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STUDIES ON HEAD PORES OF SOME INDIAN SPECIES OF CHYDORIDS (CLADOCERA : CHYDORIDAE)

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ABSTRACT

The present study, being first of its kind from India, deals with head pore studies of 20 species (spread over two subfamilies and 12 genera) of the largest Cladoceran family Chydoridae. The pore arrangement in the reported genera of the subfamily Chydorinae is characteristic. On the other hand, subfamily Aloninae showed a diversity in the numbers and arrangement of head pores in the presently recorded genera. Furthermore, differences in size, shape and sculpturing of head shields and in the details of the pore arrangement and their morphology have also been found to be useful for distinguishing the examined species. A key to the recorded genera of this family, based on the present investigations, is also given.

INTRODUCTION

The studies on head pores in Chydoridae, the largest family of Cladocera, are found to have taxonomic and phylogenetic significance. Warner (1924), first of all, suggested that the large head pores occurring in the Chydoridae may be of taxonomic value. Frey (1959, 62, 67) examined the general appearance of these structures in this family and mentioned the possibility of their use in establishing phylogenetic relationships. Frey (1959) also pointed that the pore arrangement and their morphology in chydorids appeared to be conservative character subjected to little ontogenic change.

The present work, being first of its kind from India, deals with head pore studies of 20 species of chydorids (spread over two subfamilies and 12 genera) collected from Calcutta and its environs, West Bangal. Based on this study, a key to the presently recorded genera has also been given.

MATERIAL AND METHODS

The material for the present investigations was collected from various water bodies from Calcutta and its adjacent areas (some localities in 24-Parganas District), West Bengal. The specimens preserved in 5% formalin were used for this study. For disarticulation of head shields, the technique suggested by Megard (1965) was employed. Disarticulated head shields were mounted in Polyvinyl alcohol-lectophenol mixture and examined

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under a steroscopic binocular-microscope. The drawings were made using a cemera lucida.

LIST OF EXAMINED SPECIES

Class : CRUSTACEA

Subclass : BRANCHIOPODA

Order : CLADOCERA

Family : CHYDORIDAE Stebbing, 1902

Subfamily : CHYDORINAE Stebbing, 1902

Pleuroxus denticulatus Birge, 1879
Pleuroxus similis Vavra, 1900
Chydorus sphaericus (O.F. Müller, 1785)
Chydorus barroisi (Richard, 1890)
Chydorus eurynotus Sars, 1901
Dunhevedia crassa King, 1853

Subfamily : ALONINAE Frey, 1967

Alona rectangula Sars, 1862
Alona davidi Richard, 1895
Alona pulchella King, 1853
Kurzia latissima (Kurz, 1875)
Kurzia longirostris (Daday, 1898)
Acroperus harpae (Baird, 1843)
Camptocercus rectirostris Schoedler, 1862
Leydigia acanthocercoides (Fischer, 1854)
Biapertura affinis (Leydig, 1860)
Biapertura karua (King, 1853)
Oxyurella tencuicaudis (Sars, 1862)
Oxyurella singalensis (Daday, 1898)
Euryalona orientalis (Daday, 1898)
Indialona globulosa (Daday, 1898)

RESULTS

Frey (1967) recognised four subfamilies of family Chydoridae. However, in the examined material, only two of them *i. e.*, Chydorinae and Aloninae are represented. The former is represented by the genera *Pleuroxus*, *Chydorus* and *Dunhevedia* while the latter includes the genera namley, *Alona* s. str., *Kurzia*, *Acroperus*, *Camptocercus*, *Leydigia*, *Biapertura*, *Oxyurella*, *Euryalona* and *Indialona*.

Subfamily : CHYDORINAE Stebbing, 1902

The arrangement of head pores in the different genera of this subfamily is characteristic : two separate main pores situated in the median line of the head shield and two small pores situated between the main pores.

Pleuroxus : Head pores typical of the subfamily : the distance from the posterior margin of the head shield more than the distance between the main pores.

