PART III
CHAPTER 6

REVIEW OF PREVIOUS WORKS ON THE OSTRACODES

The Upper Tertiary and Quaternary freshwater ostracodes of the Indian subcontinent have received scant attention as is evident from the annotated bibliography of ostracodes by Bhatia and Khosla (1971) and the papers/publications on the freshwater ostracodes from the Siwalik Group, the Karewas of Kashmir, the Late Pleistocene deposits and the Recent of Indian subcontinent annotated in this work (Baird, 1859, Brady, 1886, Gurney, 1906, 1907, 1920, Daday, 1909, Klie, 1927, Brehm, 1950, Bhatia and Khosla, 1967a,b, Bhatia, 1968a,b, 1969b, Jain et al., 1969, Singh, 1969, 1970 and Bhatia and Singh, 1970a,b). Perhaps due to an oversight these authors did not include an important work on the Recent freshwater asiatic ostracodes by Hartmann (1964a) who described/commented upon and/or illustrated from the Indian subcontinent twenty-five ostracode taxa including two new genera viz., *Indiacypris* and *Parastenocypris*, thirteen new species and a new subspecies. In the following pages an attempt has been made to review the publications on the freshwater ostracodes from the Siwalik Group, Karewas, Late Pleistocene deposits and Recent of Indian subcontinent, subsequent to the bibliography by Bhatia and Khosla (1971). For the sake of brevity, the works on freshwater ostracodes
annotated in the above mentioned bibliography have not been reviewed. The other works on the Recent freshwater ostracodes, subsequent to the bibliography by Bhatia and Khosla, are by Bhatia and Singh (1970c, 1971a). Bhatia and Singh (1970c) briefly commented upon and illustrated nine freshwater ostracode taxa from the Dal Lake, Kashmir. Bhatia and Singh (1971a) discussed the ecology and distribution of the Recent freshwater ostracodes in the Kashmir valley and listed and illustrated sixteen ostracode taxa. According to these authors the controlling factors for the quantitative and specific distribution the ostracodes in the three lakes (Dal, Nagin and Manasbal lakes) and the shallow channel connecting the Dal Lake and the Jhelum River are the depth, clarity of water, penetration of light, the total dissolved solids and the carbonate content. The low frequency of some ostracode taxa found in the channel is attributed by them to low pH and the turbidity in the channel.

In a brief note Singh (1971a) recorded the occurrence of twenty-three freshwater ostracode taxa from the Pleistocene of the Kashmir valley. The list included Candona fabaeformis (Fischer), Candona sp. cf. C. havanaensis Staplin, Candona sp. cf. C. pearlescis Staplin, Candona sp. cf. C. stammeri Klie, Candona spp. (three species), Cyclocypris ovum (Jurine),
Cypretta sp., Cypridopsis sp., Cypridopsis (Proteocypris) aculeata (Lilljeborg), C. (Proteocypris) sp., Cyprinotus incongruens (Ramdohr), Cypris pubera Mueller, Dolerocypris sp. cf. D. fasciata (Mueller), Eucypris zankeri (Chyzer and Toth), Ilyocypris spp. (three species), Limnocythere blankenbergensis Diebel, Potamocypris (Cyprilla) spp. (two species) and Stenocypris sp.

