sp.

Material examined : Chamoli dist. : 5 ♀♀, Badrinath, 4.xi.2004, from moss, coll. A.K. Sanyal.

Remarks : The specimens are very few in number and in damaged condition. Hence the specific identification was not possible.

Family NANHERMANNIIDAE Sellnick, 1928

Key to the genera of Nanhermanniidae

- 1(2) Simple setiform notogastral setae; epimeral setal formula : 3-1-3-3
..... *Cyrthermannia* Balogh, 1958
- 2(1) 'T'- shaped notogastral setae, distally branched flagellate; posterior elevation wider than long; epimeral setal formula 3-1-3-4 ..
..... *Masthermannia* Berlese, 1913

Genus *Cyrthermannia* Balogh

1958. *Cyrthermannia* Balogh, *Rev. Zool. Bot. Afr.*, 58(102) : 3.

15. *Cyrthermannia vicinicornuta* Aoki

1965. *Cyrthermannia vicinicornuta* Aoki, *Nat. Life Southeast Asia*, 4 : 153.

Diagnosis : Prodorsum and notogaster foveolated; smooth prodorsal setae; lamellar setae

short, placed very close on tubercles; two triangular horn-like processes present on postero-median border of prodorsum; fourteen pairs of notogastral setae, simple, lanceolate epimeral setae pilose; genital setae seven pairs, simple; epimeral setal formula 3-2-3-3.

Material examined : Uttarkashi dist. : 1 ♀, Dharasu, Dhunda, 15.iv.2006, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Uttarkashi), Mizoram, West Bengal.

Elsewhere : Thailand.

Genus *Masthermannia* Berlese

1913. *Masthermannia* Berlese, *Redia*, 9 : 100.

16. *Masthermannia mammillaris* (Berlese)

1913. *Masthermannia mammillaris* Berlese, *Redia*, 9 : 100.

Diagnosis : Prodorsum fairly punctate with a robust lath laterally on both sides; sensillus long, incrassate, finely feathered; weak prodorsal condyles connected by transverse lath; notogaster foveolated, notogaster profile uneven due to tubercles; notogastral setae originate from tubercles with very long branches.

Material examined : Uttarkashi dist. : 3 ♀♀, Songrati, 9.iv.2006, from soil, coll. A.K. Sanyal, 8 ♀♀, Janaki Chatti (Hanuman Chatti), 14.iv.2006, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Uttarkashi), Sikkim, Tripura, West Bengal.

Elsewhere : Australia, China, Euc Island, Fiji Island, France, Indonesia, Italy, North America, Samoa, Tahiti Island, Yugoslavia.

Family HERMANNIELLIDAE Grandjean, 1934

Key to the genera of Hermanniellidae

Genus *Hermanniella* Berlese

1908. *Hermanniella* Berlese, *Redia*, 5 : 11.

17. *Hermanniella* sp.

Material examined : Chamoli dist. : 1 ♀, Gopeswar, P.W.D. Rest House campus, 31.x.2004, from soil, coll. A.K. Sanyal.

Remarks : Only one specimen was found in the collection which could not be identified upto species level.

Genus *Issaniella* Grandjean

1962. *Issaniella* Grandjean, *Acarologia*, 4 : 649.

18. *Issaniella* sp.

Material examined : Almora dist. : 1 ♀, Binsar, 3.ix.2003, from soil, coll. A.K. Sanyal.

Remarks : Only one specimen was found in the collection which could not be identified upto species level.

Family NEOLIODIDAE Sellnick, 1928

Genus *Neoliodes* Berlese, 1888

1888. *Neoliodes* Berlese, *Bull. Soc. ent. Ital.*, 20 : 171.

19. *Neoliodes ocellatus* Pearce

1906. *Neoliodes ocellatus* Pearce, *Journ. Roy. Micr. Soc.*, 272.

Diagnosis : Hexagonal in shape; prodorsum broadly pyramidal, with few indistinct markings; sensillus small, with thin penduncle and clavate-shaped head; notogaster pentagonal with a rounded projection at posterior extremity; legs monodactyle.

Material examined : Almora dist. : 1 ♀, Binsar, 3.ix.2003, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Almora), Sikkim.

Family GYMNODAMAEDAE Grandjean, 1954

Genus *Gymnodamaeus* Kulczynski

1902. *Gymnodamaeus* Kulczynski, *Bull. Ac. Cracovie*, (1902) : 89.

20. *Gymnodamaeus adpressus* (Aoki and Fujikawa)

1971. *Allodamaeus adpressus* (Aoki and Fujikawa), *Annot. Zool. Jap.*, 44 : 115.

Diagnosis : Six transverse or longitudinal ridges on prodorsum; the meral end of the posteriormost ridge on each side bears an insertion for interlamellar setae; sensillus long, head barbed; two pairs of setae on posterior part of notogaster, decumbent along the curvature of notogaster, the anterior part of setae about three times as long as the posterior.

Material examined : Hardwar dist. : 2 ♀ ♀, Mayapur, 9.xi.2004, from soil, coll. A.K. Sanyal; Tehri Garwal dist. : 2 ♀ ♀, Lakshman Jola, 7.xi.2004, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Hardwar, Tehri Garwal), Sikkim, West Bengal.

Elsewhere : Japan.

Family DAMAEIDAE Berlese, 1896

Genus *Metabelba* Grandjean

1936. *Metabelba* Grandjean, *Ann. ent. Soc. Fr.*, 105 : 67.

21. *Metabelba (Metabelba) obtusa* Hammer

1966. *Metabelba (Metabelba) obtusa* Hammer, *Bid. Skr. Dan. Vid. Selesk.*, 15(2) : 45.

Diagnosis : Medially curved rostral and lamellar setae; interlamellar setae lash-shaped; posterior border of propodosoma with two triangular tubercles opposite to two similar ones on anterior margin of hysterosoma; notogastral setae ten pairs, arranged in two longitudinal rows; five to six pairs of genital setae.

Material examined : Almora dist. : 1 ♀, Sony, 7.ix.2003, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Almora), West Bengal.

Elsewhere : New Zealand.

Family ASTEGISTIDAE Balogh, 1961

Genus *Cultroribula* Berlese

1908. *Cultroribula* Berlese, *Redia*, 5(1) : 9.

22. *Cultroribula* sp.

Material examined : Almora dist. : 1 ♀, Binsar, 3.ix.2003, from soil, coll. A.K. Sanyal; Pithoragarh dist. : 9 ♀ ♀, Jeolcote, 12.ix.2003, from soil, coll. A.K. Sanyal.

Remarks : The specimens could not be identified upto species level due to lack of literature at this moment. The genus is reported here for the first time from India.

