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FRESHWATER ROTIFERS FROM DARBHANGA CITY, BIHAR, INDIA.

B. K. SHARMA

Department of Zoology, North-Eastern Hill University, Shillong—793014

SUMITA SHARMA

Eastern Regional Station, Zoological Survey of India, Shillong—793003

and

V. K. DUDANI

Department of Zoology, L. N. Mithila University, Darbhanga—846004

INTRODUCTION

Eventhough the systematic studies on Indian Rotifera were initiated by Anderson (1889), comprehensive regional investigations from many states in this country are still lacking (Sharma & Michael, 1980). Earlier contributions to these organisms from Bihar in Eastern India are much limited (Donner, 1949 ; Nasar, 1973 ; Laal & Nasar, 1977). The present study provides additional information to the rotifer fauna of this state based on the collections from Darbhanga City. Among the examined taxa, five represent new records from India, while 40 are new to Bihar. Some of these important taxa are briefly described and illustrated in this paper, with remarks on their distribution.

MATERIAL AND METHODS

Material for this study was collected, by one of us (VKD), from various ponds, ditches, swamps and puddles in and around Darbhanga City (Lat. 26°10′ N ; Long. 85°57′ E) during February, 1985—March, 1986. The samples were collected with a plankton net and preserved in 5% formalin. Individual taxa were mounted in Polyvinyl alcohol-lactophenol mixture. Illustrations were made with a Leitz-Dialux phase contrast microscope using a drawing tube attachment. All the measurements are given in micrometers (μm). The classification followed in this account is after Koste (1978).

The reference slides of the examined taxa are deposited in Freshwater Biology Laboratory, Department of Zoology, North-Eastern Hill University, Shillong.

LIST OF THE EXAMINED TAXA

Class : ROTIFERA
Subclass : EUROTATORIA
Superorder : MONOGONONTA
Order : PLOIMIDA

Family : BRACHIONIDAE

Anuraeopsis fissa (Gosse, 1851)
Brachionus angularis Gosse, 1851
B. calyciflorus calyciflorus Pallas, 1766
B. calyciflorus anuraeiformis (Brehm, 1909)
B. caudatus personatus (Ahlstrom, 1948)
B. caudatus aculeatus (Hauer, 1937)
B. diversicornis (Daday, 1883)
B. falcatus Zacharias, 1898
B. forficula Wierzejski, 1891
B. forficula minor (Voronkov, 1913)
B. mirabilis (Daday, 1897)
B. patulus (O. F. Müller, 1786)
B. quadridentatus quadridentatus Hermann, 1783
B. quadridentatus melheni (Barrois & Daday, 1894)
Keratella tropica (Apstein, 1907)
Platyias quadricornis (Ehrenberg, 1832)

Family : EUCHLANIDAE

Euchlanis dilatata Ehrenberg, 1832
E. triquetra Ehrenberg, 1838
Dipleuchlanis propatula (Gosse, 1886)
Beauchampiella eudactylota (Gosse, 1886)

Family : EPIPHANIDAE

Epiphanus macrourus (Barrois & Daday, 1894)

Family : MYTILINIDAE

Mytilina ventralis macracantha (Gosse, 1886)

Family : COLURELLIDAE

Colurella uncinata (O. F. Müller, 1773)
Lepadella (Lepadella) patella (O. F. Müller, 1786)

L. (L.) ovalis (O. F. Müller, 1786)
L. (L.) acuminata (Ehrenberg, 1834)
L. (Heterolepadella) heterostyla (Murray, 1913)

Family : LECANIDAE

Lecane (Lecane) curvicornis (Murray, 1913)
L. (L.) leontina (Turner, 1892)
L. (L.) ludwigi (Eckstein, 1883)
L. (L.) luna (O. F. Müller, 1776)
L. (L.) papuana (Murray, 1913)
L. (L.) signifera signifera (Jennings, 1896)
L. (L.) ungulata (Gosse, 1887)
L. (Monostyla) closterocerca (Schmarda, 1859)
L. (M.) bulla (Gosse, 1851)
L. (M.) lunaris (Ehrenberg, 1832)
L. (M.) pyriformis (Daday, 1905)
L. (M.) quadridentata (Ehrenberg, 1832)
L. (M.) thalera (Harring & Myers, 1926)
L. (M.) unguitata (Fadeev, 1925)

Family : TRICHOCERCIDAE

Trichocerca (Trichocerca) bicristata (Gosse, 1887)
T. (T.) rattus carinata (Ehrenberg, 1830)
T. (T.) pusilla (Lauterborn, 1898)
T. (Diurella) similis (Wierzejski, 1893)
T. (D.) weberi Jennings, 1903

Family : NOTOMMATIDAE

Scaridium longicaudum (O. F. Müller, 1786)

Family : SYNCHAETIDAE

Synchaeta cf. *longipes* Gosse, 1887
Polyarthra vulgaris Carlin, 1943

Family : ASPLANCHNIDAE

Asplanchna priodonta Gosse, 1850

Order : GNESIOTROCHA
Suborder : FLOSCULARIACEA

Family : HEXARTHRIDAE

Hexarthra mira (Hudson, 1871)

Family : FILINIIDAE

Filinia longiseta longiseta (Ehrenberg, 1834)
F. longiseta saltator (Gosse, 1886)
F. opoliensis (Zacharias, 1898)
F. terminalis (Plate, 1886)
F. pejleri Hutchinson, 1964

Family : TESTUDINELLIDAE

Testudinella patina (Hermann, 1783)
T. emarginula (Stenroos, 1898)

Superorder : DIGONONTA
Order : BDELLOIDEA

Family : PHILODINIDAE

Rotaria neptunia (Ehrenberg, 1832)

Observations

1. TAXA NEW TO INDIA

Mytilina ventralis macracantha (Gosse, 1886)
(Fig. 1)

1886. *Salpina macracantha* Gosse, In : Hudson & Gosse, Rotifera, vol, 2, p. 82, pl. 22, fig. 6.
1912. *Mytilina macracantha* (Gosse) : Sache, Süsswasserfauna Deutchlands, vol. 4, p. 152 Fig. 307.
1978. *Mytilina ventralis* var. *macracantha* (Gosse) : Koste, ROTATORIA : Die Rädertiere Mitteleuropas, p. 147, T. 42 : 6a-b ; Michelangelli *et al.*, 1979/80, Cah. O.R.S.T.O.M. ser. Hydrobiol., vol. Xiii, p. 56, Fig. 10.

Material Examined : 10 parthenogenetic females.

Lorica relatively elongated and dorsal keel ending into distinct posterior spines. Lorica length 210-236 ; postero-dorsal spines 36-42 ; postero-ventral spines 90-100. It is a little known taxon. Besides its original description by Gosse (*loc. cit.*), it has been documented only from Venezuela (Michelangelli *et al.*, 1979/80).

