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CLADOCERANS (CRUSTACEA : BRANCHIOPODA) FROM ASSAM AND ADJACENT HILL STATES IN NORTH EAST INDIA

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(With 8 Text-figures)

INTRODUCTION

The present paper deals with material of cladoceran crustacea in the collections of the Eastern Regional Station of the Zoological Survey of India at Shillong in Meghalaya, bulk of the material comes from the Ward Lake, Shillong, a large artificial body of freshwater covering an area of about 300 acres, collected in 1961. In addition to the Ward Lake material, a small collection from nursery tanks of the Fisheries Department at Gauhati and another from Lakhimpur in North Assam were also examined.

As a result of this study 24 species of cladocerans have been identified. The Ward Lake accounts for 16 of these. Of the eight species identified in the collection from Gauhati, four are not represented in the Ward Lake ; similarly four out of five species recorded from Lakhimpur are not present in Ward Lake. Patil (1976) published a list of Cladocera from North East India, listing 17 species from Meghalaya (Ward Lake and other ponds in Shillong) and Manipur. This list includes seven species not present in my collection. Including those listed by Patil, the known cladocera fauna of North East India now comes to 34 species contained in 15 genera spread in five families. Since the localities and habitats explored so far are few, the present tally is far from complete. More extensive surveys should considerably add to the number of cladoceran species known so far from this area.

Our knowledge of the cladocera of Assam and contiguous hill states in North East India is nearly blank. As far as I could ascertain from literature, only two species of cladocerans have been recorded earlier from this region, viz., *Simocephalus vetuloides* Sars by Brehm (1950) from Changchang Pani in Naga Hills (Nagaland) and *Alona costata* Sars by the present author (Biswas, 1965) from Kameng Division in Arunachal Pradesh (former North East Frontier Agency). The present study,

coupled with the list of Patil,[5] considerably enhances our information about the cladocera fauna of this region. Most of the species reported in this paper are new records from this area, and seven species are reported for the first time from India.

In order to facilitate identification, at least upto generic level, key to the identification of genera reported here has been provided.

I am thankful to the Director, Zoological Survey of India for allowing the facilities to examine the collections and to Dr. K. K. Tiwari for help in preparation of this paper.

List of Cladocera species from North East India

		Ward Lake and other places of Shillong	Nursery tank Gauhati	Lakhimpur N. Assam	Manipur
	Sididae				
1.	*Sida crystallina* (Muller)	—	—	+	—
*2.	*Diaphanosoma sarsii* Richard	+	—	—	—
3.	*D. excisum stingelini* Jenkin	+	+	—	—
	Daphnidae				
4.	*Simocephalus serrulatus* (Koch)	+	—	—	—
*5.	*S. expinosus* (Koch)	+	—	+	—
6.	*S. vetulus* (Muller)	—	—	+	—
7.	*S. australiensis* (Dana)	+	—	+	—
**8.	*S. elizabethae* (King)	+	—	+	+
*9.	*Scapholebris kingi* Sars	+	+	—	—
*10.	*Ceriodaphnia rigaudi* Richard	+	+	—	—
11.	*C. cornuta* Sars	+	—	—	—
12.	*Moina micrura* Kurz	—	+	—	—
13.	*M. dubia* Guerne & Richard	—	+	—	—
**14.	*M. brachiata* (Gurine)	+	—	—	—
	Bosminidae				
*15.	*Bosmina longirostris* (Muller)	+	—	—	—
	Macrothricidae				
**16.	*Streblocercus serricaudatus* (Fischer)	—	—	—	+
17.	*Macrothrix chevreuxi* Guerne & Richard	+	—	—	—
**18.	*M. spinosa* King	—	—	—	+
**19.	*Ilyocryptus halyi* Brady	+	—	—	—
	Chydoridae				
*20.	*Camptocercus rectirostris* Schodler	+	—	—	—
*21.	*Acroperus harpae* Baird	+	—	+	—
22.	*Leydigia qudrangularis* (Leydig)	—	+	—	—

		Ward Lake and other places of Shillong	Nursery tank Gauhati	Lakhim-pur N. Assam	Mani-pur
	CHYDORIDAE *(contd.)*				
23.	*L. acanthocercoides* (Fischer)	—	+	—	—
24.	*Alonopsis elongata* Sars	+	—	—	—
25.	*Al. aureola* Doolittle	+	—	—	—
*26.	*Alona affinis* (Leydig)	+	—	—	—
**27.	*A. rectangula* Sars	+	—	—	—
28.	*A. quadrangularis* (Muller)	+	—	—	—
29.	*A. guttata* Sars	+	—	—	—
*30.	*Chydorus sphaericus* (Muller)	+	—	—	—
**31.	*C. denticulatus* Henry	+	—	—	—
**32.	*C. globous* Baird	+	—	—	—

*The species have been also listed by Patil from Shillong and Manipur.

**Species not represented in my collection.

KEY TO THE FAMILIES AND GENERA OF FRESH-WATER CLADOCERA FROM ASSAM AND MEGHALAYA

1.	Body and feet covered by a bivalve shell ; feet in general foliaceous, not plainly jointed. ...	Suborder EUCLADOCERA
2 (6)	Six pairs of feet, all similar, except the last and all foliaceous.	Superfamily SIDOIDEA
3 (7)	Shell of ordinary type. Antenna biramous in female, rami flattened, the dorsal with numerous setae, both lateral and terminal. ...	Family SIDIDAE Baird
4 (5)	Dorsal ramus of antenna 3-jointed, rostrum present.	Genus *Sida* Straus, 1820
5 (4)	Dorsal ramus of antenna 2-jointed, no rostrum, without lateral expansion of antenna and no spine on postabdomen.	Genus *Diaphanosoma* Fischer, 1850
6 (2)	Five or six pairs of feet ; first and second more or less prehensile, others foliaceous ...	Superfamily CHYDOROIDEA
7 (14)	Antennules of female usually small, sometimes rudimentary ; if large never inserted at anterior end of ventral surface of head. Dorsal ramus of antenna 4-jointed, ventral 3-jointed. Intestine simple	Family DAPHNIDAE Straus
8 (11)	Rostrum present.	
9 (10)	Valves transversely straited. Postabdomen broad, with indentation in which anus opens.	Genus *Simocephalus* Schoedler, 1858
10 (9)	Valves obscurely reticulated and with some striae. Posterior and ventral margin straight, the latter extending into a spine.	Genus *Scapholebris* Schoedler, 1858

11 (8) Rostrum absent.

12 (13) Head small and depressed. Antennules small, valves oval and rounded. No postanal extension of postabdomen. ... ... Genus *Ceriodaphnia* Dana, 1853

13 (12) Head large usually extended. Antennules large and freely moveable. Postabdomen with postanal extension. ... ... Genus *Moina* Baird, 1850

14 (16) Six pairs of feet. Antennules of female large, fixed. Intestine simple ; no ceca. ... ... Family BOSMINIDAE Sars

15. Antennules of female approximately parallel to each other, curving backward, fixed to head, olfactory setae on side, usually near base. ... ... Genus *Bosmina*, 1845

16 (22) Antennules of female long, freely movable, usually inserted at anterior end of ventral surface of head. Rami of antennae 3- and 4-jointed. Intestine simple or convoluted. Hepatic ceca usually wanting. Five or six pairs of feet. ... ... Family MACROTHRICIDAE Norman and Brady

17 (19) Intestine convoluted.

18. Antennary setae $\frac{0\text{-}0\text{-}1\text{-}3}{1\text{-}1\text{-}3}$, Animal small and spherical. ... ... Genus *Streblocercus* Sars, 1862

19 (17) Intestine simple.