The two examined species of this genus, *P denticulatus* and *P. similis* differ little in the shapes of their head shields (Figs. 1 & 2).

Chydorus : Smirnov (1971 : 277) pointed the head pores to be apparently absent in *C. barroisi*. However, Fernando (1974) figured head pores in this species and the same have also been observed in the presently examined specimens (Fig. 3). In *C. sphaericus*, the head shield is having broadly rounded posterior margin and pointed rostral projection (Fig. 4). The head shield of another chydorid species, *C. eurynotus* is shown in Fig. 5.

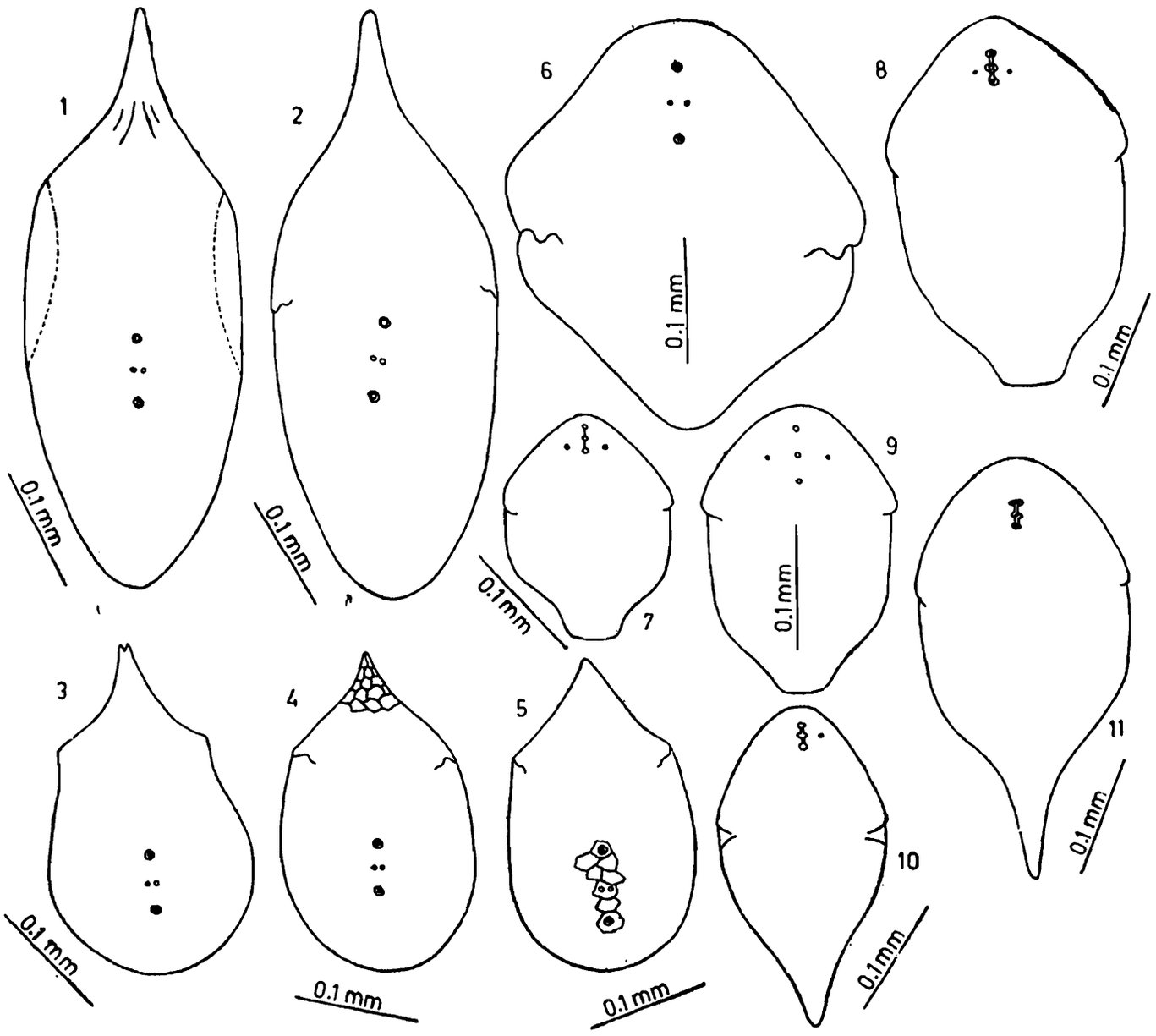
Dunhevedia : Distance from the head pores to the posterior margin of head shield shorter than the distance between the main pores.