Trichocerca bicristata (Gosse, 1887)
(Figs. 2-4)

1887. *Mastigocerca bicristata* Gosse, Jour. Roy. Micr. Soc., p. 2, pl. 1, fig.5.
1903. *Rattulus bicristatus* Jennings, Bull. U. S. Fish. Comm., (1902), vol. 22, p. 330, pl. 9, figs. 77-80.
1913. *Trichocerca bicristata* (Gosse) : Harring, Bull. U. S. Natl. Mus., vol. 81, p. 102 ; Kutikova, 1970, Rotifer Fauna of USSR, p. 316, Fig. 313.
1978. *Trichocerca bicristata bicristata* (Gosse) : Koste, ROTATORIA : Die Rädertiere Mitteleuropas, p. 395, T. 137 : 3 a-m.

Material Examined : 18 parthenogenetic females.

Characterised by two distinct keels extending upto 2/3 or even more the length of its dorsum. Left toe longer than body ; right toe reduced. Trophi diagnostic. Body length (including foot) 260-272 ; left toe 280-290 ; right toe 28-32 ; trophi 79-82.

It is a cosmopolitan species and designated as an indicator of oligosaprobic waters (Koste, 1978).

Trichocerca rattus carinata (Ehrenberg, 1830)
(Fig. 5)

1830. *Mastigocerca carinata* Ehrenberg, Abh. Akad. Wiss. Berlin, p. 66.
1877. *Monocerca carinata* Eyferth, Mikr. Süsswasserbew., p. 52. Fig. 87.
1890. *Acanthodactylus carinatus* Tessin, Arch. Naturg. Mecklenburg, vol. 43, p. 156, pl. II, fig. 15.
1903. *Rattulus carinatus* Jennings, Bull. U. S. Fish. Comm., (1902), vol. 22, p. 332, pl. XI, figs. 95-97.
1913. *Trichocerca cristata* Harring, Bull. U. S. Natl. Mus , vol. 81, p. 102.
1923. *Rattulus cristatus* Hofstein, Zool. Bdr., vol. 4, p. 865.
1939. *Trichocerca carinata* (Ehrenberg) : Meuche, Arch. Hydrobiol., vol. 34, p. 408.
1970. *Trichcerca rattus carinata* (Ehrenberg) : Kutikova, Rotifer Fauna USSR, p. 319, Fig. 321.
1978. *Trichocerca rattus* f. *carinata* (Ehrenberg) : Koste, ROTATORIA : Die Rädertiere Mitteleuropas, p. 398, T. 137a : 7, 139 : 1a-d.

Material Examined : 12 parthenogenetic females.

Differentiated from typical *T. rattus* in having clearly high dorsal keel and broader anterior body-opening. Body length 135-138 ; left toe 158-164 ; maximum width 74-76 ; anterior width 40-42.

Apparently cosmopolitan in its distribution and is reported to co-occur with typical specimens (Koste, 1978). However, in the material from Darbhanga, typical *T rattus* was not observed.

Synchaeta cf. **longipes** (Gosse, 1887)
(Fig. 6)

1887. *Synchaeta longipes* Gosse, Jour. Royal Micro. Soc., p. 5, pl. 2, fig. 15 ; Harring, 1913, Bull. U. S. Natl. Mus., vol. 81, p. 98 ; Koste, 1978, ROTATORIA : Die Rädertiere Mitteleuropas, p. 423, T. 151 : 1a-c.

Material Examined : 2 parthenogenetic females.

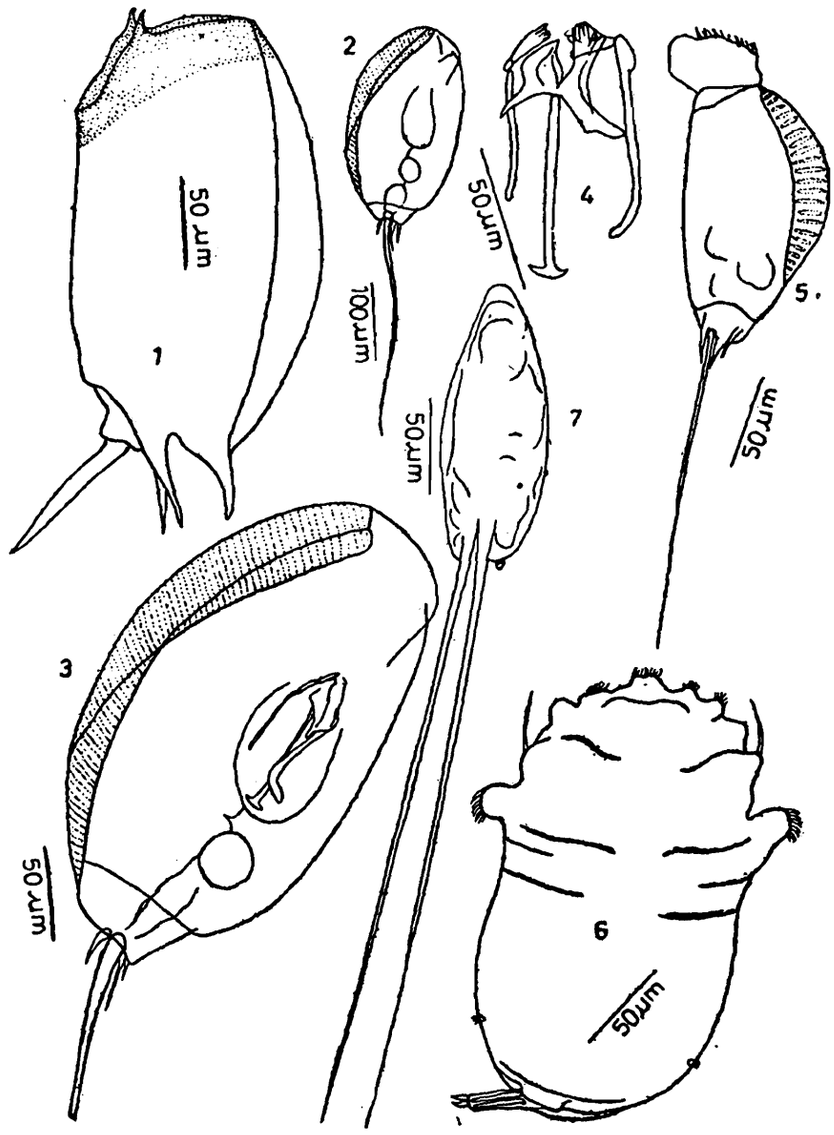
The specimens noticed in this study are broadly identical with *S. longipes* in the shape of corona, in general body outline and in having an elongated cylindrical foot. Body length 230-234 ; maximum width 128-130 ; foot 32-34 ; toes 6-8.

This warm-stenothermic species is reported so far only from Europe, Asia, North America and South America.