20 (21) Antennary setae $\frac{0\text{-}0\text{-}0\text{-}3}{1\text{-}1\text{-}3}$. Vertex of head forming sharp angle in front of insertion of antennules. ... ... Genus *Ilyocryptus* Sars, 1861

21 (20) Antennary setae 0-0-1-3, Vertex evenly or abruptly rounded ; barsal seta of 3-jointed ramus stout and strong. ... ... Genus *Macrothrix* Baird, 1843

22 (16) Fornices extended so as to cover antennules in whole or in part, and uniting with the rostrum into a beak, projecting ventrally in front of antennules. ... ... Family CHYDORIDAE Stebbing

23. Anus on dorsal side of postabdomen, whose postanal portion bears denticle. No hepatic ceca. Two summer eggs ; one ephippial egg. Male with strong hook on first foot. ... Subfamily Chydorinae.

24 (36) Posterior margin of valves not greatly less than maximum height. Body elongated, form not spherical.

25 (34) Infero-posteal angle of valves rounded but without teeth.

26 (32) Body compressed ; claws with secondary tooth in middle.

27 (30) Crested on head and valves.

28 29)	Postabdomen narrow, with marginal and lateral denticles.	Genus *Camtocercus* Baird, 1843
29 (28)	Postabdomen broad, without marginal denticle.	Genus *Acroperus* Baird, 1843
30 (27)	No crest.	
31.	Valves not tumid ; postabdomen broad. ...	Genus *Alonopsis* Sars, 1962
32 (26)	Body not greatly compressed ; claws with on basal spine.	
33.	Postabdomen broad with numerous clusters of large spines.	Genus *Ledigia* Kurz, 1874
34 (25)	Infero-posteal angle rounded, with small tooth or teeth.	
35.	Postabdomen not noticably narrow ; distal denticles not conspicuously larger. Basal spine small valves with longitudinal striae.	Genus *Alona* Baird, 1850
36 (24)	Posterior margin of valves considerably less than maximum height. Body spherical and broadly ellipsoidal.	
37.	Postabdomen ordinarily short with prominent pre-anal angle.	Genus *Chydorus* Leach, 1843

SYSTEMATIC ACCOUNT

Family SIDIDAE

1. **Sida crystallina** (O. F. Müller)

(Text-fig. 1 D-H)

1776. *Daphnia crystallina* O. F. Müller, *Zool. Daniae Prodo., Animalium Daniae* etc., Hauniae : 200.

Material : 2 ex, Dumduma, Lakhimpur ; 2. iii. 61, coll. *A. K. Mukherjee.*

Distribution : India : Kashmir, Almost cosmopolitan (Palaearctic, Nearctic and Neotropical and central America).

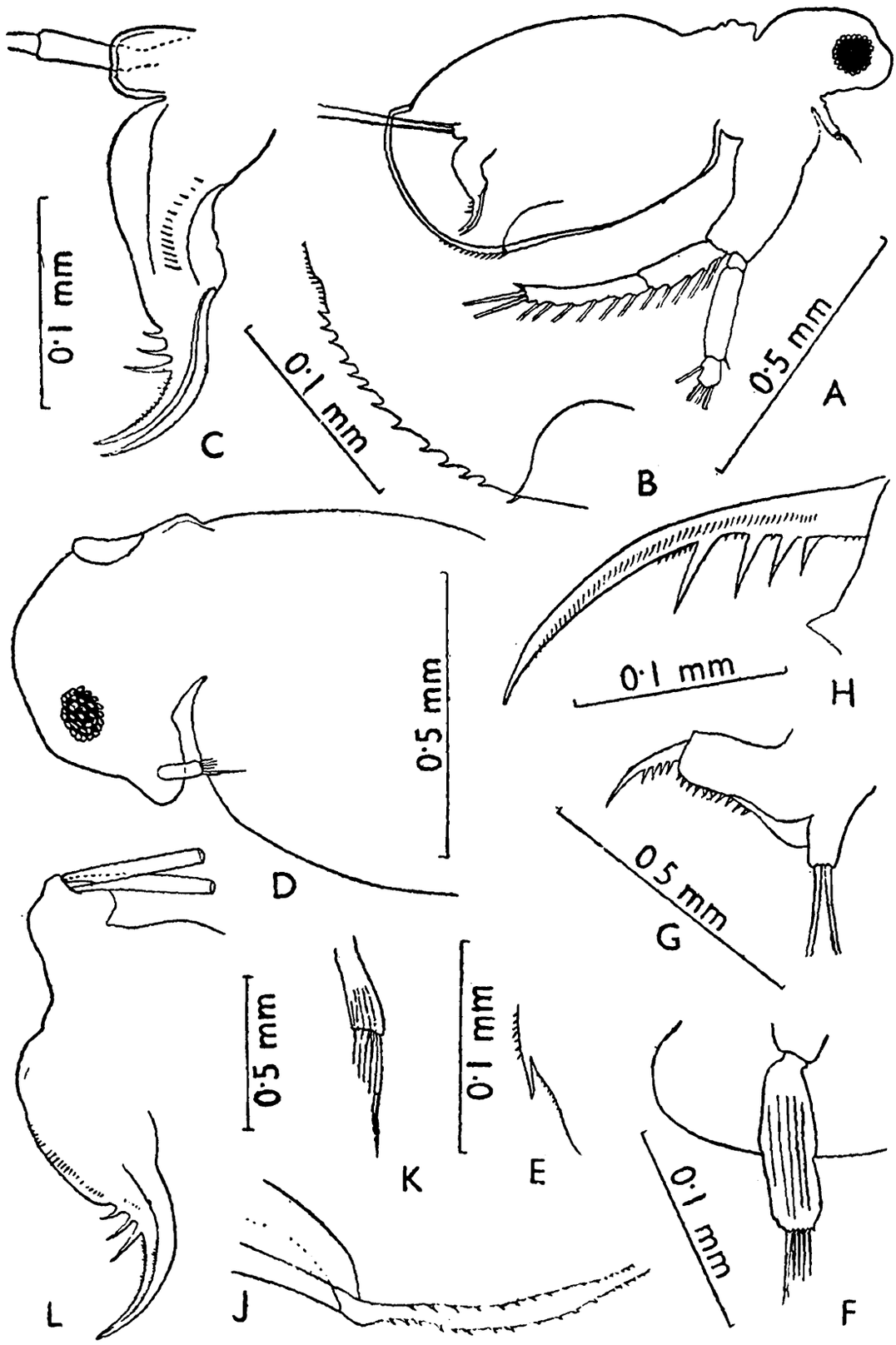
Remarks : Three varieties are usually recognised in this species, i. e., *limnetica* Burkhart, *crystallina* (Müller) and *elongata* (de Geer). The specimens of the collection are referred in the var. *crystallina.*

2. **Diaphanosoma sarsii** Richard

(Text-fig. 1 A-C)

1895. *Diaphanosoma sarsii* Richard, *Annls. Sci. nat.*, Paris, (7) 18 : 365-367, pl. 15, figs. 1 and 8.

Material : 34 ex., Ward Lake, Shillong ; on 8. i. 61, 18. i. 61 and 24. i. 61 ; Coll. *M. Rynth.*



Text-fig. 1. Cladocera from Assam. (A-C) *Diaphanosoma sarsii* Richard, A. lateral view, B. infero-posteal part of the shell, C. post-abdomen ; (D-H) *Sida crystallina* (O. F. Müller), D. lateral view of anterior part, E. infero-posteal part of the shell, F. antennule enlarged, G. post-abdomen, H. claw of the post-abdomen ; (J-L) *Diaphanosoma excisum* Sars var. *stingelini* Jenkin, J. infero-posteal part of the shell, K. antennule, L. postabdomen.

Distribution : India : South India, Chotanagpur and Rajasthan. Also South East Asia (Sumatra, Java, Celebes, Singapore and Bangkok, Africa and South America).

Remarks : This species belongs to the group of species where shell-duplicator is present on the shell and comes very near *D. excisum* Sars but differs from it in the shape of the head and shell duplicator. The specimens have been assigned to the above mentioned species considering the number and size of the marginal spinules as well as the shape of head and shell duplicator.

3. **Diaphanosoma excisum** Sars
(Text-figs. 1 J, K, & 2 H)

1934. *Diaphanosoma excisum* Sars var. *Stingelini* Jenkini, *Ann. Mag. nat. Hist.*, London, (10) **13** : 140-143, figs. 1, 1a.

