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NOTES ON SOME RARE AND INTERESTING CLADOCERANS (CRUSTACEA : BRANCHIOPODA) FROM MEGHALAYA

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INTRODUCTION

The systematic studies on Freshwater Cladocera of India were initiated by Baird (1860). Since then these micro-crustaceans have been recorded from various localities in different states of the country (Sharma and Michael, 1987; Michael and Sharma, 1988; Sharma, 1991). Investigations on Cladoceran fauna of Meghalaya began in the last quarter of twentieth century and the related contributions are those of Patil (1976), Biswas (1980), Michael and Sharma (1988) and Sharma and Sharma (1999).

While working on zooplankton samples collected from the state of Meghalaya, the author came across seven interesting species of Cladocera including two new records from India, four new records from North-Eastern region and one new record from Meghalaya. The present report provides descriptions and illustrations of the recorded cladocerans and remarks are made on their distribution.

MATERIALS AND METHODS

The present observations are based on plankton samples collected during 2003-2005, and also those collected earlier (during 1988-1990) for the "State Fauna of Meghalaya : Zooplankton Survey", from localities in different districts of Meghalaya state. The examined material include samples deposited in Freshwater Biology Laboratory, Department of Zoology, North-Eastern Hill University, Shillong and those in the holdings of the Eastern Regional Station, Zoological Survey of India, Shillong.

The examined samples were collected with an nylobolt plankton net (No. 25) and preserved in 5% formalin. Various cladocerans and their disarticulated appendages were mounted in Polyvinyl

alcohol-lectophenol mixture. The details of head pores and their arrangements in the Chydorids were studied following the technique given by Megard (1965). Various taxa were identified following Smirnov (1971, 1996), Michael and Sharma (1988) and Korovchinsky (1992). Drawings were made with Leitz-Dialux phase contrast microscope using a drawing-tube attachment and the measurements were indicated in millimeters (mm).

LIST OF THE EXAMINED TAXA

Super class CRUSTACEA
 Class BRANCHIOPODA
 Super order CLADOCERA (*s. str.*)
 Order CTENOPODA
 Family SIDIDAE

1. *Diaphanosoma volzi* Stingelin, 1905**

Order ANOMOPODA
 Family CHYDORIDAE
 Subfamily CHYDORINAE

2. *Alonella clathratula* Sars, 1896**

Subfamily ALONINAE

3. *Alona guttata tuberculata* Kurz, 1875*
 4. *A. macronyx* Daday, 1898**
 5. *A. monacantha tridentata* (Stingelin, 1905)***
 6. *Camptocercus uncinatus* Smirnov, 1971*
 7. *Graptoleberis testudinaria* (Fischer, 1851)**

*New records from India, **New records from N. E. region, ***New record from Meghalaya.

TAXONOMIC NOTES

Diaphanosoma volzi Stingelin, 1905
 (Figs. 1-3)

1905. *Diaphanosoma sarsi* var. *volzi* Stingelin, *Zool. Jb. Syst. Okol. Geogr.*, **21**, p. 339, Taf. 11, figs. 6-8.
 1956. *Diaphanosoma aspinosum* Chiang, *Acta Hydrobiol. Sin.* **2**, p. 309-312, Pl. 1, figs. 1-4, Pl. 2, figs. 7-9; Idris & Fernando, 1981, *Hydrobiologia*, **77**, p. 236-237, Figs 5-7.
 1981. *Diaphanosoma volzi* Stingelin : Korovchinsky, *Aust. J. mar. Freshwat. Res.*, **32**, p. 822-825, Figs. 6, 7.

Characters : Body massive and high. Head small, bent down and with convex ventral side. Eye large. Distal segment of antennal exopodite with only seven swimming setae and a long apical sensory seta. Ventral valve margins of carapace inflexed, forming a broad free flap. Postero-ventral and posterior margin of valves without denticles or setules. One large lanceolate dorsal spine near posterior margin of each valve. Postabdomen claw relatively short and massive; with three long basal spines.

Distribution : N. E. India—new record. India-Kerala.

Elsewhere : Tropical and subtropical parts of Australasia and in Africa (Sudan).