Filinia longiseta saltator (Gosse, 1886)

(Fig. 7)

1886. *Pedetus saltator* Gosse, In : Hudson & Gosse, Rotifera, vol. 2, p. 8, figs. 13, 16.
1953. *Filinia longiseta* var. *acaudata* Hauer, Arch. Hydrobiol., vol. 48, p. 166, Abb. 8, a-b.
1975. *Filinia longiseta* f. *saltator* (Gosse) : Pourriot, Cah. O.R.S.T.O.M. ser. Hydrobiol., vol. 9, p. 89, fig. 5.
1978. *Filinia longiseta* var. *saltator* (Gosse) : Koste, ROTATORIA : Die Rädertiere Mitteleuropas, p. 571, T. 217 : 1g-h, Abb. 59a-b.



Figs. 1-7. *Mytilina ventralis macracantha* (Gosse) : Fig. 1, lateral view ;
Trichocerca bicristata (Gosse) : Fig. 2, lateral view (left side), Fig. 3, body (enlarged), Fig. 4, Trophi ;
Trichocerca rattus carinata (Ehrenberg) : Fig. 5, lateral view (right side) ;
Synchaeta cf. *longipes* Gosse : Fig. 6, dorsal view ;
Filinia longiseta saltator (Gosse) : Fig. 7, dorsal view.

Material Examined : 15 parthenogenetic females.

Body cylindrical and elongated ; anterior setae longer, posterior seta lacking. Body length 138-156 ; maximum width 58-68 ; anterior setae 336-340.

This is another little known and interesting rotifer previously reported from South America, Antilles and West Africa. The present specimens were longest and had longer setae those examined so far by Pourriot (1975), Koste (1978) and Coussement & Dumont (1980).

2. OTHER RARE AND INTERESTING TAXA :

Brachionus mirabilis Daday, 1897

(Fig. 8)

1897. *Brachionus mirabilis* Daday, Math. Term. Ert., vol. 15, p. 140, fig. 8 ; Harring, 1913, Bull. U. S. Natl. Mus , vol. 81, p. 22 ; Ahlstrom, 1940, Bull. Amer. Mus. Nat. Hist., vol. 77, p. 167, pl. XI, figs. 5-8.

1978. *Brachionus quadridentatus mirabilis* (Daday) ; Koste, ROTATORIA : Die Rädertiere Mitteleuropas, p. 75, T. 11 : 5a-d ; Koste & Shiel, 1987, Invertebr. Taxon., vol. 7, p. 980, figs. 12, 16 : 3.

Material Examined : One parthenogentic female.

Charcterised by its long postero-ventral spines, directed at an angle of 45°. This brachionid is known to be distributed in Africa, South & Central America, Neu-Guinea, Thailand, India, Malaysia and Singapore. Its occurrence in India is restricted to West Bengal (Sharma, 1979a) and Assam (Sharma, 1980). The presently examined specimen is smaller than previously documented Indian material.

Epiphanes macrourus (Barrois & Daday, 1894)

(Fig. 9)

1894. *Notops macrourus* Barrois & Daday, Math Term. Ert., vol 12, p. 226, tab. VII, figs. 7, 16.

1896. *Brachionus mollis* Hempel, Bull. Illinois State Lab. Nat. Hist., vol. 4, p. 312, pl. XXIV, figs. 7, 8.

1930. *Brachionus pala* f. *nova* Wesenberg-Lund, Mem. Acad. Roy. Soc. Letts., Denmark, vol. 9, ser. II (1), p. 116, pl. vi, fig. 2.

1932. *Notops mollis* De Beauchamp, Linn. Soc. J. Zool., vol. 38, p. 256, text fig. A-D.

1938. *Epiphanes macrourus* (Barrois & Daday) : Ahlstrom, J. Elisha Mitchel Sci. Soc., vol. 54, p. 96 ; Koste, 1978, ROTATORIA : Die Rädertiere Mitteleuropas, p. 59, T, 3 : 1a-k, T. 5 : 1a-d.

Material Examined : 12 parthenogenetic females.

Identical with the description given by Koste (1978). This is a little known species among Indian Rotifers and has been reported from Meghalaya (Patil, 1978) and Delhi (Sarma, 1988).

Euchlanis triquetra Ehrenberg, 1838

(Figs. 10 & 11)

1838. *Euchlanis triquetra* Ehrenberg, Infusionsth., p. 461, pl. 57, fig. 8 ; Harring, 1913, Bull U. S. Natl. Mus., vol. 81, p. 47 ; Kutikova, 1970, Rotifer Fauna of USSR, p. 574, Fig. 903 ; Koste, 1978, ROTATORIA : Die Rädertiere Mitteleuropas, p. 142, T. 38 : 5.

1854. *Euchlanis hyolina* Leydig, Zeitschr. Wiss. Zool., vol. 6, p. 60.

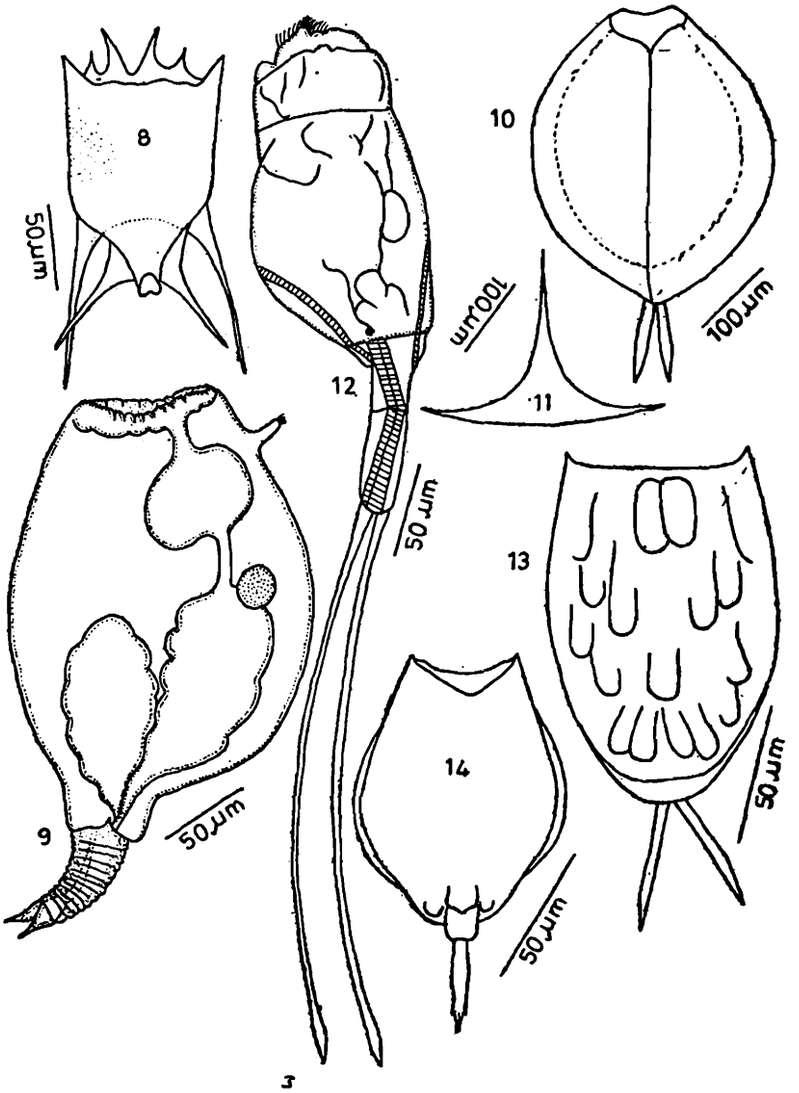
1854. *Euchlanis unisetata* Leydig, Zeitschr. Wiss. Zool., vol. 6, p. 61, pl. 4, fig. 45.