Material : 19 ex., Ward Lake, Shillong ; 22. 11. 1961, 13. x. 1961, 26. vii. 1961 ; Coll. *Rynth.* 3 ex., Digli Nursery tank, Gauhati ; 24. iv. 1961, Coll. *C. B. Srivastava.*

Distribution : India : Rajasthan. Also Sumatra and Africa (Egypt and Uganda).

Remarks : Three varieties, *excisum* Sars, *stingelini* Jenkin and *longiremis* Ekman, have been recognised in this species. The first variety is recognised by its shorter antennae and absence of hairs on the side of postabdomen but in var. *steingelini* though the antennae are not reaching beyond the posterior border of the shell but recognised by the presence of hairs on the postabdomen. In var. *longiremis* the antennae exceeds the posterior margin of the shell. The species is referable to var. *stingelini.*

Family DAPHNIDAE

4. **Simocephalus serrulatus** (Koch)
(Text-fig. 3 F & 4, C-E)

1841. *Daphnia serrulata* Koch, *Deutschlands crustaceen Myriapoden and Arachniden*, Heft. 35, Tab. 14.

Material : 15 ex., Dumduma, Lakhimpur ; 2. iii. 1961, Coll. *A. K. Mukherjee* ; 3 ex., Ward Lake, Shillong, 9 iv. 1963 and 29. x. 1963, Coll. *M. Rynth.*

Distribution : First record from India. Also Palaearctic, Nearctic, Neotropical, Oriental and Ethiopian (Madagascar).

Remarks : Depending on the shape of head and in the distribution of head spinules which may be present or absent five varieties viz. *serrulatus* Koch, 1841 ; *productifrons* Stingelin, 1905 ; *montenegrinus*

Verescagin, 1912 ; *nudifrons* Delachau, 1919 and *rotundifrons* Brehm, 1934 have been separated. In the collection of Ward Lake there are one typical and two *productifrons* like specimens and fifteen specimens from Dumduma resembling *rotundifrons*.

5. **Simocephalus expinosus** (Koch)

(Text-fig. 4 A, B)

1841. *Daphnia expinosa* Koch, *Deutschland crustacean*, Heft 35, Tab. II.

Material : 1 ex., Lakhimpur, 2. iii. 63, Coll. *A. K. Mukherjee*.

Distribution : First record from India. Also Palaearctic, Nearctic and Tropical (Sumatra, Borneo, Sri Lanka).

Remarks : One specimen from Lakhimpur has been referred in the present species. The species comes very near to *S. congener* Schoedler. The main character of difference between the two species is the number of spines consisting the comb at the base of the claw, 9-12 in the present species where as it varies from 17-30 in the *congener*.

6. **Simocephalus vetulus** (Müller)

1776. *Daphne vetula* Müller, *Zoolog. Daniae Prodromus*, No. 2399: 199.

Material : 1 ex, Lakhimpur, 2. iii. 1961, Coll. *A. K. Mukherjee*.

Distribution : India : Kumaon, Kashmir, Ladakh and Punjab. Also Palaearctic, Nearctic and Neotropical.

Remarks : *S. elizabathae* and *S. vetuloides* are allied to the present species but differs mainly in shape of the body. In *elizabathae* the hind part of the valve is turned into a median protuberance and in *vetuloides* the dorso-posterior hump is very much prominent. Some variation have been recorded in this species based on which three varieties have been recognised viz. *aegypticus* Richard, *spinosulus* Stingelini and *gebhardti* Ponyi.

7. **Simocephalus australiensis** (Dana)

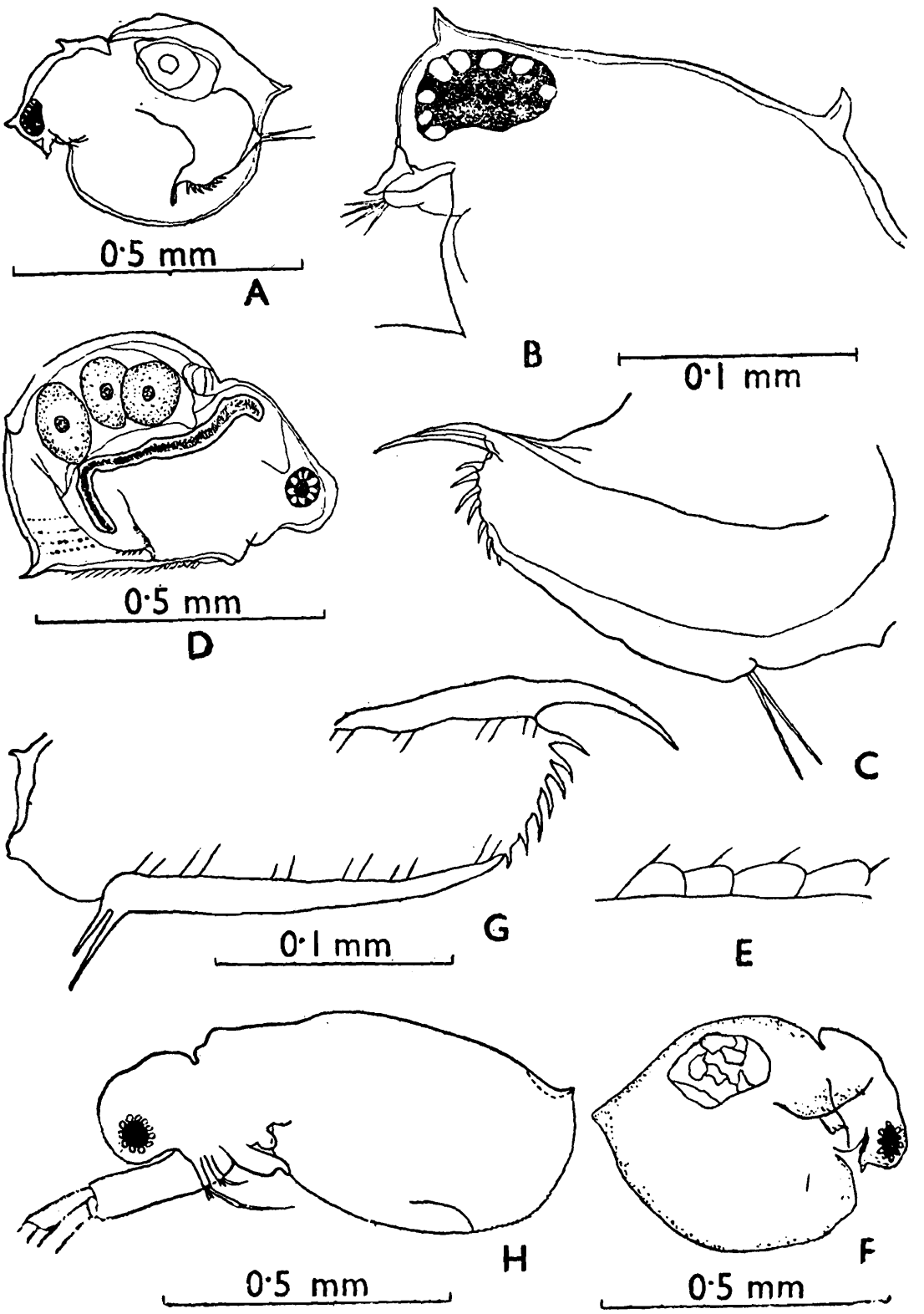
(Text-fig. 4 G)

1853. *Daphnia australiensis* Dana, *Report v. s. Explo. Expd. Crustacea*, II, **14** : 127, pl. 89, figs. 4 a-e.

Material : 6 ex., Dumduma, Lakhimpur ; 2. iii. 61, Coll. *A. K. Mukherjee*.

Distribution : India : Rajasthan. Also Java, Australia, North America and South Africa.

Remarks : The specimens to some extent vary with the body shape of the species figured in the literature otherwise, they agree with the main characters of the species namely upturned rostrum and rounded ocellus hence the specimens have been referred to the present species.