Alonella clathratula Sars, 1896

(Figs. 4-6)

1896. *Alonella clathratula* Sars, *Arch. Math. Naturvidensk. Christinia*, **18**, p. 43-45, figs. 7-8; Sharma & Sharma, 2001, *Rec. zool. Surv. India* **99**, p. 37, Figs. 16-19.

Characters : Body relatively more elongated; length : height ratio 1.8. Valves with polygons with longitudinal striations. Antennae and antennules do not reach the tip of rostrum. Valves with blunt indentation at posterior-ventral corner. Labral plate cuneiform and with blunt apex. Postabdomen elongated and with small irregular anal teeth. Claw with two basal spines, the proximal spine smallest.

Differential diagnosis : This species can be differentiated from the closely related *A. excisa* in having more elongated body; valves with polygons and longitudinal striations; posterior margin of valves almost straight and at right angle with the ventral margin.

Distribution : N. E. India—new record, India-Bihar.

Elsewhere : Australian, Ethiopian and Neotropical regions, and Java

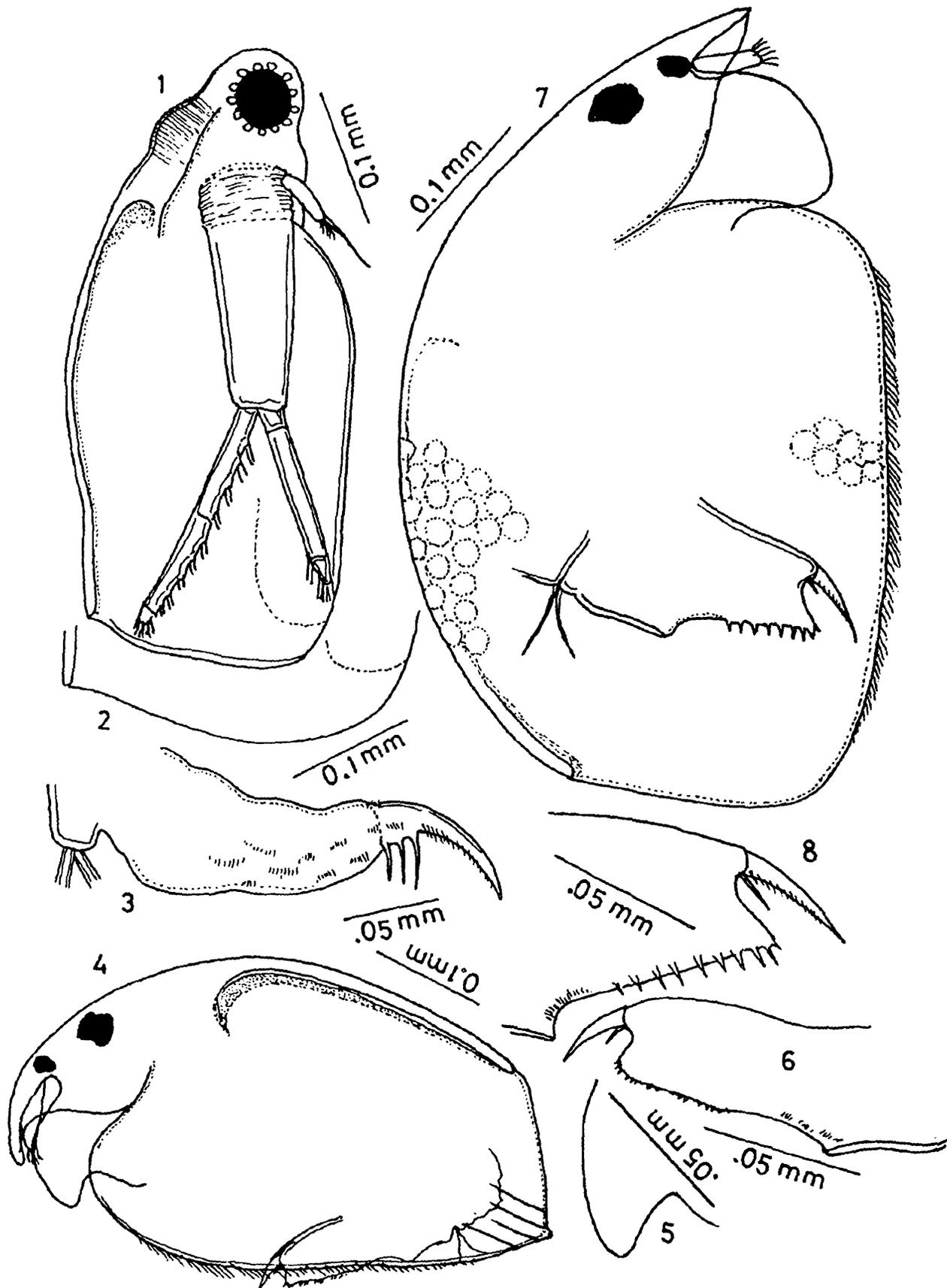
Alona guttata tuberculata Kurz, 1875

(Figs. 7-8)

1875. *Alona tuberculata* Kurz, *Sitz. Ber. Math. Naturw. Kl. K.k. Akad. Wissench*, **70**, p. 51, Plate II, Fig. 1.

1971. *Alona guttata tuberculata* Kurz : Smirnov, *The World Chydorid Fauna*. USSR Acad. Sci. Zool. Inst. Nova ser. **101**, p. 468, Fig. 456, 457.

Characters : Body almost oval with maximum height in the middle. Head shield with rounded posterior margin. Three main head pores with a narrow connection between them. Valves with rounded postero-dorsal and postero-ventral corners. Head shield and valves with rounded pits. Antennules reaching apex of rostrum. Labral plate rounded. Ocellus smaller than eye and situated halfway between eye and apex of rostrum. Postabdomen with projecting pre-anal corner; distal