1921. *Euchlanis pellucida* Harring, Rept. Canadian Arctic Exped. 1913-1918, vol. 8, p. 6. pl. 2.

1934. *Dapidia carinata* Carlin-Nilson, Ark. Zool., vol. 26A, p. 6, fig. 2.

1934. *Dapidia lata* Carlin-Nllson, Ark. Zool., vol. 26A, p. 7, fig. 3.

1955. *Euchlanis triquetra pterigoidea* Grese, In : Notizen Zur Fauna u. Flora Sibiriens, vol. 18, p. 60, pl. 15, 19 (in russian).



Figs. 8-14. *Brachionus mirabilis* Daday : Fig. 8, ventral view ;
Epiphanes macrourus (Barrois & Daday) : Fig. 9, lateral view (contracted) ;
Euchlanis triquetra Ehrenberg : Fig. 10, dorsal view, Fig. 11, cross-section ;
Beauchampiella eudactylota (Gosse) Fig. 12, lateral view ;
Lecane (*Lecane*) *signifera signifera* (Jennings) : Fig. 13, dorsal view ;
Lecane (*Monostyla*) *thalera* (Harring & Myers) : Fig. 14, ventral view.

Material Examined : 4 parthenogenetic females.

This euchlanid is characterised by its strong median keel, with sharply concave sides. This cosmopolitan species is so far reported in India only from Orissa (Sharma, 1987a).

Beauchampiella eudactylota (Gosse, 1886)

(Fig. 12)

1886. *Scaridium eudactylota* Gosse, In : Hudson & Gosse, Rotifera, vol. 2 p. 74, pl. XXI, fig. 4.

1929/33. *Beauchmpiella eudactylota* (Gosse) : Remane, Rotatoria, In : Bronns und Ordnungen des tierriechs, vol. 4, p. 107.

1927. *Eudactylota eudactylota* (Gosse) : Manfredi, Memoria, ser. B. vol. 1, p. 8, 29 ; Kutikova, 1970, Rotifer Fauna of USSR, p. 578, Fig, 906.

1965. *Manfredium eudactylota* (Gosse) : Arora, Hydrobiologia, vol. 26, p. 454.

1978. *Beauchampiella eudactylota eudactylota* (Gosse) : Koste, 1978, ROTATORIA : Die Rädertiere Mitteleuropas, p. 134, Abb11a : 1a-f.

Material Examined : 7 partheongentic females.

Body transparent, pear-shaped and second foot-segment longer ; toes long and distally dilated. This species was reported in India from Madhya Pradesh (Arora, 1965 as *Manfredium eudactylota*) and Andhra Pradesh (Dhanapathi, 1974 as *B. eudactylotum*).

Lecane (Lecane) signifera signifera (Jennings, 1896)

(Fig. 13)

1896. *Distyla signifera* Jennings, Bull. Michigan Fish. Comm , No. 6, p. 92, figs. 1, 2.

1913. *Cathypna signifera* (Jennings) : Murray, J. Roy. Micr. Soc., p. 552, pl. 23, fig. 13,

1913. *Lecane signifera* (Jennings) : Harring, Bull. U.S, Natl. Mus., vol. 81, p. 62 ; Harring & Myers, 1926, Trans. Wisc. Acad. Sci. Arts & Letters, vol. 22, p. 333, pl. XIII, figs. 3, 4.

1978. *Lecane signifera signifera* (Jennings) : Koste, ROTATORIA : Die Rädertiere Mitteleuropas, p. 209, T. 69 : 1a-b, 2c ; Sharma, 1987, Rev. Hydrobiol. trop., vol. 20, p, 103, fig. 7.

Material Examined : 5 parthenogenetic females.

Lorica oblong, relatively broad anteriorly and with small spines at external angles ; dorsal plate with characteristic pattern of surface markings.

It is a cosmopolitan lecanid which was rare in the examined material and documented in this country only from Meghalaya State (Sharma, 1987b).

Lecane (Monostyla) thalera (Harring & Myers, 1926)

(Fig. 14)

1926. *Monostyla thalera* Harring & Myers, Trans. Wisc. Acad. Sci. Arts & Letters, vol. 22, p. 394, pl. XXXIX, figs. 3, 4.

1936. *Monostyla conspicua* Hauer, Zool. Anz., vol. 115, p, 78, Abb. 2.

1957. *Lecane* (*Monostyla*) *thalera* (Harring & Myers) : Voigt, ROTATORIA, 2. 236, Taf. 43, fig. 98 ; Kutikova, 1970, Rotifer Fauna of USSR, p. 474, Fig. 670 ; Sharma, 1978, Hydrobiologia, vol. 58, p. 151, figs. 62 & 63.

1968. *Monostyla paradecipiens* Nayar, Hydrobiologia, vol. 31, p. 180, Figs. 20 & 21.

1978, *Lecane* (*Monostyla*) *lamellata thalera* (Harring & Myers) : Koste ROTATORIA : Die Rädertiere Mitteleuropas, p. 254, T. 83 : 5a-b, 7a-b.

Material Examined : One parthenogenetic female.

The specimen observed in this study is identical with the figures given by Koste (1978) except for its smaller toe. It is distributed in Eastern Europe, North America, India and Ceylon ; known in India from Madras (Hauer, 1936), Rajasthan (Nayar, 1968) and West Bengal (Sharma, 1978).

Trichocerca pusilla (Lauterborn, 1898)

(Fig. 15)

1898. *Mastigocerca pusilla* Lauterborn, Biol. Zbl., vol. 18, p. 175.

1903. *Rattulus pusillus* Jennings, Bull. U. S. Fish. Comm., (1902), vol. 22, p. 339, pl. 9, figs. 81-85.

1913. *Trichocerca pusilla* (Jennings) : Harring, Bull. U.S. Natl. Mus., vol. 81, p. 104 (considered *M. pusilla* Lauterborn to be *nomen nudum*).

1970. *Trichocerca pusilla* (Lauterborn) : Kutikova, Rotifer Fauna of USSR, p. 323, Fig. 329 ; Koste, 1978, ROTATORIA : Die Rädertiere Mitteleuropas, p. 401, T. 140 : 1a-f, 4.