Text-fig. 2. Cladocera of Assam. (A-C) *Ceriodaphnia cornuta* Sars, A. lateral view, B. lateral view of the anterior part, C. post-abdomen ; (D-E) *Scapholeberis kingi* Sars, D. lateral view, E. highly magnified margin of the shell ; (F-G) *Ceriodaphnia rigaudi* Richard, F. lateral view, G. post-abdomen ; H. *Diaphanosoma excisum* Sars var. *stingelini* Jenkin, lateral view.

8. **Scapholebris kingi** Sars

(Text-fig. 2 D, E)

1903. *Scapholebris kingi*, Sars, *Archiv. Math. Natur.* Christiania, **25** : 8-10, pl. 1, figs. 2a-c.

Material : 1 ex., Diglipokheri, Nursery, No. 1, Gauhati ; 24. iv. 61, Coll. *K. Reddiah* ; 1 ex., Ward Lake, Shillong, 21. iv. 61, Coll. *M. Rynth.*

Distribution : India : W. Bengal, Rajasthan. also Thailand, Sumatra, Africa, Australia and North America.

Remarks : This species differs from *S. mucronata* (Müller) in its small size, different shape of the head and the comparatively small size of mucron. According to Gurney (1906) except for its small size it is inseparable from the present species.

9. **Ceriodaphnia rigaudi** Richard

(Text-fig. 2 F, G)

1894. *Ceriodaphnia rigaudi* Richard, *Mem. Soc. zool. Fr.*, Paris, **7** : 239.

Material : 60 ex., Ward Lake, Shillong ; 8. ii. 62, 24. iv. 63, 26. vii. 61 and 18. viii. 61 ; Coll. *M. Rynth.* 1 ex, Diglipokhri, Nursery Tank No. 1, Gauhati, 24. iv. 62, Coll. *K. Reddiah.*

Distribution : India : Most of the states. Also from S. E. Asia, Sri Lanka, Palestine, Egypt, S. Africa, North America.

Remarks : This is smallest of the known species of the genus and is easily recognisable by the acuminate beak like projection issuing from below the head. The species can be distinguished from the nearest, *C. conuta* Sars by the smooth fornix, straight upturned tail usually with 6 to 7 anal spines, longer rostrum and shorter antennae with setae nearer to the extremity.

10. **Ceriodaphnia cornuta** Sars

(Text-fig. 2 A-C)

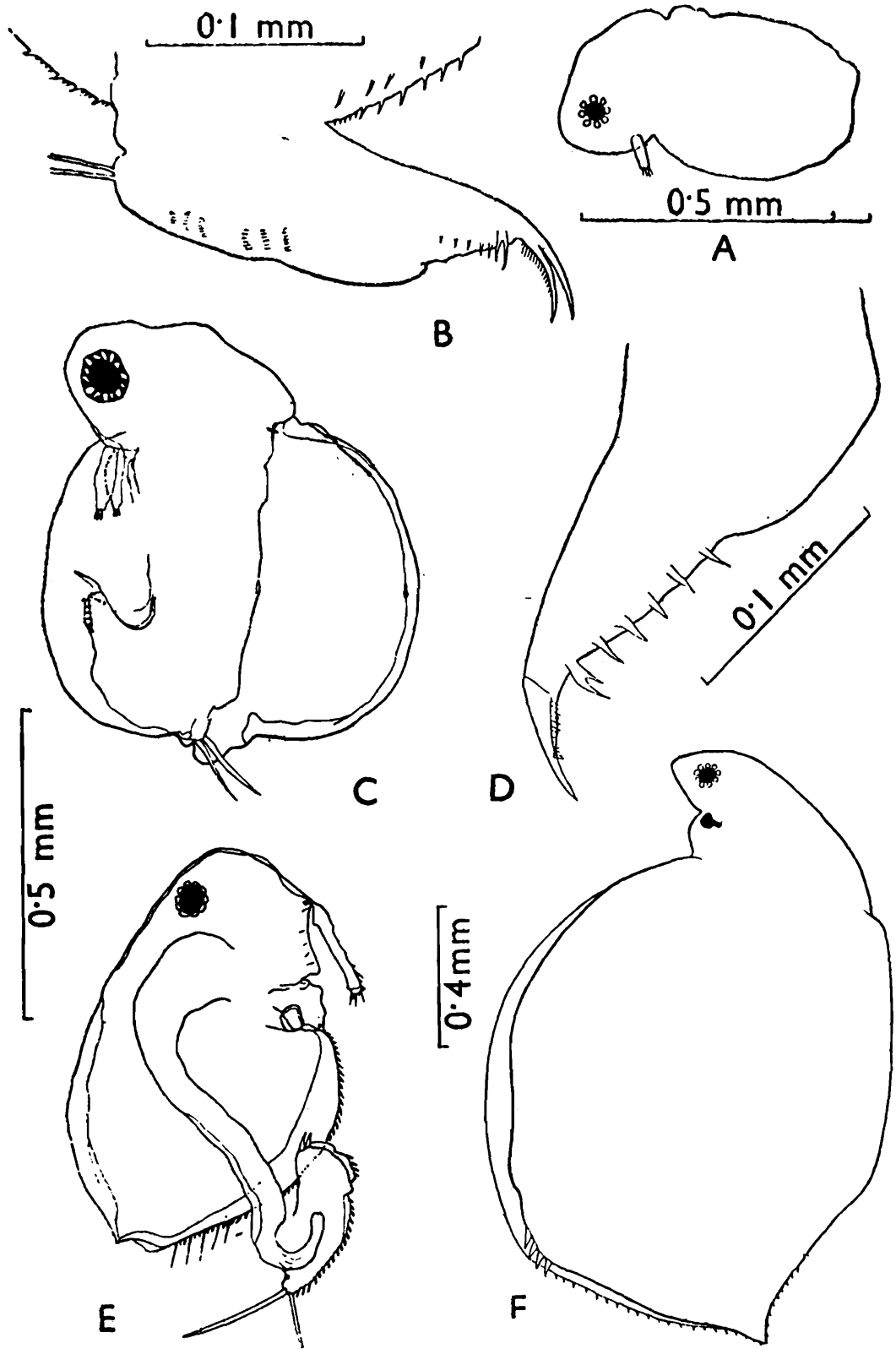
1885. *Ceriodaphnia cornuta* Sars, *Forh. Vidensk. Selsk.* Christiania, No. 8 : 26-28, pl. 5, figs. 1-3.

Material : 3 ex, Ward lake, Shillong ; 21. viii. 63, Coll. *M. Rynth.*

Distribution : India : South India, Also Australia, New Guinea, Java, Sri Lanka and East Africa.