From the Recent and the Plio-Pleistocene deposits (Karewas) of the Kashmir valley Singh (1972) listed fifty-five ostracode taxa (including nine new species). On the bases of his study of these ostracode faunas, Singh concluded that the northwestern end of the Oriental zoogeographical region, i.e., the Kashmir valley has an admixture of Holarctic, Ethiopian, Oriental and Australian elements. Of these fifty-five freshwater ostracode taxa, those restricted to the Lower Karewas were: Zonocypris costata (Vávra), Cypridopsis sp. indet. B and the new species Ilyocypris bensoni. The Upper Karewa assemblage comprised Cypris subglobosa Sowerby, Dolerocypris sp. cf. D. fasciata (Mueller), Eucypris zankeri (Chyzer and Toth), Nephtocypris raptans (Baird), Isocypris prionema Mueller, Cypridopsis aculeata (Lilljeborg), Potamocypris (Cyprilla) arcuata (Sars), P. (Cyprilla) humilis
(Sars), Candona sp. cf. G. havanaensis Staplin, Candona sp. cf. G. pearlensis Staplin, G. rawsoni Tressler, Candona sp. cf. G. stammeri Klie, Candona sp. indet. A., Candona sp. indet. B, Cyclocypris ovum (Jurine), Ilyocypris sp. indet., Limnocythere blankenbergensis Diebel and the new taxa Eucypris awantipurensis, Cypridopsis diebeli, Cyperetta mckenziei, Potamocypris (Cyprilla) pandei and Ilyocypris bhatiai. The ostracodes common to the Upper Karewas and the Recent were: Cypris pubera Mueller, Eucypris sp. cf. E. Clavata (Baird), Heterocypris incongruens (Ramdohr), Potamocypris minuta patriciae Bhatia, E. smaragdina (Vávra), Candonopsis kingslei (Brady and Robertson), Cypria ophthalmica (Jurine), Ilyocypris bradyi Sars, I. shawneetownensis Staplin and the new species Parastenocypris delormei and Potamocypris (Cyprilla) staplini. The taxa listed as common to both the Lower and the Upper Karewas were: Eucypris sp. cf. E. moguntiensis Triebel, Candona fabaeformis (Fischer), Cytherissa lacustris (Sars), Limnocythere franki Bhatia and the new species Candona kashmirensis. A few more taxa which were listed by Singh as common to the Lower and the Upper Karewas and also extending to the Recent included Cypridopsis vidua (Mueller), Candona candida (Mueller), G. compressa (Koch), G. lactea (Baird), G. marengoensis Klie,
C. neglecta Sars, Cyclocypris laevis (Mueller), and Darwinula stevensoni (Brady and Robertson). Some other taxa occurring only in the Recent of the Kashmir valley were Dolerocypris sp. indet., Stenocypris major (Baird), Cypridopsis sp. indet. A, Potamocypris sp. indet. and an unknown cyprid. None of the new taxa listed above was either described or illustrated by Singh. In a passing reference Singh (1973a) on the basis of ostracode fauna assigned a Plio-Pleistocene age to the Lower Karewas and a Pleistocene age to the Upper. Singh (1973b), in another brief note, mentioned about the fifty-five ostracode taxa from the Plio-Pleistocene (Karewas) and the Recent of the Kashmir valley, the names of which have already been given above (see pp.129-131, Singh, 1972). In passing he commented upon their affinity to the Holarctic, Ethiopian, Oriental and Australian zoogeographic provinces. Singh (1973c) briefly discussed the palaeoecology of the Karewas of the Kashmir valley, wherein he mentioned about the shallow to deep lacustrine, swampy and fluvial conditions prevailing during the Lower Karewa times and lacustrine conditions in the Upper Karewa times. The presence of pools, ponds and swamps during the Upper Karewa times was also mentioned. In a detailed paper on the ecology, palaeoecology and palaeozoogeography of the Quaternary ostracodes of the Kashmir valley, Singh (1973d) discussed ecology of ostracode fauna of a number of lakes,
ponds, rice fields and channels. With the help of the ostracodes occurring in the Recent, as well as the Plio-Pleistocene deposits (Karewas) of the Kashmir valley, Singh deciphered the palaeoecological conditions of the Karewas and the affinities of their ostracode faunas to the other zoogeographic provinces namely Holarctic, Palaearctic, Ethiopian and Australian. The ostracode taxa listed in this work of Singh have already appeared (see pp.129-131). Singh (1974) in a brief note made some observations on the biostratigraphy of thirty sections of the Karewa Series spread all over the Kashmir valley. According to him the beds cropping out around Pampur, Sombur, Bijbehara and Badgam assigned by De Terra and Paterson (1939) to the Lower Karewas lacked the characteristic bluish gray silt and lignite bands. These characters as also the ostracode fauna favour their placement in the Upper Karewas.