Family LIACARIDAE Sellnick, 1928

Genus *Birsteinus* Krivolutsky

1965. *Birsteinus* Krivolutsky, *Byull. mosk. Obsch. Ispyt. Prir.*, 70 : 118.

23. *Birsteinus* sp.

Material examined : Almora dist. : 1 ♀, Chambatia, 6.ix.2003, from soil and litter, coll. A.K. Sanyal.

Remarks : Only one specimen in damaged condition was collected. Hence the specimen could not be identified upto species level. The genus is reported here for the first time from India.

Family AMEROBELBIDAE Grandjean, 1954
Genus *Mongaillardia* Grandjean

1961. *Mongaillardia* Grandjean, *Acarologia*, 3 : 304.

24. *Mongaillardia* sp.

Material examined : Pithoragarh dist. : 1 ♀, Jeolcote, 12.ix.2003, from soil, coll. A.K. Sanyal.

Remarks : The single specimen could not be identified upto species level. The genus is reported here for the first time from India.

Family OPPIIDAE Grandjean, 1954
Key to the genera of Oppiidae

- 1(2) Crista present; setae C_2 well developed; sometimes with 1 pair of interbothridial tubercles; fissure *iad* usually paraanal
..... *Oppiella* Jacot, 1937
- 2(1) Crista absent; setae C_2 either absent or less developed than the remaining notogastral setae; interbothridial tubercles usually absent
- 3(6) Fissure *iad* inverse apoanal
- 4(5) Genital plates with 6 pairs of setae; setae ad_1 paraanal
..... *Brachioppia* Hammer, 1961
- 5(4) Genital plates with 5 pairs of setae; setae ad_1 postanal
..... *Brachioppiella* Hammer, 1962
- 6(3) Fissure *iad* paraanal, rostral setae geniculate, placed near each other; fusiform sensillus, ciliate or pectinate
..... *Ramusella* Hammer, 1962

Genus *Brachioppia* Hammer

1961. *Brachioppia* Hammer, *Biol. Skr. Dan. Vid. Selsk.* 13(1) : 51

25. *Brachioppia cuscensis* Hammer

1961. *Brachioppia cuscensis* Hammer, *Biol. Skr. Dan. Vid. Selsk.* 13(1) : 51.

Diagnosis : Rostral setae unilaterally feathered, situated far back on upper side of rostrum, lamellar setae thick, feathered, sensillus with elongate

semilunar disc like head with 4-6 branches; notogaster with nine pairs of long and smooth setae; one fissure on the shoulder and another in the middle of notogaster; genital setae six pairs.

Material examined : Bageswar dist. : 1 ♀, Someswar, 10.ix.2003, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Bageswar), West Bengal.

Elsewhere : Japan, Peru.

Genus *Brachioppiella* Hammer

1962. *Brachioppiella* Hammer, *Biol. Skr. Dan. Vid. Selsk.* 13(2) : 47.

26. *Brachioppiella periculosa* Hammer

1962. *Brachioppiella periculosa* Hammer, *Biol. Skr. Dan. Vid. Selsk.* 13(2) : 47.

Diagnosis : Rostral setae finely feathered; lamellar setae very thin, as long as their mutual distance, situated immediately behind a faint translamellar ridge; interlamellar setae distinct, situated near the posterior border of the middle field and off the space between the two light spots, pseudostigmatic organ branched with three long posterior branches and two shorter anterior ones; exopseudostigmatic organ thin, stiff, situated on the anterior end of a strongly chitinized ridge; notogastral setae nine pairs, very thin, slightly rough; five pairs of genital setae; fissure *iad* situated obliquely to the lateral sides of anal field off ad_2 ; monodactylous.

Material examined : Tehri Garwal dist. : 5 ♀ ♀, Ranichori, Khatiyar village, 5.iv.2006, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Tehri Garwal).

Elsewhere : Chile.

Remarks : This is the first record of the species from India.

Genus *Oppiella* Jacot

1937. *Oppiella* Jacot, *J.N.Y. ent. Soc.*, 45 : 356.

27. *Oppiella (Oppiella) nova* (Oudemans)

1902. *Oppiella nova* (Oudemans), *Ent. Ber.*, 1 : 36.

Diagnosis : Rostrum with a ?-shaped slit, all prodorsal setae smooth; a thin transverse line

below the rostral setae; lamellar setae thin, originating from the tip of short costulae; interlamellar setae directed posteromedially, sensillus fusiform with 7-8 radiating branches; notogastral setae ten pairs, smooth; genital setae six pairs.

Material examined : Pithoragarh dist. : 1 ♀, Jeolcote, 12.ix.2003, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Pithoragarh), Andhra Pradesh, Himachal Pradesh, Kerala, Meghalaya, West Bengal.

Elsewhere : Africa, Canary Island, Chile, Central Asia, Easter Island, Fiji, Germany, Indonesia, Japan, New Zealand, North America, Pacific Island, Pakistan, Patagonia, Reunion Island, Samoa, South America, Thailand, Tonga Tapu Island.

Genus *Ramusella* Hammer

1962. *Ramusella* Hammer, *Biol. Skr. Dan. Vid. Selsk.*, 13(2) : 50.

28. *Ramusella (Ramusella) chulumaniensis* (Hammer)

1958. *Oppia chulumaniensis* Hammer, *Biol. Skr. Dan. Vid. Selsk.*, 10(1) : 57.

1962. *Ramusella (Ramusella) chulumaniensis* (Hammer), *Biol. Skr. Dan. Vid. Selsk.*, 13(2) :

Diagnosis : Rostral setae placed closed together, extend beyond tip of rostrum by half their length, proximal part thick, set with bristles; lamellar setae stiff, thin, directed forward and inward; about half as long as their mutual distance, situated on anterior end of short lamellae; interlamellar setae stiff spines, directed outwards, three pairs of light spots between interlamellar setae, sensillus strongly branched, head flat and almost semilunar shaped; a broad chitinous border at the anterior end of notogaster; ten pairs of notogastral setae, almost equal in length, stiff.

Material examined : Pithoragarh dist. : 1 ♀, Sitalakhet, 4.ix.2003, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Pithoragarh), Tripura.

Elsewhere : Bolivia, Java, Peru.

Family TECTOCEPHEIDAE Grandjean, 1954 Genus *Tectocephus* Berlese

1913. *Tectocephus* Berlese, *Redia*, 9 : 91.