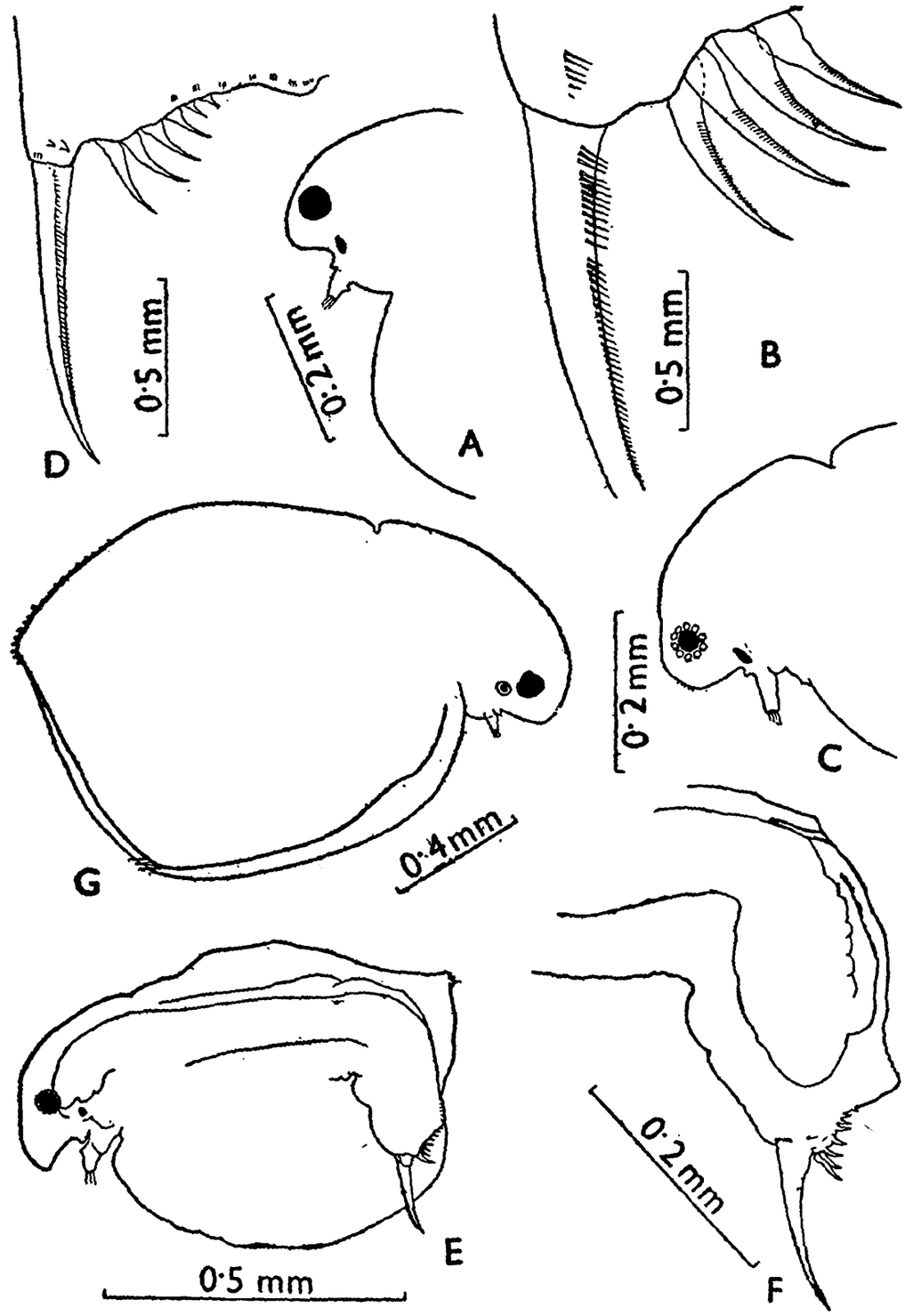
Remarks : Due to placing undue reliance on the presence and absence of cephalic process and process on the carapace by earlier

workers (Richard, 1894 ; Daday, 1905), a lot of confusion has been created in fixing up the exact identities of *Ceriodaphnia cornuta* and *C. rigaudi*. However, these characters are not reliable for speific identification since in my material I have specimens of both types from the



Text-fig. 3.* Cladocera of Assam. (A-B) *Moina dubia* Guerne & Richard, A. lateral view, B. post-abdomen with the infero-posteal border of the shell ; (C-D) *Moina micrura* Kurz, C. lateral view, D. post-abdomen ; E. *Macrothrix chevreuxi* Guerne & Richard, lateral view ; F. *Simocephalus serrulatus* (Koch). lateral view ;

same locality. Janken (1934) indicated that the distinguishing characters of *C. cornuta* are sharply pointed fornices, tapered postabdomen armed generally with 8 spines and longer antennules with setae in the middle of its length.



Text-fig. 4.—Cladocera of Assam. (A-B) *Simocephalus expinosus* (Koch), A. lateral view, anterior part, B. claw and the anterior part of the post-abdomen ; (C-D) *Simocephalus serrulatus* (Koch) var. *rotundifrons* Brehm, C lateral view, anterior part, D. claw and a part of the post-abdomen ; (E-F) *Simocephalus serrulatus* (Koch) var. *productiforns* Stingelin, E. lateral view, F. post-abdomen ; G. *Simocephalus australiensis* (Dana), lateral view.

11. **Moina dubia**Guerene and Richard

(Text-fig. 3 A, B)

1892. *Moina dubia* Guerene and Richard, *Mem. Soc. zool. Fr.*, Paris, **5** : 527-530, figs. 1 & 2.

Material : 30 ex., Goupokhri, Gauhati, 24. iv. 61, Coll. *C. B. Srivastava.*

Distribution : India : Bihar, West Bengal, Rajasthan. Nepal, Java, Australia, Africa (Sahara, Uganda, Congo and Transvaal), Germany and Europe.

Remarks : This is a variable species and comes near *M. micrura* Kurz. But following characters mentioned by Brehm (1953) are useful for separating this species from the other allied species. The ventral proximal margin of the valve is provided with strong spines and the distal with groups of spinules, the proportion of the reduced distal part to the broad proximal part of postabdomen is 1 : 2, without accessory ridge on the end claw and the head depression is at an angle of 70°.

Some authors tried to differentiate this species further into varieties, *baringoansis* Jenkin and *parva* Ramner on the basis of relative degree of erectness of the relatively decreasing head and size of the tail.

12. **Moina micrura** Kurz

(Text-fig. 3 C, D)

1874. *Moina micrura* Kurz, *Acad. Wien*, **70** : 7, pl. 1, fig. 1.

Material : 5 ex, Jaypokheri, Gauhati ; 24. iv. 61, Coll. *C. B. Srivastava.*

Distribution : First record from India. Also Zanzibar, Bohemania (Bohmen), Hungary (Ungarn) and Central Asia.

Remarks : Some authors synonimised *M. dubia* under the present species but there are characters, *i.e.*, shape of the body, absence of comb on the claw, only one "basaldorn", absence of hairs on the sides of the postabdomen and more robust antennae, which justify the separate status of this species.

Family BOSMINIDAE

13. **Bosmina longirostris** (O. F. Müller)

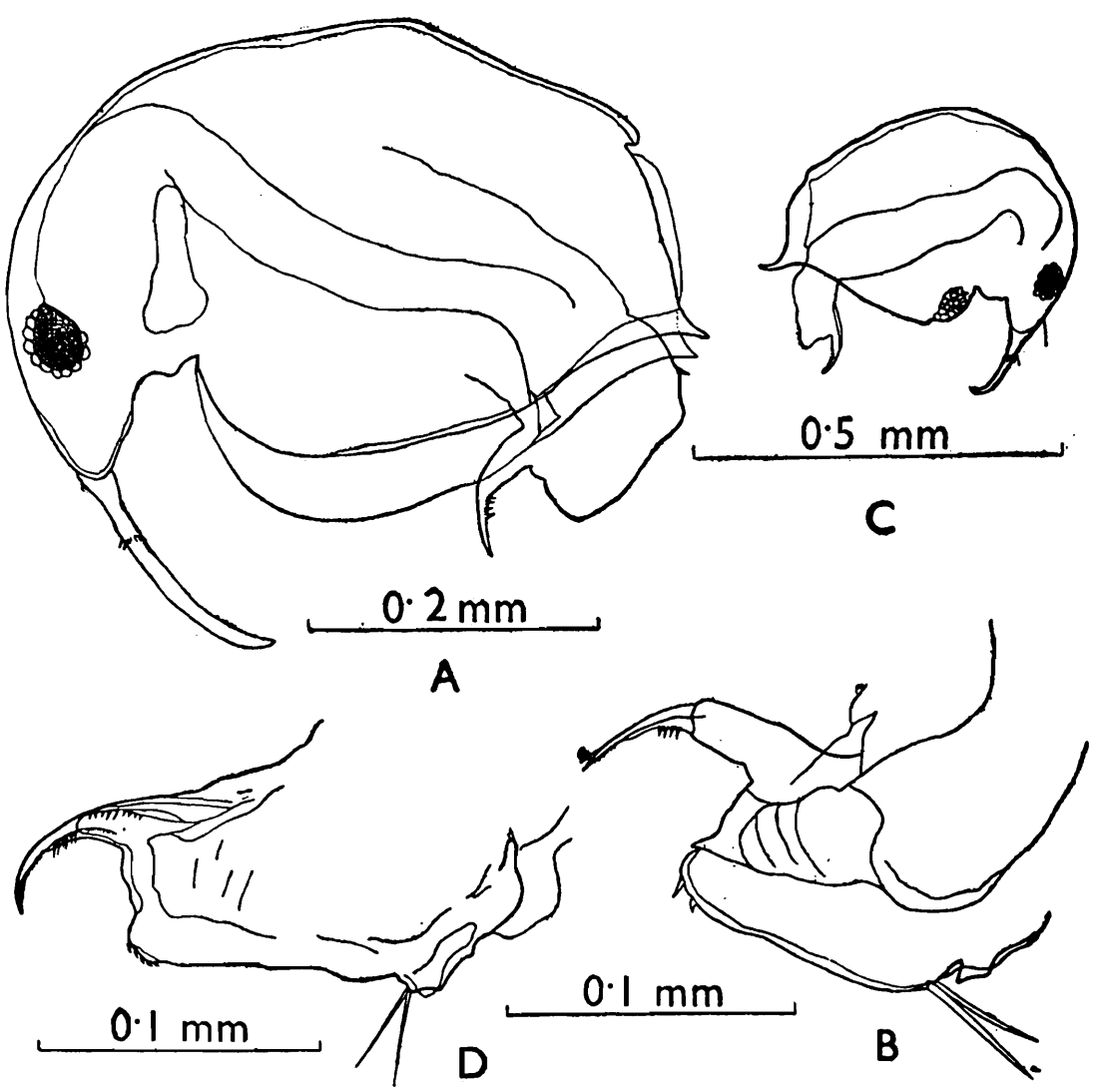
(Text-fig. 5 A-D)