In the examined species of this genus, *D. crassa*, head shield is with rounded anterior and posterior margins (Fig. 6).

Subfamily : ALONINAE Frey, 1967

This subfamily exhibits a diversity in the number and arrangement of head pores. Of the five main categories mentioned by Smirnov (1971), only four have been noticed in the present material. These categories are :

1. Three main head pores with a narrow connection between them ;



Figs. 1-11. *Pleuroxus denticulatus* Birge, Head shield ; 2. *Pleuroxus similis* Vavra, Head shield ; 3. *Chydorus barroisi* (Richard), Head shield ; 4. *Chydorus sphaericus* (O. F. Müller), Head shield ; 5. *Chydorus eurynotus* Sars, Head shield ; 6. *Dunhevedia crassa* King, Head shield ; 7. *Alona rectangula* Sars, Head shield ; 8. *Alona davidi* Sars, Head shield ; 9. *Alona pulchella* King, Head shield ; 10. *Kurzia latissima* (Kurz), Head shield ; 11. *Kurzia longirostris* (Daday), Head shield.

2. two main head pores with a narrow connection between them ;

3. two separate main head pores with two small pores between them and two small pores situated laterally ;

4. a single pore.

Furthermore, Smirnov (1971 : 336) broadly grouped all the genera of Aloninae into five categories depending upon the nature of head pores. Again, only four such groups are recorded in the examined material :

i. Three main head pores : *Alona* s. str., *Kurzia*, *Acroperus*, *Camptocercus* and *Leydigia* ;

ii. two main head pores with a narrow connection between them : *Biapertura* ;

iii. two separate head pores : *Oxyurella* and

iv. one main head pore : *Euryalona* and *Indialona*.

Considering the great phylogenetic significance of the structure of head pores, Smirnov (1971) revised the previously least well defined genus *Alona*. Leaving aside the species with three main head pores, the forms with two main head pores with a narrow connection were transferred into the newly erected genus *Biapertura*. In the present material, the genus *Alona* is represented by three species : *rectangula*, *davidi* and *pulchella*. Of these, the former two species (Figs. 7 & 8) showed the head pore arrangement typical of the genus but they differed in the shapes of their head shields. However, in *Alona pulchella*, three main head pores were not connected with each other (Fig. 9). Such a deviation has also been mentioned by Smirnov (*loc. cit.*).

The recorded species of the genus *Kurzia* i. e., *K. latissima* and *K. longirostris* could be differentiated (Figs. 10 & 11) by the relative length of the rostral projections. Moreover, in *K. longirostris* the posterior head pore is laterally expanded.