Key to the species of *Tectocephus*

- 1(2) Lamellar cusp narrow and pointed, lyrifissure *iad* placed parallel.....
..... *velatus* (Michael, 1888)
- 2(1) Lamellar cusp broad and round; lyrifissure *iad* placed laterally
..... *sarekensis* Tragardh, 1910

29. *Tectocephus velatus velatus* (Michael)

1880. *Tectocephus velatus velatus* (Michael), *Ray. Soc.*, 65.

Diagnosis : Body rough with irregularly raised dots, rostrum trifid; lamellae large detached blades, lying nearly horizontal, extend beyond the lateral margin of the cephalothorax, median portion broad, cusps narrow or thick, almost reaching the tip of rostrum; translamella distinct, rostral and lamellar setae curved inward and barbed unilaterally; interlamellar setae minute, smooth, inserted near the base of lamellae, sensillus long with slender stalk, head licheniform, dorsosejugal suture interrupted, paired *iad*, large, placed parallel to the anterior part of the lateral side of anal field.

Material examined : Pithoragarh dist. : 1 ♀, Marya Garden, 2.ix.2003, from soil, coll. A.K. Sanyal; Almora dist. : 1 ♀, Binsar, 3.ix.2003, from soil, coll. A.K. Sanyal; Bageswar dist. : 6 ♀ ♀, Someswar, 10.ix.2003, from soil, coll. A.K. Sanyal, 2 ♀ ♀, Jeolcote, 12.ix.2003, from soil, coll. A.K. Sanyal; Dehradun dist. : 2 ♀ ♀, Mussouri FRI Company bagan, 28.x.2004, from soil, coll. A.K. Sanyal, FRI Wood Research Campus, 4 ♀ ♀, 30.x.2004, from soil, coll. A.K. Sanyal; Chamoli dist. : 4 ♀ ♀, Gopeswar Mondal, 31.x.2004, from soil, coll. A.K. Sanyal, 1 ♀, Josimoth, 1.xi.2004, from soil, coll. A.K. Sanyal; 5 ♀ ♀, Pipolkoti, 1.xi.2004, from soil, coll. A.K. Sanyal, 1 ♀, Gobindaghat from soil, coll. A.K. Sanyal; Terhi Garwal dist. 1 ♀, Muni-ki-Reti, 7.xi.2004, from soil, coll. A.K. Sanyal, Mussouri, Kempty falls, 1 ♀, from soil, coll. B.J. Sarkar.

Distribution : India : Uttarakhand (Pithoragarh, Almora, Bageswar, Dehradun, Chamoli, Terhi Garwal), Andhra Pradesh, Bihar, Gujarat, Himachal Pradesh, Kerala, Manipur, Meghalaya, Mizoram, Orissa, Sikkim, Tripura, West Bengal.

Elsewhere : Africa, Central Asia, Easter Island, Europe, Fiji Island, Indonesia, Japan, Jordan, New Zealand, North America, Pakistan, South America, Spitsbergen, Tonga Island, Turkey.

30. *Tecticepheus velatus sarekensis* Tragardh

1910. *Tecticepheus velatus sarekensis* Tragardh, *Naturw. Unters Sarekgeb in Schw. Lappland*, 4 : 567.

Diagnosis : The median and lateral borders of lamella run parallel towards tip; prodorsum bears indistinct longitudinal furrows behind translamellae; tips of lamellae broad and round; *iad* directed laterally.

Material examined : Dehradun dist. : 8 ♀ ♀, F.R.I. campus, 2.iv.2006, from soil, coll. B.J. Sarkar; Uttarkashi dist. : 5 ♀ ♀, Kutal Village, 7.iv.2006, from soil, coll. B.J. Sarkar, 2 ♀ ♀, Pata village, 8.iv.2006, from soil, coll. B.J. Sarkar, 1 ♀, Dharasu, Chitnasur, 13.iv.2006, from soil, coll. B.J. Sarkar, 1 ♀, 15.iv.2006, from soil, coll. B.J. Sarkar.

Distribution : India : Uttarakhand (Dehradun, Uttarkashi), Tripura, West Bengal.

Elsewhere : Germany, Indonesia, New Zealand, Spain.

Family SCUTOVERTICIDAE Grandjean, 1954 Genus *Scutovertex* Michael

1879. *Scutovertex* Michael, *J. Roy. Micr. Soc. London*, 2 : 242.

31. *Scutovertex laminipes* Hammer

1961. *Scutovertex laminipes* Hammer, *Biol. Skr. Dan. Vid. Selsk.*, 13(1) : 81.

Diagnosis : Rostrum flat with incurvation in the middle; rostral setae uneven less than half as long as their mutual distance; lamellae covered with dark Chitinous wrinkles; interlamellar setae not seen; surface of propodosoma covered with dark round granules in more or less radiating rows towards an indistinct triangular field in the middle; pseudostigmatic organs consist of a short thin stalk and a dark flat club covered with spines; greatest part of dorsal side of hysterosoma with soft wrinkles running in transverse curves, some were flat, some pointed in the middle, notogastral setae nine pairs, scoop-shaped, i.e. a big deep bowl on a short handle, outer side of scoop set with short broad spines; behind and partly round the genital field soft wrinkles present; legs tridactylous.

Material examined : Chamoli dist. : 5 ♀ ♀, Chamoli, 31.x.2004, from soil, coll. A.K. Sanyal, 1 ♀, Gobindaghat, 2.xi.2006, from soil, coll. A.K. Sanyal, 1 ♀ Gopeswar, 31.x.2006, from soil, coll. A.K. Sanyal; Tehri Garwal dist. 1 ♀, Muni-ki-Reti, 7.xi.2004, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand, (Chamoli, Tehri Garwal).

Elsewhere : Argentina, Peru.

Remarks : This is first report of the species from India.

Family PHENOPELOPIDAE Petrunkevitch, 1955

Key to the genera of Phenopelopidae

- 1(2) Interlamellar setae very small, setiform
.....*Peloptulus* Berlese, 1908
- 2(1) Interlamellar setae long, leaf-shaped
.....*Eupelops* Ewing, 1917

Genus *Eupelops* Ewing

1917. *Eupelops* Ewing, *Ann. Ent. Soc. Amer.*, 10 : 126.

39. *Eupelops acromis minor* Chakrabarti, Bhaduri and Raychaudhuri.

1973. *Eupelops acromis minor* Chakrabarti, Bhaduri and Raychaudhuri. *Sci. & Cult.*, 39(8) : 365.

Diagnosis : Lamellar cusp 'U'-shaped; interspace between lamellar cusps wider posteriorly; lamellar setae finely barbed; interlamellar setae phylliform; head of sensillus lanceolate, beset with fine setae; notogastral setae ten pairs, distally thick, tip pointed, finely barbed; lenticulus large; six pairs of genital setae.