1785. *Lynceus longirostris* Müller, *Entomostraca* : 16, pl. 10, figs. 7, 8.

Material : 10 ex., Ward Lake, Shillong ; 18. i. 61, 8. ii. 62, 21. iv. 61, 24. iv. 61, 26, iv. 63, 24. v. 61, 26. vii. 61 and 29.10.63, Coll. *M. Rynth.*

Distribution : India : S. India and Kashmir. Cosmopolitan in distribution.

Remarks : Six morphological varieties have been classified within this species mainly depending on the length and shape of the antennules and mucro. These are : var. *brevicornis* Hellich, 1878 ; var *longirostris* (O. F. Müller), 1785 ; var. *similis* (Lilljeborg) Sars, 1890 ; var, *pellucida* Stingelin, 1895 ; var. *cornuta* (Jurine), 1820 and var. *curvirostris* Fischer, 1854. In the present collection there are two forms which come near to var. *similis* and *curvirostris*.



Text-fig. 5. Cladocera of Assam. (A-B) *Bosmina longirostris* (Müller) var. *similis* (Lilljeborg), A. lateral view, B. post-abdomen ; (C-D) *Bosmina longirostris* (Müller) var. *curvirostris* Fischer, C. lateral view, D. post-abdomen.

Family Macrothricidae

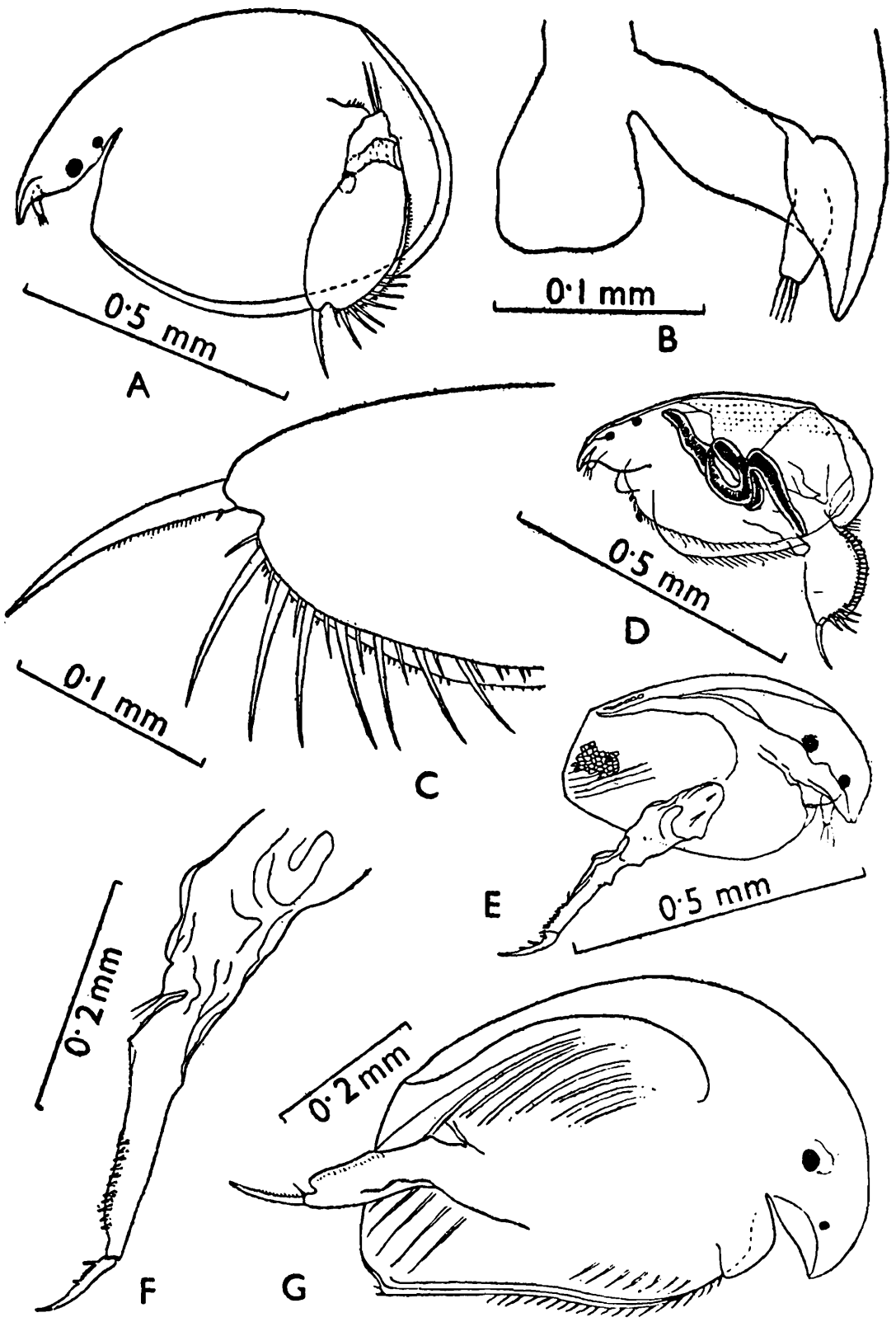
14. **Macrothrix chevreuxi** Guerne & Richard

(Text-fig. 3 E)

1892. *Macrothrix chevreuxi* Guerne & Richard, *Mem. Soc. zool. Fr.*, Paris, **5** : 530-533,

Material : 1 ex., Ward Lake, Shillong ; 25. ix. 62, Coll. *M. Rynth.*

Distribution : India : Rajasthan. Also S. America & Africa (Congo, Uganda and Transvaal).



Text-fig. 6. Cladocera of Assam. (A-C) *Leydigia quadrangularis* (Schoedler), A. lateral view, B. head and labrum, C. posterior part of the post-abdomen ; D. *Leyoigia acanthocercoides* (Fischer), lateral view ; (E-F) *Camptocercus rectirostris* Schoedler, E. lateral view, F. post-abdomen ; G. *Acroperus harpae* Baird, lateral view.

Remarks : The specimen assigned in the present species agrees more with the description of the species given by Jenkin (1934) than to the description of *M. triseralis* Brady by Gurney (1907) or Daday (1896).