As regards the works on the freshwater ostracodes of the Siwalik Group, Wadia (1928) was perhaps the first to mention in passing in his paper on the Geology of Poonch State (now partly Jammu and Kashmir State of India) and adjacent portions of the northern Punjab (now in Pakistan) about some disc like crustacean shells assigned doubtfully by him to the genus Cypris from the Palandri formation (Lower Siwaliks).
However, the first definite record of the ostracodes from the Siwalik Group with which the present work is concerned is by Bhatia and Khosla (1967a) which is annotated in the bibliography by these authors (Bhatia and Khosla, 1971). It may not be out of place to mention here that the nine ostracode taxa viz., *Candona candida* (Mueller), *C. lactea* Baird, *Ilyodromis* sp., *Hemicypris pyxidata* (Moniez), *Zonocypris costata* (Vávra), *Cypridopsis (?)* sp. cf. *C. striolata* (Brady), *Ilyocypris bradyi* Sars, *Darwinula stevensoni* (Brady and Robertson) and *Limnocythere* sp., recorded in their work come from the Pinjor Formation (Upper Siwaliks) near Chhoti Parch in the northwest of Chandigarh which forms part of the present work (Locality AI).

Bhatia and Mathur (1971) while discussing the palaeoecological implications of gastropod taxa from a Late Pleistocene terrace (*T₃*) of the river Sirsa, near Nalagarh (Himachal Pradesh), casually mentioned the occurrence of freshwater ostracode taxa *Candona lactea* Baird and *C. marengensis* Klie in the terrace in support of their palaeoecological studies. They also listed *Candonopsis kingsleii* (Brady and Robertson) in the legend of Figure 1.

In a brief note, Bhatia and Singh (1971b) recorded five ostracode taxa from a calc-tuffa terrace deposit overlying the
Boulder Conglomerate Formation (Upper Siwaliks) near Garhshankar (district Hoshiarpur, Punjab) (Locality C, present work). The list included *Candonopsis* sp. cf. *S. kingslei* (Brady and Robertson), *Stenocypris major* (Baird), *Stenocypris* sp. cf. *S. sewelli* Klie, *Darwinula brevis* Straub and *Darwinula* sp. which the authors believed to be a new species close to *Darwinula cylindrica* Straub but differing from it in muscle scar pattern.

The author (Mathur, 1972) recorded/commented upon, described and/or illustrated ten ostracode taxa from the Tatrot Formation (Upper Siwaliks) near village Dhamala, 6 km WNW of Pinjaur (Locality AVII, present work). The assemblage included a new species, *Limnocythere bhatiai*, three taxa already recorded from the Upper Siwaliks by Bhatia and Khosla (1967a) viz. *Zonocypris costata* (Vávra), *Candonopsis lactea* Baird and *Ilyocypris bradyi* Sars and the six taxa recorded for the first time from the Upper Siwaliks, namely, *Cypris subglobosa* Sowerby, *Potamocypris* sp., *Strandesia* sp., *Candonopsis marengoensis* Klie, *Candonopsis kingslei* (Brady and Robertson) and *Ilyocypris gibba* (Dandohr).

As is evident from the foregoing, there are only a few publications on the ostracodes of the Upper Siwaliks which range in thickness between 2,000 and 2,500 metres. The huge
thickness of about 3,200 metres to 4,000 metres of the Lower and the Middle Siwaliks extending all along the foothills of the Himalaya still remains to be explored for their ostracode remains. The only doubtful mention of the crustacean shells by Wadia (1928) from the Lower Siwaliks (Palandri formation = Chinji Formation) of Pakistan is too insignificant to receive attention. It was with the intention of filling in some of these lacunae that the author took up the study of ostracodes of the Siwalik Group as part of his present investigations. The stratigraphic distribution of the ostracodes of the Siwalik Group (see Text Figure 23) records ostracodes from the Chinji Formation of the Lower Siwaliks, Dhok Pathan Formation of the Middle Siwalik and Tatrot and Pinjor Formations of the Upper Siwaliks. In addition to these, the present work also includes ostracodes from the Late Pleistocene terrace deposits.