Material examined : Chamoli dist. : 4 ♀ ♀ Badrinath, 4.xi.2004, from moss, coll. A.K. Sanyal, 4 ♀ ♀, Mana village, 4.xi.2004, from soil, coll. A.K. Sanyal; Dehradun dist. : 1 ♀, F.R.I. campus, 28.x.2004, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand, (Chamoli, Dehradun), West Bengal.

Genus *Peloptulus* Berlese

1908. *Peloptulus* Berlese, *Redia*, 5 : 7.

33. *Peloptulus foveolatus* Hammer

1961. *Peloptulus foveolatus* Hammer, *Biol. Skr. Dan. Vid. Selsk.*, 13(1) : 131.

Diagnosis : Rostral wings as this chitinous blades along the lateral sides of rostrum; lamellae connected by translamella; lamellar setae rough, situated on lamellar curp. interlamellar setae short, very thin; pseudostigmatic organ with long stalk and long slender club rounded at tip, head set with short scales or bristles, reaches as far as translamella; lamellae very faintly punctate, notogaster faintly foveolate-reticulated, densely punctate; notogastral setae slightly bent spines; ventral side foveolate - reticulated.

Material examined : Chamoli dist. : 1 ♀, Mana village, Badrinath, 4.xi.2004, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Chamoli).

Elsewhere : Peru.

Remarks : The genus and species are reported here for the first time from India.

Family UNDULORIBATIDAE Kunst, 1971

Genus *Unduloribates* Belogh

1943. *Unduloribates* Balogh, *Ann. Hist. nat. Mus. Hung. Zool.*, 36 : 39.

34. *Unduloribates hebes* Aoki

1965. *Unduloribates hebes* Aoki, *J. Coll. Arts Sci. Chiba Univ.*, 4 : 289.

Diagnosis : Rostrum and lamellar setae completely hidden beneath the well developed lamellae; lamellae very broad, largely covering prodorsum; a very short translamella present; lamellar setae thick, more blunt and little shorter than rostral setae; interlamellar setae stiff, erect blunt and roughened; 10 pairs of notogastral setae, short, thick, stiff, blunt in tips; distance *ti-ti* equal to that of *ms-ms*; *ti-ms* slightly larger than *ms-ms*; nine pairs of genital setae.

Material examined : Pithoragarh dist. : 3 ♀ ♀, Jeolcote, 12.ix.2003, from soil. coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Pithoragarh), Himachal Pradesh.

Elsewhere : Japan.

Family AUSTRACHTERIIDAE Luxton, 1985

Key to the genera of Austrachipteriidae

1(2) Adanal region with 3 pairs of setae
..... *Hypozetes* Balogh, 1959

2(1) Adanal region with 2 pairs of setae
..... *Lamellobates* Hammer, 1958

Genus *Hypozetes* Balogh

1959. *Hypozetes* Balogh, *Acta zool. Hung.*, 5 : 15.

35. *Hypozetes laysanensis* Aoki

1964. *Hypozetes laysanensis* Aoki, *Pacific Insects*, 6 : 655.

Diagnosis : Rostrum tricuspidate; rostral setae densely barbed on each side and situated on apophyses; lamellar and interlamellar setae minutely barbed; sensillus with a finely barbed club-shaped head; ten pairs of notogastral setae, minutely barbed; sacculi *sa* placed closer to *ti* than to *te*.

Material examined : Kathgudam dist. : 1 ♀, Kaladhungi, 15.ix.2006, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Kathgudam), Arunachal Pradesh, Mizoram, Tripura, West Bengal.

Elsewhere : Hawaiian Island.

Genus *Lamellobates* Hammer

1958. *Lamellobates* Hammer, *Biol. Skr. Dan. Vid. Selsk.*, 10(1) : 100.

36. *Lamellobates (Lamellobates) molecula molecula* (Berlese)

1916. *Lamellobates (Achipteria) molecula* Berlese, *Redia*, 12 : 58.

1958. *Lamellobates palustris* Hammer, *Biol. Skr. Dan. Vid. Selsk.*, 10(1) : 100.

Diagnosis : Pointed rostrum, sides concave; very long rostral setae, reaching far beyond the tip of rostrum, unilaterally feathered; lamellae broad without distal tips; inner cuspides of lamellae rounded, outer lamellar cuspides tapering into short and sharp point; lamellar setae situated a short distance behind anterior border nearest to median side; equally very thick throughout, rough; interlamellar setae situated where lamellae and anterior border of hysterosoma meet, very long, rough tip reaches beyond lamellar setae; sensillus long, slender, club-shaped; tip pointed, beset with short hairs; notogaster almost as broad as long, oosterior end narrow; notogastral setae nine pairs, thin, long, occupy dorsal part of notogaster, six pairs genital setae, legs monodactylous.

Material examined : Almora dist. : 2 ♀ ♀, Binsar, 3.ix.2003, from soil and moss, coll. A.K. Sanyal; Dehradun dist. : 1 ♀, Mussouri, Kempty falls; 28.x.2004, from soil, coll. A.K. Sanyal; Chamoli dist. : 1 ♀, Baitarini, 31.x.2004, from soil, coll. A.K. Sanyal; Tehri Garwal dist. : 1 ♀, Bharat Ashram, Rishikesh, 9.xi.2004, from soil, coll. A.K. Sanyal; Uttarkashi dist. : 1 ♀, Janakichati, 14.iv.2006, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Almora, Chamoli, Tehri Garwal, Uttarkashi), Andhra Pradesh, Arunachal Pradesh, Gujarat, Bihar, Kerala, Meghalaya, Mizoram, Sikkim, Tripura, West Bengal.

Elsewhere : Fiji Island, Indonesia, New Zealand, Pakistan, Seychelles, Argentina, Thailand, Tonga Tapu Island.

Family ACHIPTERIIDAE Thor, 1929
Genus *Plakoribates* Popp

1960. *Plakoribates* Popp, *Bull. Soc. ent. Egypte*, **44** : 212.

37. *Plakoribates scutatus* Hammer

1979. *Plakoribates scutatus* Hammer, *Biol. Skr. Dan. Vid. Selsk.*, **22**(9) : 63.

Diagnosis : Lamellae forming one very broad scutate plate covering most of the prodorsum; lamellar setae situated far anteriorly, close together at the anterior end of a furrow, along the fused medial border of the lamellae, thick, barbed, two to three times longer than their mutual distance, tip bent ventrally; interlamellar setae thick, uneven, reach the anterior border of lamellar plate; epimeral setae 3:1:3:2, barbed; genital setae six pairs, long, setaceous, smooth, adanal setae two pairs, barbed; *iad* long, located in front of *ad*₂; area between genital and anal fields slightly darker and faintly reticulated; tridactylous.