Figs. 1-8 : *Diaphanosoma volzi* Stingelin; 1. parthenogenetic female, 2. armament on posterior valve margin, 3. postabdomen. *Alonella clathratula* Sars; 4. parthenogenetic female, 5. Labral plate, 6. postabdomen. *Alonella guttata tuberculata* Kurz; 7. parthenogenetic female, 8. postabdomen.

dorsal end pointed and projecting beyond base of claws. Postabdomen with 8-10 anal spines. Claw with a basal spine and setae on its concave margin.

Distribution : India—new record.

Elsewhere : Europe, Columbia and USSR (Kunashir island).

Alona macronyx Daday. 1898

(Figs. 9-11)

1898. *Alona macronyx* Daday, *Termes. Füzetek*, Anhangesheft, **21**, p. 35-37, Fig. 15.

1971. *Indialona macronyx* (Daday) : Smirnov, *The World Chydorid Fauna*. USSR Acad. Sci. Zool Inst. Nova ser. **101**, p. 618-619, Fig. 644, 646.

Characters : Body globular-oval in outline. Valves with lines; postero-ventral corner rounded, postero-dorsal corner distinct. Ventral margin of valves slightly concave and with setae. Antennules not reaching apex of rostrum. Labral plate with convex anterior margin and truncate apex. Postabdomen narrowing distally; with 12-14 large anal denticles. Claw with a basal spine and setae on concave margin.

Distribution : N. E. India—new record. India-Madhya Pradesh.

Elsewhere : The Indo-Malayan region.

Alona monacantha tridentata (Stingelin, 1905)

(Figs. 12-14)

1905. *Alona acuticostata* var. *tridentata* Stingelin, *Zool. Jb. Abt. Syst. Geogr und Biol.*, **21**, p. 349-350, Pl. 12, Figs 18-19

1971. *Alona monacantha tridentata* Stingelin : Smirnov, *The World Chydorid Fauna*. USSR Acad. Sci. Zool. Inst. Nova ser., **101**, p. 440, Fig. 413.

Characters : Body oval in outline, valves marked with longitudinal lines; postero-ventral corner of valves with 2-3 denticles. Rostrum long and blunt, antennules not reaching apex of rostrum. Postabdomen with distinct preanal corner, with about 10 anal spines and groups of lateral setae; distal seta in each group longest and a few distal setae projecting beyond dorsal margin of postabdomen. Claw with a basal spine and setae on concave margin.