Material Examined : 3 parthenogenetic females.

This small species was rare in the examined material from Darbhanga. It has been recently reported from Delhi (Sarma, 1988) and also examined by one of the authors (BKS) from Orissa and some States in North-Eastern India.

Trichocerca weberi Jennings, 1903

(Figs. 16 & 17)

1903. *Diurella weberi* Jennings, (1902), Bull. U. S. Fish. Comm., vol. 22, p. 309, pl. I, figs. 11-14, pl. XIII, figs. 116, 117,

1898. *Coelopus porcellus* Weber, Rev. Sussie Zool., vol. 5, p. 512, pl. 20, figs. 2-4 (in part) ; Hilgendorf, 1903, Proc. New Zealand Inst. Wellington, vol. 35, p. 269.

1903. *Rattulus unicornuta* Hilgendorf, Proc. New Zealand Inst. Wellington, vol. 35, p. 303.

1950. *Trichocerca weberi* (Jennings) : Donner, Zool. Anz., vol. 145, p. 140, Abb. 2 ; Koste, 1978, ROTATORIA : Die Rädertiere Mitteleuropas, p. 387, T. 134 : 3a-h,

Material Examined : 6 parthenogenetic females.

It is a cosmopolitan and variable species. The only earlier Indian report (Edmondson & Hutchinson, 1934) gave no description or illustration to enable comparison. However, Bihar specimens resembled with those from Ontario (Chengalath & Mulamoottil, 1975).

Filinia pejleri Hutchinson, 1964

(Fig. 18)

1964. *Filinia pejleri* Hutchinson, Postilla, vol. 81, p. 1-8, Fig. 1a ; Koste, 1978, ROTATORIA : Die Rädertiere Mitteleuropas, p. 575, T. 217 f3 ; Sharma, 1979b, Hydrobiologia, vol. 65, p. 46, Pl. III, Fig. 10 ; Sharma, 1987a, State Fauna of Orissa, Part I, p. 337, Fig. 41.

Material Examined : 5 parthenogenetic females.

An interesting tropical and subtropical species ; it is characterised by its fusiform body and terminally located broad-based posterior seta. *F. pejleri* has so far been documented in this country from Rajasthan (Nayar, 1968), West Bengal (Sharma, 1979b) and Assam (Sharma, 1980).

3. TAXA INDICATING INFRASPECIFIC VARIATIONS :

Brachionus calyciflorus Pallas, 1766

1766. *Brachionus calyciflorus* Pallas, Elench. Zooph., p. 93 ; Harring, 1913, Bull. U. S. Natl. Mus., vol. 81, p. 19 ; Koste, 1978, ROTATORIA : Die Rädertiere Mitteleuropas, p. 87.
1803. *Brachionus longispinus* Schrank, Fauna Bioca, vol. 3, p. 133.
1826. *Brachionus bicornis* Bory de St. Vincent, Class. Anim. Micr., p. 83.
1886. *Brachionus decipiens* Plate, Jen, Zeitschr. Naturw., vol. 19, p. 73.

Material Examined : 15 parthenogenetic females.

It is represented by *B. calyciflorus calyciflorus* (Fig. 19) and *B. calyciflorus anuraeiformis* (Fig. 20) ; these are differentiated by the relative length of their median occipital spines.

Brachionus caudatus Barrois & Daday, 1894

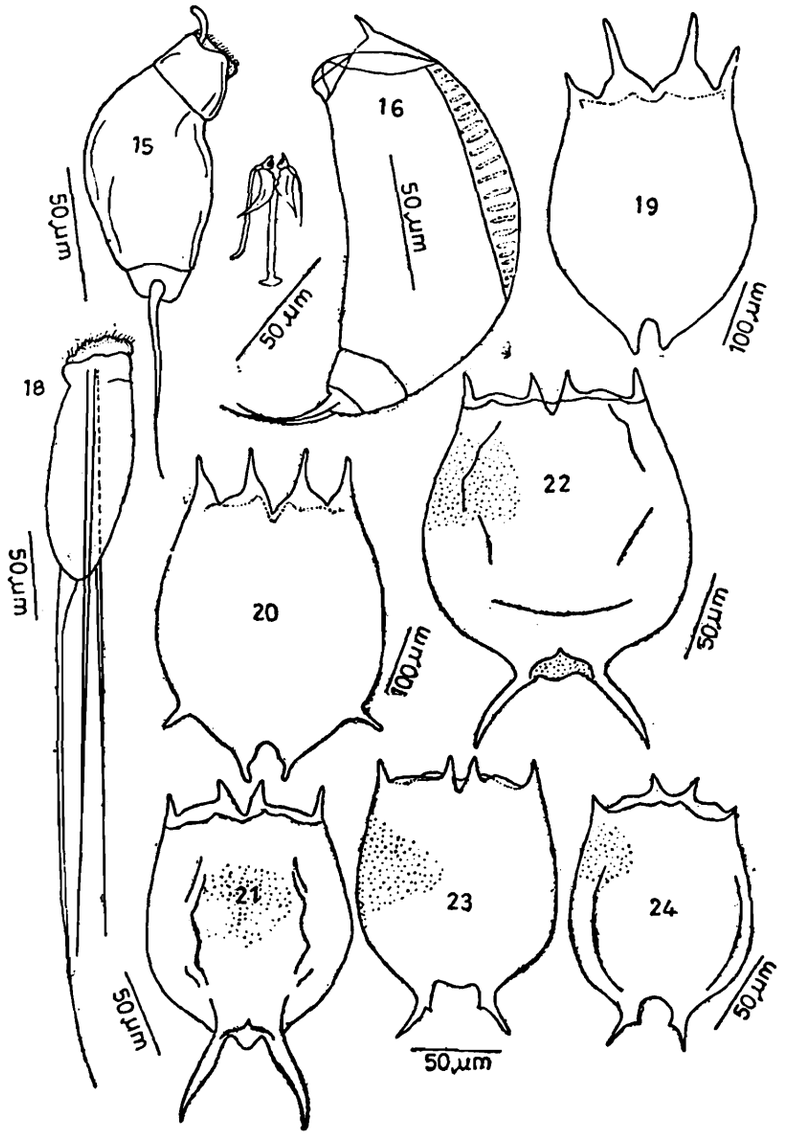
1894. *Brachionus caudatus* Barrois & Daday, Math. Termz. Ert., vol. XII, p. 232, pl. VII, figs. 9, 10, 13 ; Ahlstrom, 1940, Bull. Amer. Mus. Nat. Hist., vol, 77, p. 155 ; Koste, 1978, ROTATORIA : Die Rädertiere Mitteleuropas, p. 94.

Material Examined : 20 parthenogenetic females.

Includes subtropical *B. caudatus personatus* (Figs. 21 & 22) and the pantropical *B. caudatus aculeatus* (Figs. 23 & 24). The former is identified by the size of its occipital spines and by its divergent posterior spines. The latter is notable for the presence of spur-like outgrowths on the inner side near base of each posterior spine.