Material examined : Chamoli dist. : 1 ♀, Gopeswar, 31.x.2004, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Chamoli).

Elsewhere : Java..

Remarks : The species is the first report from India.

Family ORIBATELLIDAE Jacot, 1925
Genus *Oribatella* Banks

1895. *Oribatella* Banks, *Trans. Amer. Ent. Soc.*, **22** : 4.

38. *Oribatella Unispinata* Hammer

1958. *Oribatella unispinata* Hammer, *Biol. Skr. Dan. Vid. Selsk.*, **10**(1) : 100.

Diagnosis : Rounded rostrum; densely feathered rostral setae; lamellae slightly furrowed, densely punctate; lamellar setae rough, about twice as thick as median tip, interlamellar setae rough, thin; sensillus with slender head and stalk, cup of sensillus with sharp point on its anterior border; anterior border of notogaster with 8-10 parallel lines lateral to sensillus; notogaster with 8-10 parallel lines lateral to sensillus; notogastral setae thin, area porosae small; notogaster densely punctate; legs tridactylous.

Material examined : Dehradun dist. : 3 ♀ ♀, Mussouri, Kempty falls, 28.x.2004, from soil, coll. A.K. Sanyal; Chamoli dist. : 2 ♀ ♀, Gopeswar, P.W.D. Rest House campus, 31.x.2004, from soil, coll. A.K. Sanyal, 1 ♀, Josimath, 1.xi.2004, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand, (Dehradun, Chamoli), Tripura.

Elsewhere : Bolivia.

Family CERATOZETIDAE Jacot, 1925
Genus *Murcia* Kock

1935. *Murcia* Kock.

39. *Murcia rausensis* (Aoki)

1962. *Murcia rausensis* (Aoki),

Material examined : Chamoli dist. : 1 ♀, Mana Village, Badrinath, 4.xi.2004, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand, (Chamoli), Tripura.

Elsewhere : Japan.

Genus *Zetomimus* Hull

1916. *Zetomimus* Hull, *New Castle Trans. Nat. Hist. Soc.*, **4** : 395.

40. *Zetomimus* sp.

Material examined : Chamoli dist. : 1 ♀, Badrinath, 4.xi.2004, from moss, coll. A.K. Sanyal.

Remarks : The single damaged specimen could not be identified upto species level. The genus is already recorded from Andhra Pradesh.

Family PUNCTORIBATIDAE Thor, 1937
Genus *Pelopsis* Hull

1911. *Pelopsis* Hull, *Journ. Ent.*, 3 : 504.

41. *Pelopsis* sp.

Material examined : Chamoli dist. : 1 ♀, Mana Village, Badrinath, 4.xi.2004, from soil, coll. A.K. Sanyal.

Remarks : Only one specimen was collected which could not be identified upto species level. The genus is reported for the first time from India.

Family MOCHLOZETIDAE Crandjeon, 1960
Genus *Nesiotizetes* Jacot

1934. *Nesiotizetes* Jacot, *Bull. Bishop Mus. Honolulu*, No. 114 : 229.

42. *Nesiotizetes* sp.

Material examined : Dehradun dist. : 1 ♀, F.R.I. campus, Dehradun, 27.x.2004, from soil, coll. A.K. Sanyal.

Remarks : The single damaged specimen could not be identified upto species level. The genus is reported here for the first time from India.

Family CALOPPIIDAE Balogh, 1960
Genus *Chaunoproctus* Pearce

1906. *Chaunoproctus* Pearce, *Journ. Roy. Micr. Soc.*, 271.

43. *Chaunoproctus minor* (Balogh)

1958. *Chaunoproctus minor* (Balogh), *Rev. Zool. Bot. Aft.*, 58(1-4) : 11.

Diagnosis : Prodorsal setae barbed; lamellar setae longer than rostral setae; sensillus with clavate granulated head; all prodorsal setae except *ta*, *p*₂ and *p*₃ long and barbed.

Material examined : Chamoli dist. : 2 ♀ ♀, Pipolkoti, 1.xi.2004, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Chamoli), Kerala, West Bengal.

Elsewhere : Angola.

Family LIEBSTADIIDAE Balogh, 1984
Genus *Reductobates* Balogh and Mahunka

1966. *Reductobates* Balogh and Mahunka, *Folica ent. Hung.*, N.S. 19 : 566.

44. *Reductobates latiohumeralis* Hammer

1972. *Reductobates latiohumeralis* Hammer, *Biol. Skr. Dan. Vid. Selsk.*, 19(3) : 49.

Diagnosis : Rostrum pointed, rostral setae very thin, distinctly barbed; lamellae narrow; lamellar setae thin, barbed; interlamellar setae thin, barbed; pseudostigmata hidden below the anterior border of pteromorphae, pseudostigmatic organ a short club set with minute bristles; no suture between propodosoma and very broad hysterosoma; ten pairs of short, thin, smooth notogastral setae, *ta* and *te* longer than others; three pairs of areae porosae *A*₁ absent, in front of *Aa* a light spot; two pairs of genital setae; all tarsi monodactylous.

Material examined : Kathgudam dist. : 1 ♀, Kaladhungi, 15.ix.2003, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Kathgudam).

Elsewhere : Tahiti.

Remarks : The genus and species are reported for the first time from India.

Family SCHELORIBATIDAE Grandjean, 1953
Key to the genera of Scheloribatidae

1(2) Legs tridactyle
..... *Scheloribates* Berlese, 1908

2(1) Legs monodactyle
..... *Perscheloribates* Hammer, 1973

Genus *Perscheloribates* Hammer

1973. *Perscheloribates* Hammer, *Biol. Skr. Dan. Vid. Selsk.*, 20(3) : 43.

45. *Perscheloribates (Perscheloribates) albialatus* (Hammer)

1961. *Perscheloribates (P.) albialatus* (Hammer), *Biol. Skr. Dan. Vid. Selsk.*, 13(1) : 94.

Diagnosis : Rostral and lamellar setae barbed; interlamellar setae smooth; sensillus with short, round, disc-shaped head set with fine scales; no setae on notogaster; chitinous pores on notogaster; genital setae four pairs.

Material examined : Dehradun dist. : 1 ♀, Mussouri, Kollukhet, 28.x.2004, from soil, coll. A.K. Sanyal; Chamoli dist. : 12 ♀ ♀, Gopeswar, 29-31.x.2004, from soil, coll. A.K. Sanyal, 18 ♀ ♀, Badrinath, 4.xi.2004, from soil and moss, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Dehradun, Chamoli), Arunachal Pradesh, Gujarat, Meghalaya, Mizoram, Rajasthan, Sikkim, West Bengal.