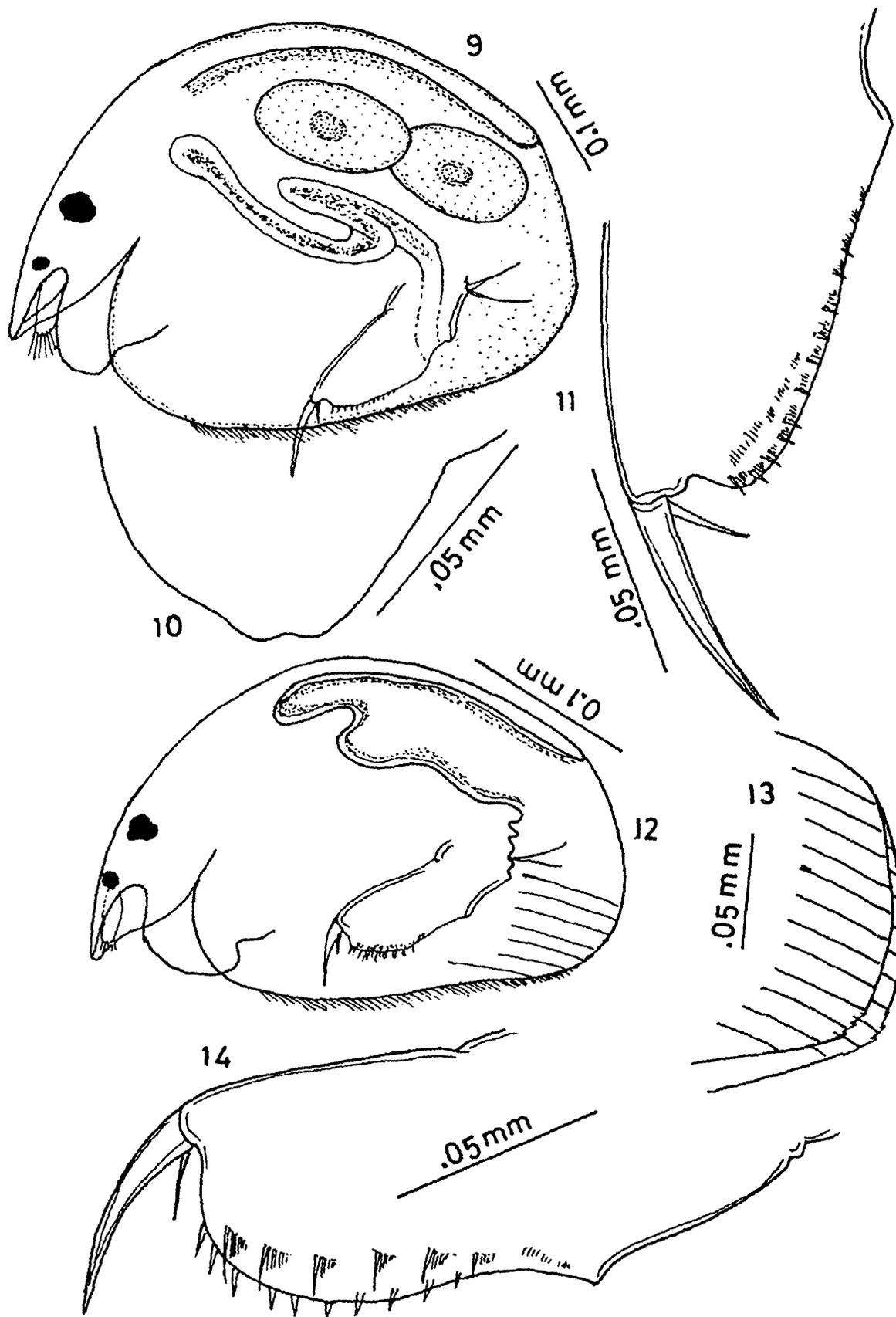
Distribution : N. E. India—Tripura. India-Tamil Nadu and Bihar.

Elsewhere : Thailand.