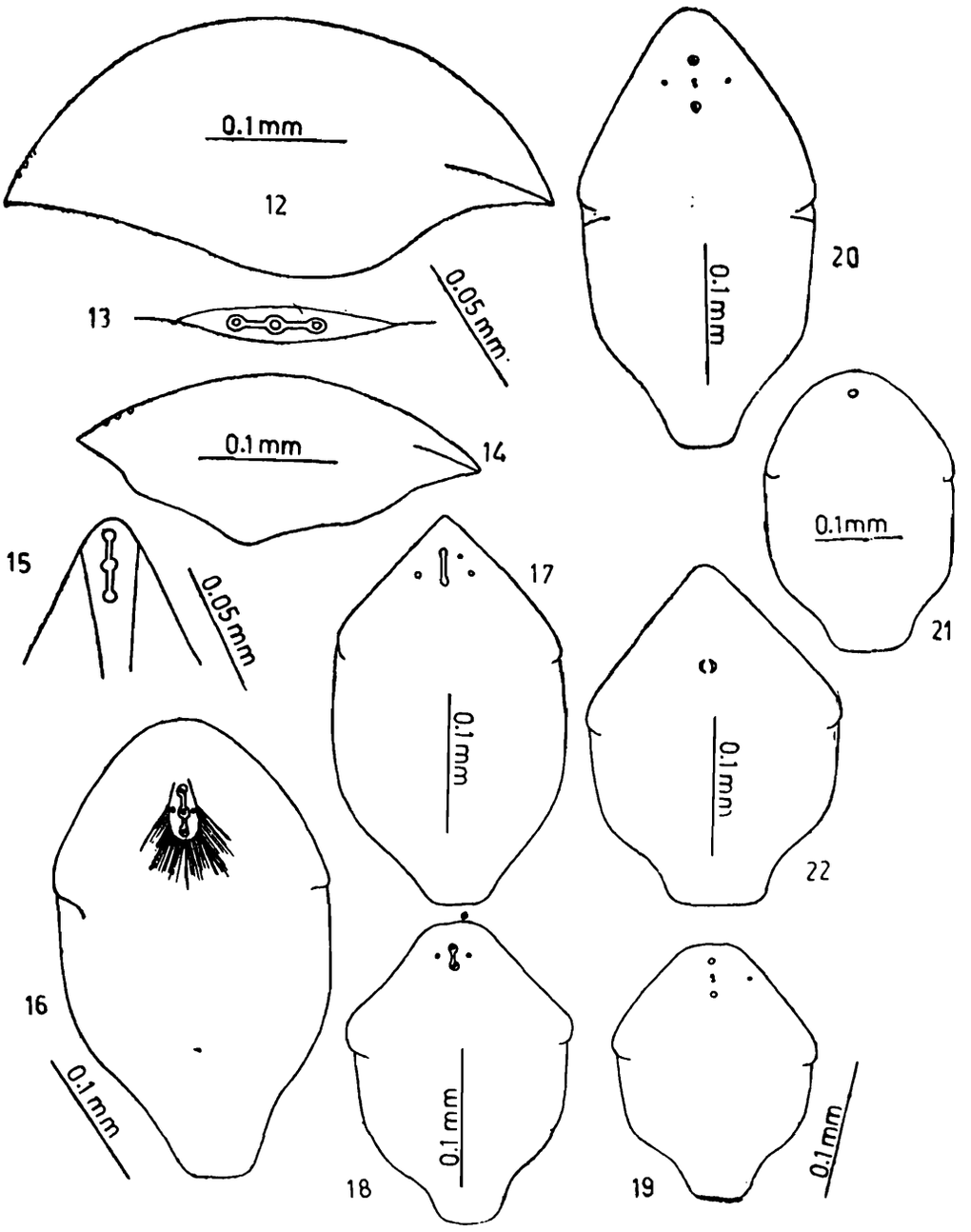
In *Acroperus harpae* (Figs. 12 & 13) and *Camptocercus rectirostris* (Figs. 14 & 15), the head shields are sharply keeled and three connected head pores are situated on the crest of the head shields near the posterior margin.

In *Leydigia acanthocercoides* (Fig. 16), three main head pores are connected by a narrow channel and lateral pores are very close to the main pores. In addition, the surface of the head shield is also marked by fine striae.

The genus *Biapertura* is represented by *B. affinis* and *B. karua* in the present material and they differ in the shapes of their head shields. In *B. affinis* (Fig. 17), the posterior margin of the head shield is pointed while it is rounded in *B. karua* (Fig. 18).

The two examined species of *Oxyurella i.e.*, *tenuicaudis* and *singalensis* show identical arrangement of head pores but differ in the size and shapes of their head shields (Figs. 19 & 20).