Elsewhere : Peru.

Genus *Scheloribates* Berlese

1908. *Scheloribates* Berlese, *Redia*, 5 : 2.

Key to the species of *Scheloribates*

- 1(2) Hysterosoma as broad as long, lamellar setae as thick as rostral setae; sensillus with long slender stalk and spear-shaped head, directed outwards and backwards
..... *huancayensis* Hammer, 1961
- 2(1) Hysterosoma longer than broad; sensillus not spear-shaped
- 3(4) Sensillus with clavate head; rostral setae on apophyses *parvus* Pletzen, 1963
- 4(3) Sensillus with lanceolate head; rostral setae not on apophyses
..... *thermophilus* Hammer, 1961

46. *Scheloribates huancayensis* Hammer

1961. *Scheloribates huancayensis* Hammer, *Biol. Skr. Dan. Vid. Selsk.*, 13(1) : 94.

Diagnosis : Prodorsal setae long, distinctly feathered, about one and half times longer than their mutual distance; sensillus very slender, with narrowly spear-shaped head, pointed at the tip, set with short bristles in four longitudinal rows; notogastral setae absent, instead chitinous pores present.

Material examined : Almora dist. : 1 ♀, Kossi river area, 2.ix.2003, from soil, coll. A.K. Sanyal, 4 ♀ ♀, 2 kms from Almora F.R.H., 2.ix.2003, from soil, coll. A.K. Sanyal, 11 ♀ ♀, Binsar, 3.ix.2003, from soil and litter, coll. A.K. Sanyal, 7 ♀ ♀, Chaubatia, 6.ix.2003, from soil under palm free, coll. A.K. Sanyal; Bageswar dist. : 18 ♀ ♀, Baijanath, 9.ix.2003, from soil, coll. A.K. Sanyal; Pithoragarh dist. : 2 ♀ ♀, Jeolcote, 12.ix.2003, from soil, coll. A.K. Sanyal; Dehradun dist. : 1 ♀, F.R.I. Campus, Dehradun 27.x.2004, from soil, coll. A.K. Sanyal, 2 ♀ ♀, Mussouri, Kempty falls, 28.x.2004, from soil, coll. A.K. Sanyal; Chamoli dist. : 3 ♀ ♀, P.W.D. Rest House campus, Gopeswar, 31.x.2004, from soil coll. A.K. Sanyal; Uttarkashi, dist. : 2 ♀ ♀,

Kaulagarh, 31.iii.2006, from soil, coll. A.K. Sanyal, 2 ♀ ♀, Tilodh, 7.ix.2006, from soil, coll. A.K. Sanyal, 2 ♀ ♀, Kharga village, 8.iv.2006 from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Almora, Bageswar, Pithoragarh, Dehradun, Chamoli, Uttarkashi), Assam, Andhra Pradesh, Meghalaya, Sikkim, Tripura, West Bengal.

Elsewhere : Panama, Peru.

47. *Scheloribates (Scheloribates) parvus* Pletzen

1963. *Scheloribates parvus* Pletzen, *Acarologia*, 5(4) : 701.

Diagnosis : All prodorsal setae barbed; sensillus with short stalk and clavate head beset with distinct setae; *ad*₃ nearly parallel with *iad*, genital setae 4 pairs, legs tridactylous.

Material examined : Almora dist. : 1 ♀, Kossi village, 2.ix.2003, from soil, coll. A.K. Sanyal, 8 ♀ ♀, Binsar, 3.ix.2003, from soil, coll. A.K. Sanyal; Bageswar dist. : 18 ♀ ♀, Someswar, 10.ix.2003, from soil, coll. A.K. Sanyal; Dehradun dist. : 1 ♀, Mussoouri, 28.x.2004, from soil, coll. A.K. Sanyal; Chamoli dist. : 3 ♀ ♀, 2 kms from Gopeswar, 30.x.2004, from soil, coll. A.K. Sanyal, 4 ♀ ♀, P.W.D. Rest House campus, Gopeswar, 31.x.2004, from soil, coll. A.K. Sanyal, 1 ♀, Baitarani, 31.x.2004, from soil, coll. A.K. Sanyal, 3 ♀ ♀, Josimath, 1.xi.2004, from soil, coll. A.K. Sanyal, 10 ♀ ♀, Pipolkoti, 1.xi.2004, from soil, coll. A.K. Sanyal, 6 ♀ ♀, 15 km from Gobindaghat, 4.xi.2004, from soil, coll. A.K. Sanyal; Dehradun dist. : 5 ♀ ♀, Mussouri, 31.iii.2006, from soil, coll. A.K. Sanyal, 2 ♀ ♀, Kaulagarh, Dehradun, 1.iv.2006, from soil, coll. A.K. Sanyal; Uttarkashi dist. : 4 ♀ ♀, Chamba, I.C.F.R.E. campus, 4.iv.2006, from soil, coll. B.J. Sarkar.

Distribution : India : Uttarakhand (Almora, Bageswar, Dehradun, Chamoli, Uttarkashi), Andhra Pradesh, Assam, Arunachal Pradesh, Meghalaya, Mizoram, West Bengal.

Elsewhere : South Africa.

48. *Scheloribates thermophilus* Hammer

1961. *Scheloribates thermophilus* Hammer, *Biol. Skr. Dan. Vid. Selsk.*, 13(1) : 95.

Diagnosis : All prodorsal setae barbed; rostral setae about twice as long as their mutual distance;

lamellar setae thick, unusually short, slightly longer than their mutual distance; inter lamellar setae thick; sensillus slender with lanceolate head; notogastral setae minute; all tarsi tridactylous.

Material examined : Almora dist. : 3 ♀ ♀, Kossi village, 2.ix.2003, from soil in paddy field, coll. A.K. Sanyal, 2 ♀ ♀, Binsar, 3.ix.2003, from soil and litter, coll. A.K. Sanyal; Pithoragarh dist. : 25 ♀ ♀, Jeolcote, from soil, coll. A.K. Sanyal; Chamoli dist. : 4 ♀ ♀, Kollukhet, 28.x.2004, from soil, coll. A.K. Sanyal, 3 ♀ ♀, Teendhara, 29.x.2004, from soil, coll. A.K. Sanyal; Dehradun dist. : 2 ♀ ♀, Mussouri, Kempty falls, 1.iv.2006, from soil, coll. B.J. Sarkar; Uttarkashi dist. : 9 ♀ ♀, Tilodh village, 7.iv.2006, from soil, coll. B.J. Sarkar, 4 ♀ ♀, Pata village, 8.iv.2006, from soil, coll. B.J. Sarkar.