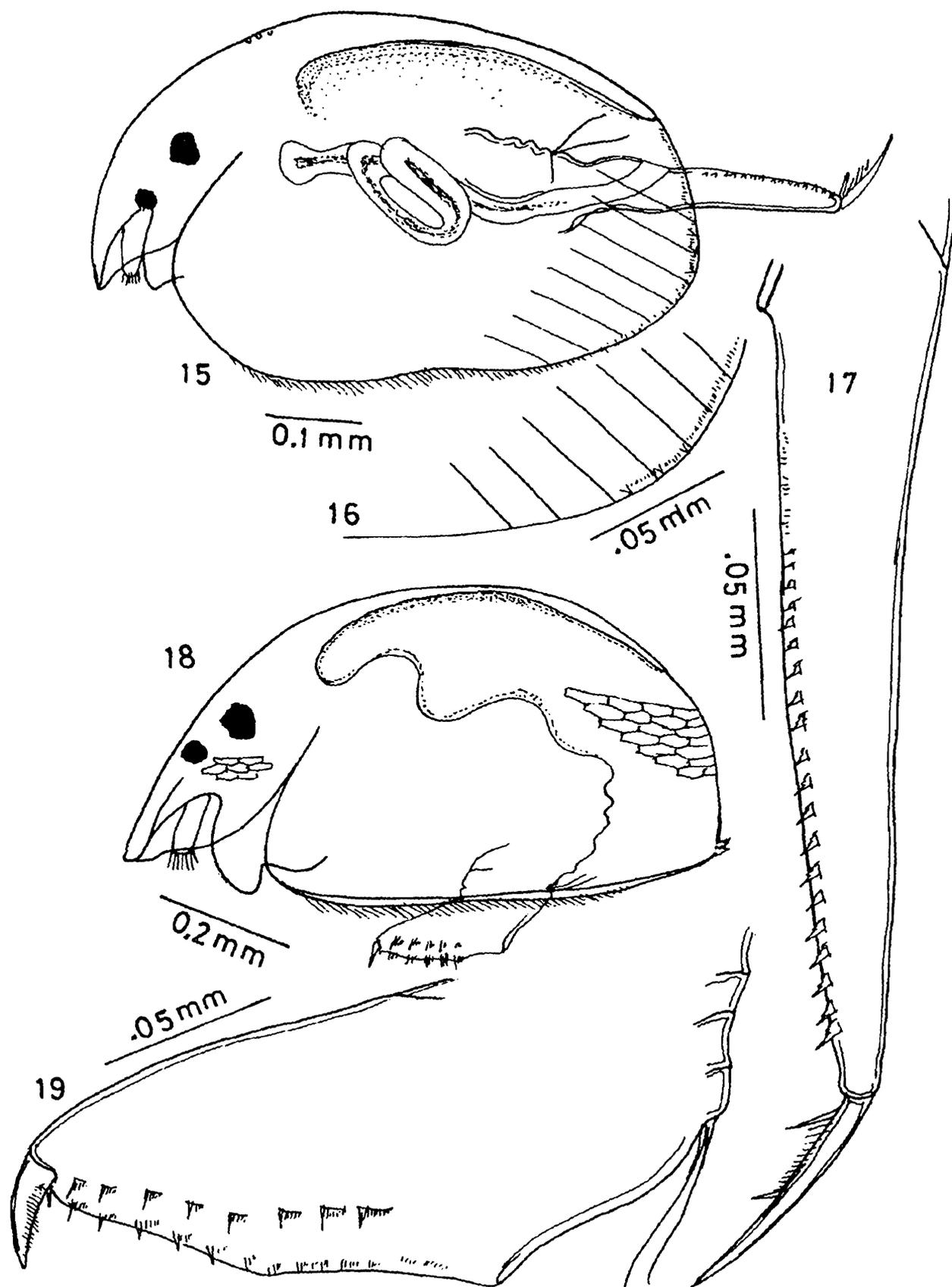
Camptocercus uncinatus Smirnov, 1971

(Figs. 15-17)

1971. *Camptocercus uncinatus* Smirnov, *The World Chydorid Fauna*. USSR Acad. Sci. Zool. Inst. Nova ser., **101**, p. 436-438, Fig. 128, 532; Smirnov, 1998, *Hydrobiologia*, **386**, p. 76-77, Figs. 51-57.



Figs. 9-14 : *Alona macronyx* Daday; 9. parthenogenetic female, 10. Labral plate, 11. postabdomen. *A. monacantha tridentata* (Stingelin); 12. parthenogenetic female, 13. postero-ventral corner of valves, 14. postabdomen.