Family CHYDORIDAE

15. **Camptocercus rectirostris** Schoedler

(Text-fig. 6 E, F)

1862. *Camptocercus rectirostris* Schoedler, *Jahresb. Doroth. Realschule* : 25, pl. 2, figs. 42, 43.

Material : 3 ex., Ward Lake, Shillong ; 9. iv. 63 and 16. v. 63, Coll. *M. Rynth.*

Distribution : India : Kashmir, Chotonagpur. Also (America, Europe) Palaearctic, Nearctic, Oriental and Ethiopian.

Remarks : Three varieties, *siklejevi* Sremek-Hasek, *biserratus* Schoedler and *typica,* are usually found in this species. The present specimens belong to the var. *biserratus* in having marginal denticles on the postabdomen within the range 12 to 15.

16. **Acroperus harpae** Baird

(Text-fig. 6 G)

1850. *Acroperus harpae* Baird, *British Entomostraca* : 129, pl. 16. fig. 5.

Material : 1 ex., Philobari, Lakhimpur, 26. ii. 61, Coll. *A. K. Mukherjee* ; 6 ex., Ward Lake, Shillong, 9. iv. 63 and 26. iv. 63, Coll. *M. Rynth.*

Distribution : India : Kashmir. Also Australia, Indonesia, Central America, Antarctic, Europe.

Remarks : Two varieties, var. *harpae* Baird and var. *angustatus* Sars and two forms, *forma frigida* Ekman and *forma neglecta* Lilljeborg have been recognised in the present species. The specimens in the present collection has been referred in the var. *typica.*

17. **Alonopsis elongata** Sars

(Text-fig. 7 A, B)

1861. *Alonapsis elongata* Sars, *Forhandl. Selsk. Christiania* : 161.

Material : 1 ex., Ward Lake, Shillong ; 9. iv. 63, Coll. *M. Rynth.*

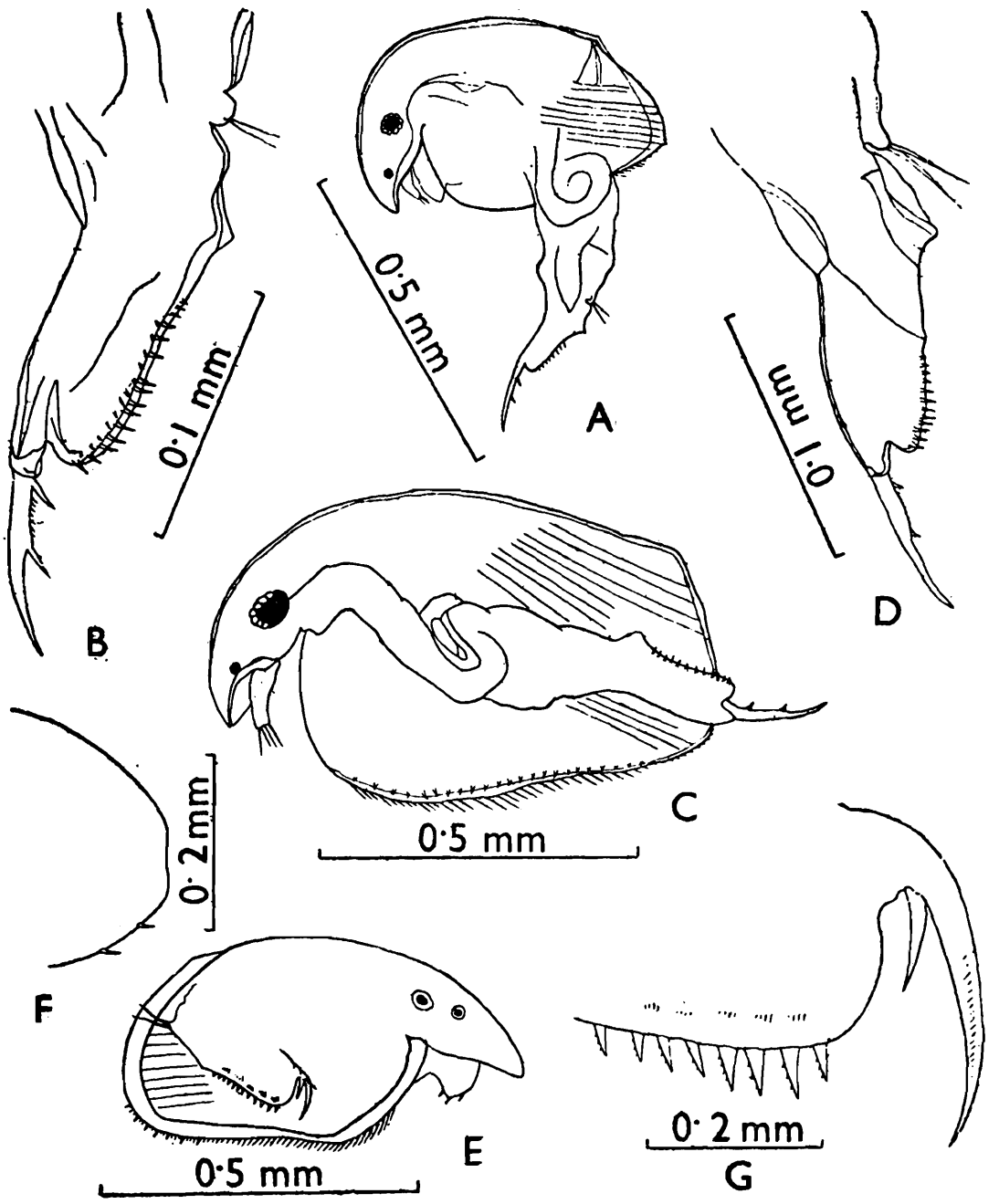
Distribution : First record from India. Also Central America, Europe (Palaearctic and Nearctic).

Remarks : Distinguishing characters of the species are the presence of 15 to 17 marginal denticles and fascicles on the postabdomen and a minute tooth at the infero-posteal angle of the valve.

18. **Alonopsis aureola** Doolittle

(Text-fig. 7 C, D)

1912. *Alonopsis aureola* Doolittle, *Proc. U. S. nat. Mus.*, **43** (1940) : 561-565, pl. 2, fig. 11.



Text-fig. 7. Cladocera of Assam. (A-B) *Alonopsis elongata* Sars, A. lateral view, B. post-abdomen ; (C-D) *Alonopsis aureola* Doolittle, C. lateral view, D. post-abdomen ; (E-G) *Alona quadrangularis* (Müller), E. lateral view, F. labrum, G. claw and the posterior part of the post-abdomen.

Material : 1 ex., Ward Lake, Shillong ; 21. viii. 61, Coll. *M. Rynth.*

Distribution : First record from India. Also America.

Remarks : There are about 11 marginal denticles and no lateral fascicles on the postabdomen. The infero-postal tooth of the valve is absent.

19. **Leydigia quadrangularis** (Leydig)

(Text-fig. 6 A-C)

1860. *Lyncus quadrangularis* Leydig, *Naturg. der Dephn.* : 221, pl. 8, fig. 59.

1863. *Alona leydigii* Schoedler, *Neue Beitrage Zur. Naturgeschichta der clodocern*, Berlin : 27.

Material : 1 ex., Diglipokhri, Nursary No. 1, Gauhati, 24. iv. 61, Coll. *K. Reddiah.*

Distribution : First record from India. Also Palearctic, Nearctic and Neotropical.

Remarks : The important characters of the species are, valves without marking, claws with basal spines and the shape of the labium keel.

20. **Leydigia acanthocercoides** (Fischer)

(Text-fig. 6 D)

1884. *Lynceus acanthocercoides* Fischer, *Bull. Soc. nat.*, Moscou, **27** : 431, pl. 3, figs. 22-23.

Material : 1 ex., Diglipokhri, Nursery No. 1, Gauhati ; 24. iv. 61, Coll. *K. Reddiah.*

Distribution : India : W. Bengal and Rajasthan. Also Palaarctic, Nearctic, Neotropical, Oriental and Ethiopian.