Distribution : India : Uttarakhand (Almora, Pithoragarh, Chamoli, Dehradun, Uttarkashi), Andhra Pradesh, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Rajasthan, Sikkim, West Bengal.

Elsewhere : Fiji Island, Peru.

Family PROTORIBATIDAE Balogh and Balogh Key to the genera of Protoribatidae

- 1(2) Genital plates with 5 pairs of setae; 14 pairs of notogastral setae
Setoxylobates Balogh and Mahunka, 1967
- 2(1) Genital plates with 4 pairs of setae; 10 pairs of notogastral setae
.....*Protoribates* Berlese, 1908

Genus *Protoribates* (*Protoribates*) Berlese

1908. *Protoribates* (*Protoribates*) Berlese, *Redia*, 5 : 1.

49. *Protoribates* (*Protoribates*) *capucinus* Berlese

1908. *Protoribates* (*Protoribates*) *capucinus* Berlese, *Redia*, 5 : 2.

Diagnosis : Rostal setae small, fine, smooth; lamella broad in the middle, tip pointed; lamellar setae smaller than rostral setae, smooth; interlamellar setae long, fine, barbed unilaterally; sensillus with long stalk, head swollen, barbed outwardly; notogastral setae eleven pairs, minute.

Material examined : Pithoragarh dist. : 2 ♀ ♀, Marya Garden, 2.ix.2003, from soil, coll. A.K.

Sanyal, 1 ♀, Jeolcote, 12.ix.2003, from soil, coll. A.K. Sanyal; Chamoli dist. : 1 ♀, Gangotri, 30.x.2004, from soil, coll. A.K. Sanyal; Hardwar dist. : 4 ♀ ♀, Mayapur, 9.xi.2005, from soil, coll. A.K. Sanyal; Tehri Garwal dist. : 3 ♀ ♀, Bharat Ashram, Rishikesh, 6.xi.2004, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Pithoragarh, Chamoli, Hardwar, Tehri Garwal), Andhra Pradesh, Rajasthan, Tripura, West Bengal.

Elsewhere : Africa (Sahara), Bulgaria, Indonesia, Italy, New Zealand, North America, Pakistan, Russia, Samoa, South America, Spain, Tonga Tapu Island, Turkey.

50. *Protoribates* (*Protoribates*) *natalensis* (Pletzen)

1963. *Protoribates* (*P.*) *natalnesis* (Pletzen), *Acarologia*, 5(4) : 700.

Diagnosis : Prodorsal setae short, fine; lamellar and dorsal setae barbed throughout; distal halves of interlamellar setae unilaterally barbed; sensillus very long, with slightly thickened heads, unilaterally barbed on the anterior side; notogastral setae minute; *ad*₃ very small; genital setae five pairs, tarsi monodactylous.

Material examined : Almora dist. : 8 ♀ ♀, 8 km from Almora town, 2.ix.2003, from soil and litter, coll. A.K. Sanyal, 1 ♀, Binsar, 3.ix.2003, from soil and moss, coll. A.K. Sanyal, 8 ♀ ♀, Chambatia, 6.ix.2003, from soil, coll. A.K. Sanyal; Bageswar dist. : 22 ♀ ♀, Someswar, 10.ix.2003, from soil, coll. A.K. Sanyal; Pithoragarh dist. : 3 ♀ ♀, Jeolcote, 12.ix.2003, from soil, coll. A.K. Sanyal; Chamoli dist. : 3 ♀ ♀, Gopeswar, 31.x.2003, from soil, coll. A.K. Sanyal; Tehri Garwal dist. : 1 ♀, Bharat Ashram, Rishikesh, 6.xi.2004, from soil, coll. A.K. Sanyal, 7 ♀ ♀, Ranichori, Khatiyal village, 5.iv.2006, from soil, coll. A.K. Sanyal; Uttarkashi dist. : 2 ♀ ♀, Rana village, 11.iv.2006, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Almora, Bageswar, Pithoragarh, Chamoli, Tehri Garwal, Uttarkashi), Arunachal Pradesh, Mizoram, Sikkim, West Bengal.

Elsewhere : South Africa (Durban).

**51. *Protoribates (Triaungius) seminudus*
Hammer**

1971. *Protoribates (Triaungius) seminudus* (Hammer), *Biol. Skr. Dan. Vid. Selsk.*, 16 : 38.

Diagnosis : Rostral setae unilaterally barbed; lamellar and interlamellar setae also barbed; sensillus with long stalk and lanceolate head, both of which beset with long bristles on outer border; notogastral setae ten pairs represented by pores on the dorsum; ventral setae present; genital setae five pairs.

Material examined : Tehri Garwal dist. : 2 ♀ ♀, Ranichori, Khatiyar village, 5.iv.2006, from soil, coll. B.J. Sarkar.

Distribution : India : Uttarakhand (Tehri Garwal), Arunachal Pradesh, Manipur, Meghalaya, Sikkim, Tripura, West Bengal.

Elsewhere : Fiji Island, Tahiti Island, Tonga Tapu Island.

Genus *Setoxylobates* Balogh and Mahunka

1967. *Setoxylobates* Balogh and Mahunka, *Acta zool. Acad. Sci. Hung.*, 23(1-2) : 59.

**52. *Setoxylobates (Setoxylobates) foveolatus*
Balogh and Mahunka**

1967. *Setoxylobates (S.) foveolatus* Balogh and Mahunka, *Acta zool. Acad. Sci. Hung.*, 13(1-2) : 59.

Diagnosis : Distinct foveolae on prodorsum, pteromorphae, notogaster and ventral plate; rostral setae shorter than lamellar setae, weakly barbed; lamellar setae exceeding beyond rostrum, apical half weakly barbed; interlamellar setae arising anteriorly on dorsosejugal suture, weakly barbed, sensillus reclinate, long, fusiform, acutely terminated, unilaterally barbed; fourteen pairs of notogastral setae, very minute; four pairs of true areae porosae of medium size; genital plate punctate, five pairs of genital setae, epimeral setal formula 3 : 1 : 2 : 2; epimeral region foveolate.