Two other genera of Aloninae, *Euryalona* and *Indialona* fall in the same category because of the presence of a single main pore. The sole examined species of the former genus i. e., *E. orientalis* is known to have a single head pore and head shield is with blunt anterior margin and rounded posterior margin (Fig. 21). In *I. globulosa* the head shield shows angular posterior margin (Fig. 22).



Figs. 12-22. 13 & 13. *Acroperus harpae* (Baird)

12. Head shield (lateral view) ;
13. Head pores (enlarged) ;

14 & 15. *Camptocercus rectirostris* (Schoedler)

14. Head shield (lateral view) ;
15. Posterior part of head shield (enlarged) showing head pores ;

16. *Leydigia acanthocercoides* (Fischer), Head shield ;
17. *Biapertura affinis* (Leyding), Head shield ;
18. *Biapertura karua* (King), Head shield ;
19. *Oxyurella tenuicaudis* (Sars), Head shield ;
20. *Oxyurella singalensis* (Daday), Head shield ;
21. *Euryalona orientalis* (Daday), Head shield ;
22. *Indialona globulosa* (Daday), Head shield.

KEY TO THE RECORDED GENERA OF FAMILY CHYDORIDAE, BASED ON THE PRESENT STUDY :

1 (8). Two main head pores, separate and situated in the median line of the head shield ; two small pores situated between main pores ; if there is a single pore then it is situated far from the posterior margin of head shield. ... CHYDORINAE Stebbing. 1902

2 (6). Distance from the posterior head pore to the posterior margin of head shield more than the distance between main pores.

3 (4). Rostrum long. Distance from the apex of rostrum to the posterior end of fornix slightly longer than distance from the posterior end of fornix to posterior margin of head shield ... PLEUROXUS Baird, 1843

4 (5). Rostrum short. Distance from apex of rostrum to posterior end of fornix larger than distance from posterior end of fornix to posterior margin of head shield. Head shield rarely without pores.

5 (4). Rostral part of head shield without combs ... CHYDORUS Leach, 1816

6 (2). Distance from the posterior margin of head shield to the posterior head pore shorter than distance between main head pores.

7 (6). Head shield with rounded anterior margin and blunt rostrum ... DUNHEVEDIA King, 1858

8 (1). Two or three main pores situated in the median line of head shield, free or united and two small pores situated lateral to main pores ; if the main pore single, it is situated near the posterior margin of head shield ALONINAE Frey, 1967

9 (24). Two or three main head pores.

10 (22). Main pores connected.

11 (20). Three main head pores.

12 (17). Small pores located at a moderate distance from the main head pores.

13 (16). Anterior magin of head shield blunt, with slightly produced apex.

14 (15). Small pores situated at some distance from the main pores ... ALONA Baird, 1843. emend. Smirnov, 1971

15 (14). Small pores located very close to the main head pores LEYDIGIA Kurz. 1875

16 (13). Anterior margin of head shield with pointed apex KURZIA Dybowski & Grochowski, 1894

17 (12). Small pores situated far from the main head pores.

18 (19). Distance from apex of rostrum to posterior end of fornix longer than distance from posterior end of fornix to posterior end of head shield ... ACROPERUS Baird, 1843 emend. Smirnov, 1971

19 (18).	Distance from posterior end of fornix as long as distance from posterior end of fornix to posterior end of head shield ...	CAMPTOCERCUS Baird, 1843
20 (11).	Two main head pores.	
21 (20).	Main head pores narrowly connected ...	BIAPERTURA Smirnov, 1971
22 (10).	Two main separated head pores.	
23 (22).	Two small pores between main pores and two small pores lateral to them ...	OXYURELLA Dybowski & Grochowski, 1894
24 (9).	One main head pore.	
25 (26).	Head shield with broadly rounded posterior margin and truncate anterior end	EURYALONA Sars, 1901
26 (25).	Head shield with broadly rounded posterior and anterior margins ; if posterior end pointed, anterior margin truncate ...	INDIALONA Petkovski, 1966

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