Remarks : The Present species is nearer to *Leydigia propinqua* Sars from which it differs in the general outline of the shell and smaller ocellus in comparison to the eye.

21. **Alona affinis** (Leyding)

(Text-fig. 8 C, D)

1860. *Lynceus affinis* Leydig, *Naturg, de Daphn.* : 223, pl. 9, figs. 68, 69.

Material : 1 ex., Ward Lake, Shillong ; 9. iv, 63, Coll. *M. Rynth.*

Distribution : First record from India. Also cosmopolitan (Europe, North & Central Asia, Australia and North and South America).

Remarks : This species is very near to *A. quadrangularis* but differs from it in the presence of spinules at the base of the end claws. Three

varieties are found this species *i. e.*, var. *ornata* Stingelin 1895, var. *dentata* Verescagin, 1911 and var. *affinis* Leydig, 1860. The specimen has been referred to the typical variety.

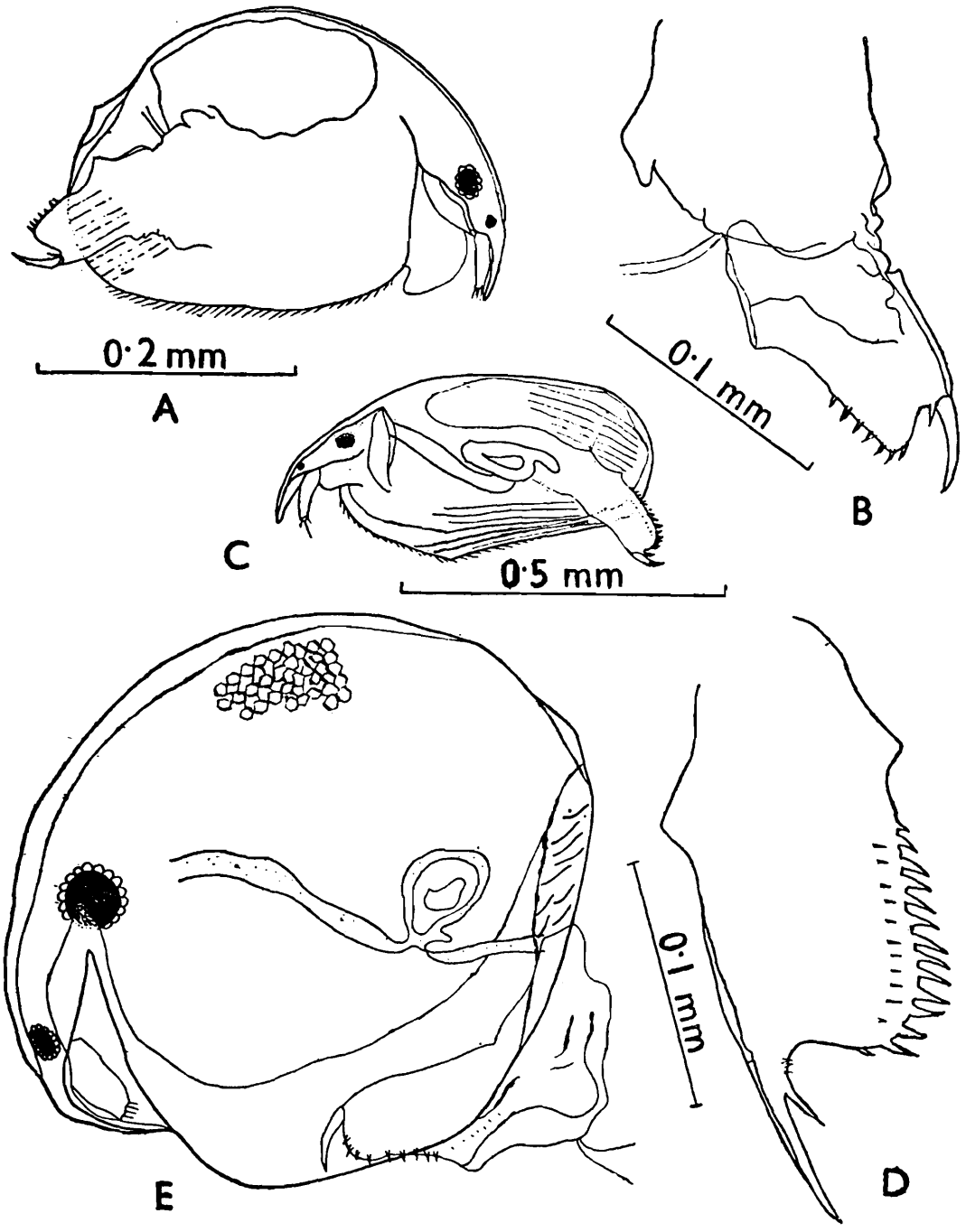
22. **Alona quadrangularis** (O. F. Müller)

(Text-fig. 7 E-G)

1785. *Lynceus quadrangularis* Müller, *Entomostraca* : 72, pl. 9, fig. 1-3.

Material : 2 ex., Ward Lake, Shillong ; 9. iv. 63, Coll. *M. Rynth.*

Distribution : First record from India. Also Nepal (Kalipokhari) widely distributed in Central America, Europe.



Text-fig. 8. Cladocera of Assam. (A-B) *Alona guttata* Sars, A. lateral view, B. post-abdomen ; (C-D) *Alona affinis* (Leydig), C. lateral view, D. post-abdomen ; E. *Chydorus sphaericus* (Müller), lateral view.

Remarks : The specimens of the collection were in a disintegrated condition as it was collected dead from the lake but the postabdomen is characteristic enough to identify them. The greatest height is usually posterior to middle of the valve and the postabdomen is large, flattened, the dorsal margin of which dialated. Two varieties, *lepida* Birge, 1892 and *dilatata* Verescagin, 1911 have been noticed in this species.

23. **Alona guttata** Sars

(Text-fig. 8 A, B)

1862. *Alona guttata* Sars, *Forhandl. Selsk. Christinania*, : 287.

Material : 2 ex., Ward Lake, Shillong ; 18. i. 61, Coll. *M. Rynth.*

Distribution : India : S. India and Ladakh. Also cosmopolitan.

Remarks : This species resembles *A. costata* in body shape but differs from it being smaller in size and having less arched dorsal margin. The postabdomen is with 8-10 marginal denticles and without lateral fascicle. Carapace sculpture is variable and usually two varieties, *guttata* Sars and *tuberculata* Kurz, 1874, were found to occur. The present specimens belong to the typical variety.

24. **Chydorus sphaericus** (O. F. Müller)

(Text-fig. 8 E)

1785. *Lynceus sphaericus* O. F. Müller, *Entomostraca* : 71, pl. 9, figs. 7-9.

Meterial : 3 ex., Ward Lake, Shillong : 18.i.61, Coll. *M. Rynth.*

Distribution : India : S. India, Kashmir, Ladakh and Chotanagpur. Also cosmopolitan (America, Europe).

Remarks : Specimen belonging to the species can be classified within following four varieties due to their variation of some characters, var. *nitidus* Schoedler, 1868 ; var. *coelatus* Schoedler, 1863, var. *favosa* Brady, 1868, = (*syn. punctatus* Hellich, 1878) ; *leonardi King* = (*syn. alaxandrovii* Poggenpohl, 1878 ; *syn. minor* Lilljeborg, 1880) and *typica*. One specimen out of the three can be assigned to the var. *nitidus* as its shell is without marking and the other two in the typical variety having the usual marking on the shell.

Summary

The paper deals with cladocera collections from three different ecological nitches *i. e.*, a small lake in higher altitude like Ward Lake, Shillong, nursery tanks in Gauhati where fish fries are cultured and

natural water logged areas of Lakhimpur, N. Assam. As a result of this study 24 species of cladocera have been identified, 16 from Ward Lake, 8 from Gauhati and 5 from Lakhimpur area. So far 34 cladocera species are known to occur from Assam and adjacent hill states in North East India.

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