Figs. 15-19 : *Camptocercus uncinatus* Smirnov; 15. parthenogenetic female, 16. postero-ventral corner of valve, 17. postabdomen. *Graptoleberis testudinaria* (Fischer); 18. parthenogenetic female, 19. postabdomen.

1985. *Camptocercus latikae* Rane, *Crustaceana*, **48**, p. 113-116, Figs. 1-8.

1990. *Camptocercus rectirostris s. lato* : Sharma and Sharma, *Rev. Hydrobiol trop.*, **23**(2), p. 106-110, 112, Figs. 16-22.

Characters : Body elongated, postero-ventral corner of valves with 2-5 denticles distinctly separated by margin of valves. Rostrum acute, directed downwards. Valves with longitudinal lines. Antennules almost reaching apex of rostrum. Postabdomen with 19-20 anal denticles and a row of lateral groups of setae. Claw with setae on concave margin and with a basal spine at some distance from the base of each claw.

Distribution : India new record.

Elsewhere : Romania, S. W. Africa, Israel; Iraq, Ethiopia, Guatemala and Egypt.

Graptoleberis testudinaria (Fischer, 1851)

(Figs. 18-19)

1851. *Lynceus testudinarius* Fischer, *Mem. Acad. Imp. Sci. St. Petersburg*, **6**, p. 191, Pl. IX, Fig. 12.

1896. *Graptoleberis testudinaria* (Fischer) : Sars, *Arch. Math. Naturvidensk. Christiania*, **11**, p. 13.

1971. *Graptoleberis testudinaria testudinaria* (Fischer) : Smirnov, *The World Chydorid Fauna*. USSR Acad. Sci. Zool. Inst. Nova ser., **101**, p. 544-546, Fig. 545-549.

Characters : Body oblong, maximum height in the middle; dorsal margin of body convex, ventral margin nearly straight and with setae decreasing in size. Postero-ventral corner of valves with variable number of teeth. Head shield and valves with tetragonal, pentagonal or hexagonal cells. Rostrum broad and its ventral margin almost at level of ventral margin of valves. Labral plate with rounded apex. Ocellus situated nearer to eye than to apex of rostrum. Postabdomen tapering distally and with distinct preanal corner. Anal margin with row of anal spines increasing in size distally and groups of lateral setae. Claw with small basal spine and seta on concave margin.

Distribution : N. E. India—new record. India-Kashmir, Uttaranchal and Andhra Pradesh.

Elsewhere : Cosmopolitan.

REMARKS

Seven species of Cladocera belonging to two families and five genera are recorded from Meghalaya. *Camptocercus uncinatus* and *Alona guttata tuberculata* are new records from India; the former even represents a new record from the Oriental region. Four species namely *Diaphanosoma volzi*, *Alonella clathratula*, *Alona macronyx* and *Graptoleberis testudinaria* are new to Northeastern India while *Alona monacantha tridentata* is a new record from Meghalaya. All the stated taxa, except *C. uncinatus*, are rare elements in this study. The present report raises the known species richness of Cladocera from Meghalaya to 58 species which, in turn, nearly

equals the highest Indian report of 59 species from the state of Jammu and Kashmir (Prof. B. K. Sharma, personal communication).

Smirnov (1971) described *Camptocercus uncinatus* from Lake Nikolaevskoe (Russia) and it has since been reported from Romania, S.W. Siberia, Israel, Iraq, Ethiopia, Egypt and Guatemala. Smirnov (1998) again provided a detailed description of this species to resolve taxonomic anomalies, anticipated its wider occurrence and remarked on need for re-examination of the reports supposed to be that of *C. australis* in particular. The present record is apparently the first confirmed record of *C. uncinatus* from the Indian subcontinent as well as the Oriental region. *C. latikae* described by Rane (1985) from Madhya Pradesh and subsequently treated as *C. rectirostris s. lato* by Sharma and Sharma (1999) are presently confirmed as cases of mistaken identity of *C. uncinatus* and is, therefore, proposed as its synonyms. This chydorid is relatively widely distributed in the examined samples and has been observed from several localities in East Khasi Hills, West Khasi Hills, Rhi Bhoi, South and West Garo Hills districts of Meghalaya state.