Brachionus forficula Wierzjeski, 1891

1891. *Brachionus forficula* Wierzjeski, Bull. Soc. Zool. France, vol. 16, p. 51, fiig. 3 ; Ahlstrom, 1940, Bull. Amer. Mus. Nat. Hist., vol. 77. p. 162 ; Koste, 1978, ROTATORIA : Die Rädertiere Mitteleuropas, p. 95.



Figs. 15-24. *Trichocerca pusilla* (Lauterborn) : Fig. 15, lateral view (left side) ;
Trichocerca weberi Jennings : Fig. 16, lateral view (right side), Fig. 17, Trophi ;
Filinia pejleri Hutchinson : Fig. 18, lateral view ;
Brachionus calyciflorus calyciflorus Pallas : Fig. 19, dorsal view ;
Brachionus calyciflorus anuraeiformis (Brehm) Fig. 20, dorsal view ;
Brachionus caudatus personatus (Ahlstrom) : Figs. 21 & 22, ventral views ;
Brachionus caudatus aculeatus (Hauer) : Fig. 23, dorsal view, Fig. 24, ventral view.

Material Examined : 35 parthenogenetic females.

It is widely distributed in tropics and subtropics. This brachionid is presently represented by typical specimens exhibiting variable morphotypes (Figs. 25-27) and *B. forficula minor* (Figs. 28 & 29), which is notably much smaller than the former.

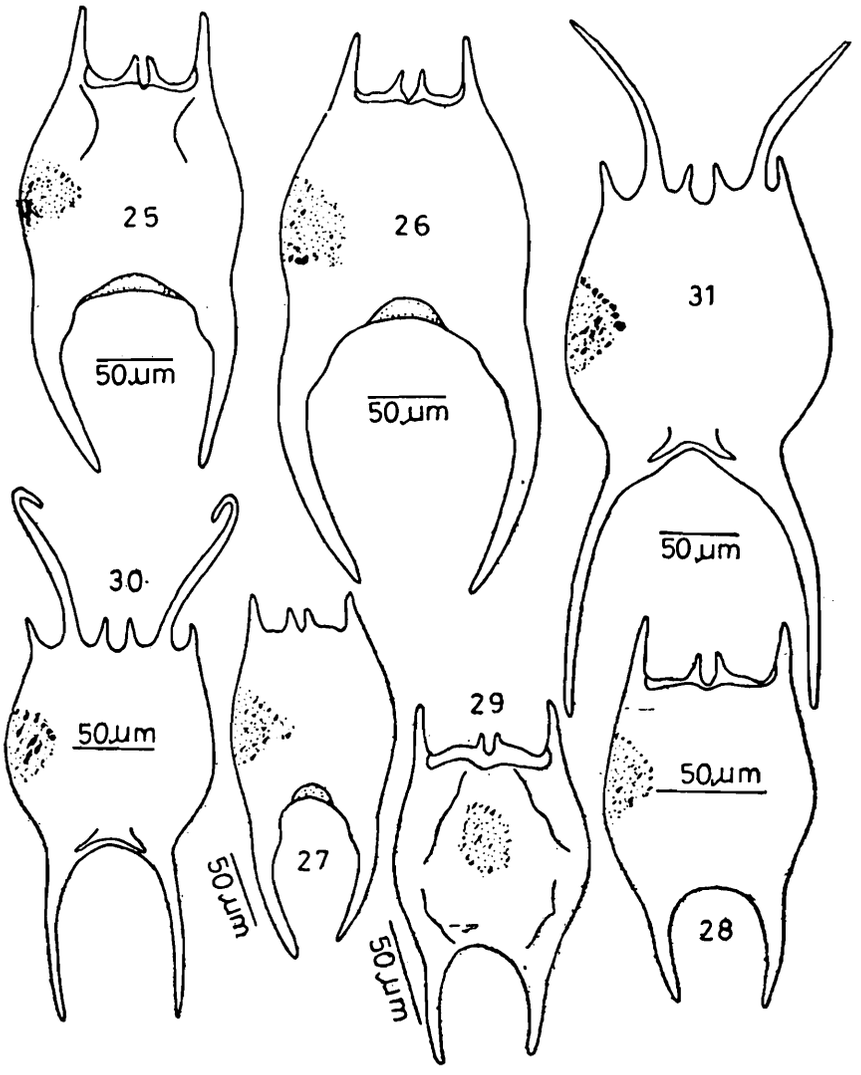
Brachionus falcatus Zacharias, 1898

1898. *Brachionus falcatus*, Forschungsbr. Biol. Stn. Plön, vol. 6, p, 133, pl. 1, fig. 4 ; Ahlstrom, 1940, Bull. Amer. Mus. Nat. Hist., vol. 77, p. 164 ; Koste & Shiel, 1983, Trans. R. Soc. S. Aust. vol. 107, p. 123-114.

1911. *Brachionus dichotomus* Shephard, Proc. Roy. Soc. Victoria, n. ser. vol. 24, p. 57, pl. 22, figs. 3, 4.

Material Examined : 40 parthenogenetic females.

