

OSTRACODE FAUNAS OF THE INDIAN SUBCONTINENT—THEIR PALEOZOOGEOGRAPHIC AND PALEOECOLOGIC IMPLICATIONS¹

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INTRODUCTION

I deem it a great privilege to have been invited by the Palaeontological Society of India to deliver the "Third Prof. M. R. Sahni Memorial Lecture". This lecture series has been initiated to perpetuate the memory of the founder president of the society. I intend to dwell in this lecture on a theme which is likely to focus attention on a much neglected aspect of paleontology in this country, namely the paleozoogeographic and paleoecologic implications of the ostracode faunas of the Indian subcontinent.

Although India has the fifth largest number (36) of Ostracodologists in the world (*vide* Sohn, 1976), the number of active workers is much less. Consequently, large gaps exist in our knowledge of the ostracode faunas of the Indian subcontinent. In the following pages an attempt has been made to synthesize the available data and to discuss the paleozoogeographic and paleoecologic aspects of the hitherto known faunas.

LOWER PALEOZOIC

The only records of the lower Paleozoic Ostracoda from the Indian subcontinent are by Reed (1912) from the Silurian of Kashmir and by Bhatia *et al.* (1982) from the Lower Devonian of Sumdo in the Lower Spiti Valley. While the former record is sketchy, the latter is more comprehensive and has interesting paleozoogeographic implications. Of the fourteen taxa recorded from the Lower Devonian of Spiti, twelve have unquestionable identity/affinity with those recorded from the Haragan/Bois d' Arc formations in south central Oklahoma, U. S. A. As in the case of Haragan Formation, the Himalayan fauna is also dominated by the Pachydomellidae, Thlipsuridae and to some extent Bairdiocyprididae. The taxa belonging to these families are *Pachydomella* sp. cf. *P. sohni*, *Phanasymetria triserrata*, *Tubulobairdia simplex*, *Eucraterellina* sp. cf. *E. spitznasi*, *Octonaria punctata*, *Rothella recta*, *Neothlipsura furca*, and *Thlipsorithella fossata*.

Faunas similar to the Haragan and Spiti are also known from formations like Birdsong and Rock house of Western Tennessee and equivalent formations in north-western Alabama and New York. A few taxa belonging to the Thlipsuridae have also been recorded from the Lower Devonian of southwestern part of the Russian Platform (*vide* Bhatia *et al.*, 1982). The broad affinities of the Lower Paleozoic faunas in general of the Himalayas with those of America has also been noted, among others, by La Touche (1913), Reed (1911-12, 1919, 1922), Sahni (1941) and Gupta (1966). The remarkable identity/affinity of the Lower Devonian ostracode fauna of Spiti with those of U. S. A. and southwestern U. S. S. R. pose interesting paleozoogeographic questions. According to Bhatia *et al.* (1982) this close affinity suggests the existence of a shallow seaway connection between the old world and the Appalachian Province particularly during Early Devonian times.

UPPER PALEOZOIC

The only record of Upper Paleozoic Ostracode fauna are those by Reed (1928) and Bhatia (19) from the Umara Marine Bed, Srivastava and Mandwal (1968) from the Zewan beds and Jain *et al.* (1972) from the Middle Carboniferous of Spiti. Of the above records, while those from Umara and Zewan are not very diagnostic and in most cases up to generic level, those from Spiti have affinities with the Upper Paleozoic faunas of the U. S. A. Of the twenty taxa recorded, nine are new.

TRIASSIC

The marine Triassic ostracodes have been recorded from Salt Range in Pakistan (Sohn, 1970) and in India from Kashmir (Sahni and Chhabra, 1974); Agarwal (1979, 1980, 1981), Agarwal *et al.* (1980), Spiti (Goel *et al.*, 1984) and Kumaun (Chhabra *et al.* 1973, Agarwal and Kumar, 1981). The Salt Range

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fauna of Early Triassic age contains a few hold overs from the Permian. In particular, the presence of definite Paleocopid Kirkbyacea is significant. The new family Kriightinidae comprises several new species belonging to the genus *Carinakriightina*. The taxa *Judahella*, *Lutkevichinella? ornata*, *Hungarella* and *Reubenella* (all doubtful identifications) are Mesozoic and younger in age. The Kashmir faunas from Khunmuh and equivalent formations of Scythian age also contain an admixture of pre-Triassic and Mesozoic taxa like the Salt Range fauna. The taxa which are mostly identified at the generic level comprise *Cytherella*, *Hungarella*, *Bairdia*, *Monoceratina*, *Judahella*, *Polycypris*, *Aechmina*, *Paracypris*, *Macrocypris*, *Pontocypris*, *Cytherelloidea*, *Cavellina*, *Krausella* and *Roundyella*. Although the assemblage as a whole is not of much paleoecologic significance, the various species of *Judahella* seem to be of biostratigraphic significance (Agarwal, 1981).