Alona guttata tuberculata is yet another new record from India. This chydorid, treated as a subspecies of *A. guttata* by Smirnov (1971), is distinctly characterized by rounded pits or tubercles on its head shield and valves. It is a rare element in the examined material and has been observed only in one locality each in West Khasi Hills and South Garo Hills districts. It is recorded so far only from Europe, Columbia and USSR as against the nominate *Alona guttata guttata* which apparently shows cosmopolitan distribution.

Diaphanosoma volzi was originally described from Thailand as *D. sarsi* var. *volzi* and was subsequently reported from Indonesia. No further records were published for a long time, until substantiation of its specific status and its conspecificity with *D. aspinosum* described by Chiang (1956) from China. On the other hand, it was treated as a distinct species by Korovchinsky (1981). Korovchinsky (1995), however, re-described *D. volzi* in view of its confusion with *D. sarsi* Richard and *D. celebensis* Stingelin based on populations from Thailand, Southern India, Philippines, Indonesia, Malaysia, Australia and Sudan. In spite of its increasing distributional reports, it is still considered as a rare species (Korovchinsky, 1995). It is known to inhabit shallow vegetated habitats and often co-occurs with *D. sarsi*. The remarks relating to rare nature are also true as only four parthenogenetic females of *D. volzi* are examined presently from a shallow wetland in East Garo Hills district which, in turn, incidentally also occurred with *D. sarsi*. Further, this second report of *D. volzi* from India significantly extends its distributional range to Northeastern region.

Alonella clathratula was described (Sars, 1896) from its type locality in neighborhood of Sydney. It was considered as a subspecies of *A. excisa* by Smirnov (1971) while he later (Smirnov, 1996) resurrected its specific status. *A. clathratula* clearly differs from the closely related *A. excisa* in distinct morphological attributes as well as in distributional ranges. The former species occurs in Australia, the Ethiopian and Neotropical regions and, Java while the later is a cosmopolitan species.

A. clathratula is so far reported from India only from Bihar (Sharma and Sharma, 2001) and the present report, therefore, extends its distributional range to N. E. region. Smirnov and Timms (1983) reported its occurrence in acidic waters in Australia. This species is also presently collected from an acidic wetland (pH : 6.0) from South Garo Hills district of Meghalaya.

Petkovski (1966) described the monotypic genus *Indialona* including *I. ganapati* from Baroda (Gujarat). Smirnov (1971), however, included *Alona macronyx* Daday and *A. globulosa* Daday. A recent redescription of *Indialona*, however, transfers the remaining two species to *Alona*. Among these, *A. macronyx* is so far recorded in India from Madhya Pradesh only; it was described as a new species *Indialona jabalpurensis* by Rane (1983) which was treated as a synonym of *A. macronyx* by Sharma and Sharma (1990). The material examined presently from only one locality of Rhi Bhoi district of Meghalaya, therefore, extends its occurrence to Northeastern India.

The cosmopolitan *Graptoleberis testudinaria* is examined from a shallow wetland in Rhi Bhoi district and located near Meghalaya-Assam border. This species shows disjunct occurrence in India, with earlier records from Kashmir, Uttaranchal and Andhra Pradesh. The present study extends its distributional range to Northeastern region. *Alona monacantha tridentata*, a new record from Meghalaya, has been reported from this region from Tripura (Venkataraman and Das, 2000). The stated species apparently identified as *A. monacantha* in fact actually refers to *A. monacantha tridentata* as per the details given by Michael and Sharma (1988).

SUMMARY

The collections examined from Meghalaya reveal seven species of rare and interesting Cladocera belonging to two families under five genera. Among these, *Camptocercus uncinatus* and *Alona guttata tuberculata* are new records from India; the former in fact represents a new record from the Oriental region. Four other species namely *Diaphanosoma volzi*, *Alonella clathratula*, *Alona macronyx* and *Graptoleberis testudinaria* are new records to N. E. India while *Alona monacantha tridentata* is the sole new record from Meghalaya. This report raises the species richness of Cladocera known from Meghalaya to 58 species. All the recorded taxa, except *C uncinatus*, exhibit rare occurrence in the examined collections.

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