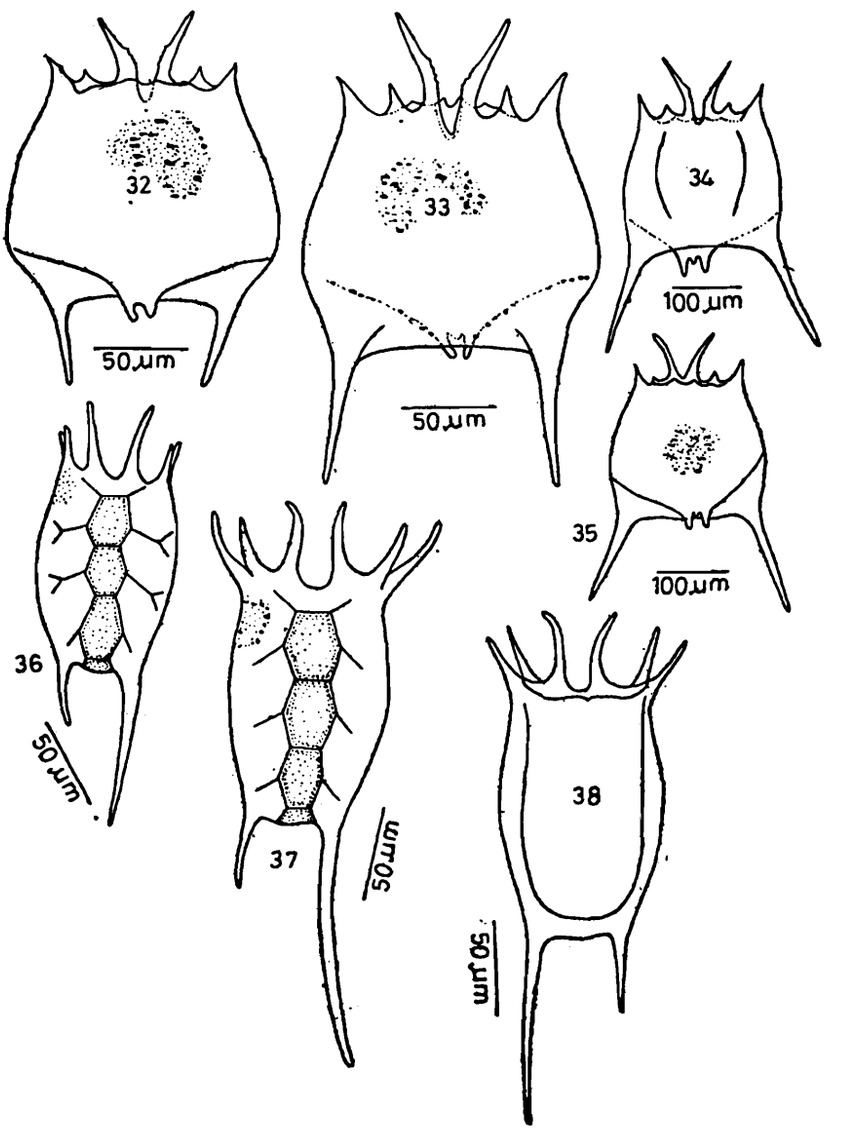
It is one of the variable species of *Brachionus* (Ahlstrom, 1940). Variations in this species were also observed by Chengalath *et al.*, (1973) from Sri Lanka and Koste & Shiel (1980, 83) from Australia. The previous Indian specimens resembled with slender S. E. Asian form (cf. Koste & Shiel, 1983, Fig. 3, f). However, the material from Darbhanga included two morphotypes (Figs. 30 & 31) which are identical with the material from Sri Lanka (Chengalath *et al.*, *loc. cit.* : Figs. 24 and 25).



Figs. 25-31. *Brachionus forficula* Wierzejski : Figs. 25 & 26, ventral views, Fig. 27, dorsal view ;
Brachionus forficula minor (Voronkov) : Figs. 28 & 29, ventral views ;
Brachionus falcatus Zacharias : Figs. 30 & 31, dorsal views (morphotypes).

Barchionus quadridentatus Hermann, 1783

1783. *Brachionus quadridentatus* Hermann, Naturforscher Halle, vol. 19, p. 47, Taf. II, fig. 9; Ahlstrom, 1940, Bull. Amer, Mus. Nat. Hist., vol. 77, p. 165, pl. XI, fig. 9, pl. XII, figs. 1-9, pl. XIII, fig. 3.
1786. *Brachionus bakeri* Müller, Anim. Infus., p. 359, Taf. XLVII, fig. 13, Taf. L, figs. 22, 23.
1803. *Brachionus quadricornis* Schrank, Fauna Boica Landshut, vol. 3, p. 134.
1803. *Brachionus bicornis* Schrank, Fauna Boica Landshut, vol. 3, p. 135.
1826. *Brachionus octodentatus* Bory de St. Vincent, Class. Anim. Micr., p. 83.
1830. *Noteus bakeri* Ehrenberg, Abh. Akad. Wiss. Berlin, p. 48.
1854. *Brachionus latissimus* Schmarda, Akad, Wiss, Wien, Math.-Naturw Klasse, vol. 7, p. 18, pl. IV, fig. 4.
1859. *Brachionus chilensis* Schmarda, Neue Wirbell. Thiere, vol. 1, p. 64, pl. XV, fig. 136.
1859. *Brachinous ancylognathus* Schmarda, Neue Wirbell. Thiere, vol. 1, p. 65, pl. XV, fig. 137.
1859. *Brachionus polyceros* Schmarda, Neue Wirbell. Thiere, vol. 1, p. 65, pl. XV, fig. 138.
1859. *Brachionus pustulatus* Schmarda, Nue Wirbell. Thiere, vol. 1, p. 65, pl. XV, fig. 139.
1889. *Brachionus longipes* Anderson, J. Asiat. Soc. Beng., vol. 58, p. 357, pl. XXI, fig. 12.
1892. *Brachionns tuberculus* Turner, Bull. Scil, Lab. Denison Univ., Granville, Ohio, vol. 6, p, 65, pl. I, fig. 6.
1894. *Brachionns entzii* France, Terms. Fuzt, Budapest, vol. 17, p. 166, pl. V, figs. 1, 2,



Figs. 32-38. *Brachionus quadridentatus quadridentatus* Hermann : Fig. 32, ventral view, Fig. 33, dorsal view ; *Brachionus quadridentatus melheni* (Barrois & Daday) : Fig. 34, dorsal view, Fig. 35, ventral view ; *Keratella tropica* (Apstein) : Figs. 36 & 37, dorsal views, Figs. 38, ventral view.

Material Examined : 15 parthenogenetic females.

Includes typical specimens (Figs. 32 & 33) and *B. quadridentatus melheni* (Figs. 34 & 35). The latter can be differentiated by its large median occipital spines, divergent and widely separated postero-lateral spines and relatively large spines flanking foot-opening.

Keratella tropica (Apstein, 1907)

1907. *Anurea valga* f. *tropica* Apstein, Zool. Jahrb. Syst., vol. 25, p. 210, Fig. F.
1921. *Anurea aculeata* var. *tropica* Tschughnov, Arb. Biol. Wolga Stat., vol. 6, figs. 13-14.
1926. *Keratella quadrata* Spandl, Arch Hydrobiol., vol. 16, fig. 4.
1934. *Keratella valga* f. *tropica* : Edmondson & Hutchinson, Mem. Conn. Acad. Arts Sci., vol. 10, Figs. 4 C-E.
1938. *Keratella quadrata valga* f. *asymmetrica* Ueno, Annot. Zool. Jap., vol. 17, figs. 16-17.
1943. *Keratella tropica* (Apstein) : Ahlstrom, Bull. Amer. Mus. Nat. Hist., vol. 80, p. 451, Pl. 42, Figs. 1-20 ; Berzins, 1955, Ark. Zool., vol. 8, p. 554, Figs. 2-3.

Material Examined : 25 parthenogenetic females.

Besides usual cyclomorphic variations in the length of the posterior spines, the examined material indicated narrow occipital margin (Fig. 36) and divergent occipital spines (Figs. 37 & 38).

REMARKS

Fifty five eurotatorian species (60 taxa) belonging to 15 families and 22 genera are documented in this account. Of these, *Trichocerca bicristata, T. rattus carinata, Mytilina ventralis macracantha Synchaeta* cf. *longipes* and *Filinia longiseta saltator* are new to India, while 40 taxa comprise new records from Bihar. The present study raised the number of known species from this state to 61 as against 24 species reported by earlier workers.