On the other hand, the assemblage from Spiti (Goel *et al.* 1984) of Middle Anisian age comprising *Patellacythere spitiensis*, *Paraberaunella (Neoberounella) cf. oertlii*, *Hungarella ussuriensis*, *Bairdia mesotriassica* and *Bairdia cf. mocki* is typical of Middle Triassic and is indicative of water depth of about 100 m or a little more. The ostracode assemblage from the Kalapani Limestone in the Kumaun Himalaya comprising thirteen taxa ranges in age from Anisian to Carnian. Most of the identifications are either indeterminate or only up to generic level.

Late Triassic freshwater ostracodes from reptilian coprolites of the Maleri Formation are reported by Sohn and Chatterjee (1979). According to them, the fauna comprising unidentifiable Darwinulids and a ?Cytheracean suggests, as do the vertebrate fossils, that India had closer connections with Eurasia than with the southern continents (Africa, Australia and Antarctica) during Late Triassic times because no endemic fossils of ostracodes or tetrapods are known from this subcontinent. Further, according to these authors, the genus *Darwinula* which is known to range from Pennsylvanian through Holocene, has not been reported from Australia or Antarctica and that the available record does not support the Plate Tectonic model. The above views of Sohn and Chatterjee, based as they are on the premise that the Darwinulids have not been recorded so far from Australia, are in contrast to the views of McKenzie and Hussainy (1968) who have discussed the relevance of freshwater cytherid ostracodes to the Continental Drift hypothesis. In the above work, McKenzie does report the occurrence of *Darwinula* from southwest Tasmania and also from an island in the Pacific. According to these authors, the Continental Drift hypothesis is necessary to explain the observed distribution in Brazil and West Africa of Meso-

zoic species of Darwinulids and freshwater Cytherids which do not lay resistant eggs. However, be that as it may, the occurrence of *Darwinula* in the Traissic Maleri Formation is significant.

JURASSIC

During the later Mesozoic and particularly the Jurassic period, the Tethys was a corridor for the distribution of pelagic and benthonic marine communities via ocean currents and continental shelves respectively and the continental faunas became more diverse and widespread as far as the ostracodes were concerned (McKenzie, 1967, 1981).

Insofar as the marine Jurassic ostracodes of India are concerned, the only works are those of Lubimova *et al.* (1960) from Kutch and Rajasthan, Singh and Jaikrishna (1969), Singh and Kulshreshtha (1972), Mannikeri (1981) and Kulshreshtha *et al.* (1985) from Jaisalmer in Rajasthan and by Jain and Mannikeri (1975) from the Spiti Shales in the Tethys Himalayas. The pioneering work of Lubimova and Mohan (in Lubimova *et al.* 1960) described and illustrated thirteen taxa including eight new species belonging to the genera *Cytherella*, *Cytherelloidea*, *Progonocythere* and *Bythocythere*. These ostracodes of Callovian age, were recorded from the Chari Series in Kutch and from the upper part of the Jaisalmer Formation in Rajasthan and have affinities with those of the Palearctic and Holarctic zoogeographic province.

Of the taxa recorded from Kutch and Jaisalmer, *Progonocythere laeviscula* and *P. implicata* have also been recorded by Grekoff (1957) from the Callovian of Madagascar pointing to the close affinity of the Madagascar and the western Indian ostracode faunas. According to Bate (1975), however, the characteristic Jurassic genus *Progonocythere* is an exclusively northern hemisphere taxon, being restricted geographically to the region north of the Tethys with the sole exception of *P. laeviscula*. If this contention is correct, same species originally assigned to *Progonocythere* in the southern hemisphere may have to be transferred to other closely related genera like *Protocythere*, *Fastigatocythere*, *Majungaella* and a yet undescribed new genus from Jaisalmer (*vide* Mannikeri, 1981). The work by Singh and Jaikrishna (1969) and Singh and Kulshreshtha (1972) records taxa mostly at the generic level. The genus *Pokornya* (Singh and Kulshreshtha, 1972; *vide etiam* Kulshreshtha, *et al.* 1985) (type species *P. kuldharensis*) from the Kuldhar Stage of the Jaisalmer Series is not only a junior synonym of the genus *Paralophocythere* Depeche (1969) but also a homonym (H. J. Oertli, personal communication).