Material examined : Almora dist. : 5 ♀ ♀, Kossi river and surroundings, 2.ix.2003, from soil, coll. A.K. Sanyal, 1 ♀, Binsar, 3.ix.2003, from soil, coll. A.K. Sanyal, 15 ♀ ♀, Chambatia, 6.ix.2003, from soil, coll. A.K. Sanyal; Pithoragarh dist. : 40 ♀ ♀, Jeolcote, 12.ix.2003, from soil, coll. A.K. Sanyal; Chamoli dist. : 3 ♀ ♀, P.W.D. Rest House campus,

Gopeswar, 31.x.2004, from soil, coll. A.K. Sanyal; Hardwar dist. : 6 ♀ ♀, Mayapur, 9.xi.2004, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Almora, Pithoragarh, Chamoli, Hardwar), Sikkim, Tripura, West Bengal.

Elsewhere : Vietnam.

Family HAPLOZETIDAE Grandjean, 1936

Key to the genera of Haplozetidae

- 1(2) Genital plates with 6 pairs of setae; aggenital setae one pair; legs tridactyle
Paraxylobates Balogh and Mahunka, 1969
- 2(1) Genital plates with 5 pairs of setae
- 3(4) Notogaster with 13-14 pairs of setae; legs tridactyle *Peloribates* Berlese, 1908
- 4(3) Notogastral setae hardly visible; legs monodactyle *Indoribates* Jacot, 1929

Genus *Indoribates* Jacot, 1929

1929. *Indoribates* Jacot, *Tsingtao*, 1929 : 1.

53. *Indoribates (Haplozetes)* sp.

Material examined : Chamoli dist. : 2 ♀ ♀, Gangotri, 30.x.2004, from soil, coll. A.K. Sanyal.

Remarks : The specimens could not be identified upto species level due to damaged condition.

Genus *Paraxylobates* Balosh and Mahunka

1969. *Paraxylobates* Balogh and Mahunka, *Acta zool. Acad. Sci. Hung.*, 15 : 20.

54. *Paraxylobates* sp.

Material examined : Dehradun dist. : 1 ♀, F.R.I. campus, 27.x.2004, from soil, coll. A.K. Sanyal; Chamoli dist. : 1 ♀, Gobindaghat, 4.xi.2004, from soil, coll. A.K. Sanyal; Tehri Garwal dist. : 2 ♀ ♀, Pandukeswar, 7.xi.2004, from soil, coll. A.K. Sanyal.

Remarks : The species seems to be new and will be published separately.

Genus *Peloribates* Berlese

1906. *Peloribates* Berlese, *Redia*, 5 : 3.

55. *Peloribates intermedius* Mondal

1984. *Peloribates intermedius* Mondal, *Rec. zool. Surv. India*, 81(3-4) : 153.

Diagnosis : Outwardly unilaterally barbed rostral and lamellar setae; interlamellar setae short, beset with minute bristles; sensillus with club-shaped head set with pseudoscales; notogastral setae 14 pairs, short, stiff, setose; 5 pairs of genital setae.

Material examined : Almora dist. : 1 ♀, Binsar, 3.ix.2003, from moss, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Almora), Andhra Pradesh, Meghalaya, Sikkim, West Bengal.

Family GALUMNIDAE Jacot, 1925
Genus *Galumna* Heyden

1826. *Galumna* Heyden, *Isis oken*, 18 : 611.

Key to the species of *Galumna*

- 1(2) A crenate line runs across the hypostome; sensillus with club-shaped head; *im* curved and directed antero-posteriorly; *gen₁* and *gen₂* placed on the anterior border of genital plate
..... *crenata* Deb and Raychaudhuri, 1975
- 2(1) No crenate line; sensillus with long broad head; *im* straight and placed obliquely; *gen₁*-*gen₃* placed on the anterior border of left part of genital plates
..... *flabellifera orientalis* Aoki, 1965

56. *Galumna crenata* Deb and Raychaudhuri

1975. *Galumna crenata* Deb and Raychaudhuri, *Annot. Zool. Japan*. 48(3) : 167.

Diagnosis : Rostral setae not visible; lamellar and interlamellar setae represented by pits; sensillus club-shaped with short but stout bristles; *ad* guttiform, provided with comma-shaped slit on the inner end; *hy* leaf-like; *Aa* placed obliquely; *im* slightly curved, directed antero-posteriorly; notogastral setae represented by 10 pairs of pits; a crenate line runs across the hypostome, genital setae 6 pairs.

Material examined : Almora dist. : 1 ♀, Kossi river surroundings, 2.ix.2003 from soil, coll. A.K. Sanyal, 1 ♀, Chambatia, 6.ix.2003, from soil and

litter, coll. A.K. Sanyal; Chamoli dist. : 2 ♀ ♀, Josimath, 1.xi.2004, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Almora, Chamoli), Andhra Pradesh, Arunachal Pradesh, Manipur, Meghalaya, Sikkim, West Bengal.

57. *Galumna flabellifera orientalis* Aoki

1965. *Galumna flabellifera orientalis* Aoki, *Nat. Life Southenst Asia*, 4 : 187.

Diagnosis : Rostral and interlamellar setae thin, short; lamellar setae minute; sensillus with long broad head, anterior margin round and beset with spur-like bristles, posterior margin flat, devoid of bristles; *ia* placed obliquely to the longitudinal axis of the body; areae porosae large; *gen₁*-*gen₃* placed on the anterior border of left genital plate; *gen₃* in right genital plate not placed on anterior border.

Material examined : Bageswar dist. : 6 ♀ ♀, Someswar, 10.ix.2003 from soil, coll. A.K. Sanyal; Pithoragarh dist. : 2 ♀ ♀, Jeolcote, 12.ix.2003, from soil, coll. A.K. Sanyal; Dehradun dist. : 1 ♀, Mussouri, Kempty falls, 28.x.2004, from soil, coll. A.K. Sanyal; Hardwar dist. : 1 ♀ Mayapur, 9.xi.2004, from soil, coll. A.K. Sanyal.

Distribution : India : Uttarakhand (Bageswar, Pithoragar, Dehradun, Hardwar), Andhra Pradesh, Manipur, Mizoram, Kerala, Sikkim, West Bengal.

Elsewhere : Thailand.

DISCUSSION

The present work is the first ever attempt on exploration of oribatid mite fauna of Uttarakhand. Altogether 57 species belonging to 50 genera and 33 families have been recorded and listed as new to the state. Of these, one family viz., Amerobelbidae, 7 genera and 12 species are reported here for the first time from India.

It may be noted here that the present work shows that the oribatid fauna of Uttarakhand represents about 15% of the total oribatid species in India.

SUMMARY

The paper contains the report of oribatid mite fauna collected from different districts of

Uttarakhand. A total of 57 species under 50 genera and 33 families have been recorded. All the taxa included here are the first record from the state. Of these, one family, 7 genera and 12 species are listed here as new to India.

The keys to identification of genera and species, important references, diagnostic characters and distribution in India and abroad for each species have been incorporated.

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