Cosmopolitan taxa comprise a dominant fraction (about 75%) of the studied fauna and a majority of them comprise eurytopic alkaline species. Tropical and subtropical elements are also well represented and these include *Brachionus caudatus personatus, B. caudatus aculeatus, B. diversicornis, B. mirabilis, B. forficula, B. forficula minor, Lecane curvicornis, L. ludwigi, L. leontina, L. papuana* and *Filinia pejleri.* Further, *Brachionus mirabilis, Epiphanes macrourus, Euchlanis triquetra, E. incisa, Beauchampiella eudactylota, Mytilina ventralis macracantha, Lecane signifera signifera, L. thalera, Trichocerca bicristata, T. rattus carinata, T. weberi, Synchaeta* cf. *longipes, Filinia longiseta saltator* and *Testudinella emarginula* are of regional biogeographical importance in Indian Rotifera.

The monogononts form a bulk of the documented species, while bdelloids are very poorly represented (only one species). Planktonic and periphytic elements are well observed. Lecanidae (14 species) and Brachionidae (12 species) are the dominant

families, while Trichocercidae, Filiniidae, Colurellidae and Euchlanidae are also important in this material. The rotifer community of Darbhanga proved to be fairly rich and diversified with regard to the overall generic and specific diversity. The species composition of planktonic taxa is broadly comparable with the adjacent state of West Bengal. However, common alkalophilic species like *Brachionus rubens* and *B. plicatilis* were not observed in the present collections, although they were previously reported from this state.

Horaëlla brehmi was an interesting element described from Bihar (Donner, 1949), but its absence in this study is notable. The dominance of the species of *Lecane*-complex and common occurrence of the various brachionids in general and *Brachionus* spp. in particular imparts a typically tropical character to the rotifer fauna of Darbhanga City.

Summary

This study revealed 55 species (60 taxa) belonging to 22 genera and 15 eurotatorian families. Five taxa are new to India while 40 taxa comprise new records from Bihar, thereby, raising the number of known species from this state to 61 species. Cosmopolitan elements form about 75% of the examined taxa. Tropical and subtropical species are also well represented. The members of the families Lecanidae and Brachionidae constitute an important component of the documented species, exhibiting a broadly tropical character.

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References

Anderson, H. H. 1889. Notes on Indian Rotifera. *J. Asiat. Soc. Beng.*, 58 : 345-358.

Arora, H. C. 1965. Studies on Indian Rotifera—Part VI. On a collection of Rotifers from Nagpur, India with four new species and a new variety. *Hydrobiologia*, 26 : 444-456.

Chengalath, R., Fernando, C. H. & Koste, W. 1973. Rotifera from Sri Lanka (Ceylon) 2. Further studies on the Eurotatoria including new species. *Bull. Fish. Res. Stn. Sri Lanka (Ceylon)*, 24 : 29-62.

Chengalath, R. & Mulamoottil, G. 1975. Littoral Rotifera of Ontario-genus *Trichocerca*. *Can. J. Zool.*, 53 : 1403-1411.

Coussement, M. & Dumont, H. J. 1980. Some peculiar elements in the rotifer fauna of the Atlantic Sahara and of the Atlas Mountains. *Hydrobiologia*, 73 : 249-254,

Dhanapathi, M. V. S. S. S. 1974. Rotifers from Andhra Pradesh, India—I. *Hydrobiologia*, 45 : 357-372.

Donner, J. 1949. *Horaëlla brehmi* nov. gen. nov. spec. ein neues Rädertier aus Indien. *Hydrobiologia*, 2 : 134-140.

Edmondson, W. T. & Hutchinson, G. E. 1934. Report on Rotatoria. Article IX. Yale North Indian Expedition. *Mem. Conn. Acad. Arts Sci.*, 10 : 153-186.

Hauer, J. 1936. Neue Rotatorien aus Indien. I. *Zool. Anz.*, 116 : 77-80.

Hudson, C. T. & Gosse, P. H. 1886. The Rotifers or Wheel-Animalcules, both British and foreign. London, I : I-VI+1-128 ; II : 1-144.

Koste, W. 1978. ROTATORIA. Die Rädertiere Mitteleuropas. Begründet von Max Voigt. Überordnung Monogononta. Gebrüder Borntraeger, Stuttgart.

Koste, W. & Shiel, R. J. 1980. New Rotifera from Australia. *Trans. R. Soc. S. Aust.*, 104 : 133-144.

Koste, W. & Shiel, R. J. 1983. Morphology, systematics and ecology of new monogonont Rotifera (Rotatoria) from the Alligator Rivers region, Northern Territory. *Trans. R. Soc. S. Aust.*, 107 : 109-121.

Laal, A. K, & Nasar, S, A. K. 1977. Rotifer fauna of Bihar, India. *Bangladesh J. Zool.*, 5 : 127-128.

Michelangelli, F., Zoppi De Roa, E & Pourriot, R. 1979/80. Rotiferos de sabanas inundables en Mantecal Edo. Apure, Venezuela. *Cah. O. R. S. T. O. M., ser. Hydrobiol.*, XIII (1-2) : 47-59.

Nasar, S. A. K. 1973. The zooplankton fauna of Bhagalpur : Rotifera. *J. Bhagalpur Univ.*, 6 : 55-62.

Nayar, C. K. G. 1968. Rotifer fauna of Rajasthan. *Hydrobiologia*, 31 : 168-185.

Patil, S. G. 1978. New records of Rotatoria from Northeast India. *Sci. Cult.*. 44 : 279-281.

Pourriot, R. 1975. Rotiferes des Antilles. *Cah. O. R. S. T. O. M.* ser. *Hydrobiol.*, IX (2) : 81-90.

Sarma, S. S. S. 1988. New records of freshwater rotifers (Rotifera) from Indian waters. *Hydrobiologia*, 160 : 263-269.

Sharma, B. K. 1978. Contributions to the rotifer fauna of West Bengal. Part I. Family Lecanidae. *Hydrobiologia*, 57 : 143-153.

Sharma, B. K. 1979a. Rotifers from West Bengal. III. Further studies on the Eurotatoria. *Hydrobiologia*, 64 : 239-250.

Sharma, B. K. 1979b. Rotifers from West Bengal. IV. Further contributions to the Eurotatoria. *Hydrobiologia*, 65 : 39-47.

Sharma, B. K. 1980. New records of eurotatoria from Assam State, India. *Bangladesh J. Zool.*, 8 : 149-150.

Sharma, B. K. 1987a. Rotifera : Eurotatoria : Monogononta (Freshwater). *Fauna of Orissa : State Fauna Series*, 1 : 323-340 (Publ. Zool. Surv. India).

Sharma, B. K. 1987b. The distribution of the Lecanid rotifers (Rotifera : Monogononta : Lecanidae) in North-Eastern India. *Rev. Hydrobiol. trop.*, 20 : 101-105.

Sharma, B. K. & Michael, R. G. 1980. Synopsis of taxonomic studies on Indian Rotatoria. *Hydrobiologia*, 73 : 229-236.