Perhaps the most comprehensive work on the Jurassic ostracodes of the Jaisalmer area is by Mac-

nikeri (1981) and more recently by Kulshreshtha *et al.* (1985). The assemblage described by Mannikeri comprises 54 taxa of which 36 are new, 5 belong to already known taxa and 13 are indeterminate. Of the above taxa, 15 have affinities with cosmopolitan European taxa, 12 with Madagascar, 11 with African and one each with those from Poland, N. America and Russia. At the specific level, *Darwinula leguminella*, *Progonocythere retusa* (referred to a new genus), *Fastigatocythere befortakaensis*, *F. implicata* and *Paralophocythere kuldharensis* have so far been recorded from Kutch, Jaisalmer and Madagascar. At the generic level, *Fastigatocythere*, *Paralophocythere*, *Amicytheridea* and *Afrocytheridea* are cosmopolitan, being known from Germany, France, East Africa, Madagascar and Rajasthan. The genera *Pichotia* and *Citrella* are so far known only from France and Rajasthan. The assemblage described by Kulshretha *et al.* (1985) from the Kuldhar beds comprise 34 taxa of which 12 are new. The fauna, which is again dominated by Cytherids (5 species) and Progonocytherids (14 species) shows unmistakable Tethyan affinities.

Jain and Mannikeri (1975) were the first to describe and illustrate 3 taxa (including a new species) from the Spiti Shales (Chidamu Stage). The taxa include "*Macrodentina*" sp. cf. "*M.*" *pulchra*, (?) *Gallia-cytheridea wolburqi* and *Progonocythere spitiensis* (new species). The last two taxa have affinities with *G. manyuliensis* and *Majungaella kimmeridgensis* respectively described by Bate (1975) from the Lower Kimmeridgian beds of Tanzania in East Africa.

Insofar as the freshwater Jurassic ostracodes are concerned, the only works are those by Govindan (1975) and Misra and Satsangi (1979) from the Kota Formation of the Pranhita-Godavari Valley in Peninsular India. The combined list of taxa includes *Timiriasevia digitalis* (a new species), *Darwinula sarytirmensis*, *D. kingi* (a new species) and indeterminate species belonging to the genera *Candona*, *Eucandona*, (?) *Limnocythere*, and *Cypridea*. Apart from the zoogeographic importance of the genus *Darwinula* (which has been discussed in an earlier section), that of *Timiriasevia* belonging to the subfamily Timiriaseviinae has interesting paleoecologic and zoogeographic implications. According to Colin and Danielopol (1978, 1979), Mesozoic and Cenozoic species of Timiriaseviinae, like the recent species, have ecological and biological properties defining them as k-strategists. The extinction of most of them could be due to the contraction of their niche during Cyprididae explosion in the Upper Jurassic-Lower Cretaceous. Their narrow ecological tolerance limits and poor dispersion abilities made them very vulnerable during major environmental disturbances. According to these authors the low rate of speciation in this subfamily could be attributed to a

change of reproductive pattern from bisexual to parthenogenetic. In any case, the genera belonging to Timiriaseviinae are known to range from the Triassic to the Palaeocene and have a cosmopolitan distribution, showing again a lack of endemism in the Peninsular Mesozoic ostracode faunas of India.

CRETACEOUS

The Cretaceous ostracode faunas of the Indian subcontinent are well documented through the works of Banerji (1970), Bhatia and Jain (1969), Govindan (1969), Gowda (1966), Guha (1971), Jain (1971, 1975 a, b, 1976 a, b, 1977, 1978 a, b), Rajagopalan (1966) and Sastry *et al.* (1972).

The vertical as well as spatial distribution of ostracodes in the Cretaceous rocks of South India, however, is extremely erratic. Only 8 taxa are known from the Dalmiapuram Formation, 27 from the Uttatur and 6 from the Trichinopoly. The Ariyalur Formation of Tiruchirapalli District has yielded the maximum number of taxa. But here again, the distribution is not uniform throughout as is evident from the fact that 109 taxa have been identified from the 10-15 m thick Kallankurichchi Member. The underlying Sillakkudi Member though much thicker has yielded only 23 taxa and the overlying Ottokovil only 3. The Kallamadu Member is devoid of ostracodes. In the Vridhachalam District, 44 taxa have been identified from the Ariyalur Formation. Of these, 12 are common to both Tiruchirapalli and Vridhachalam areas. Only 3 taxa are known from the Pondicherry Cretaceous.

Of the 191 and odd ostracode taxa hitherto recorded from the Cretaceous of South India, 54 are also known from other parts of the world. The break up is as follows—33 from Western Europe, 16 from N. America, 3 from West and North Africa and 2 from Trinidad. Of the remaining 71 new and 66 indeterminate taxa, a large number also show close affinity with those from Western Europe (Jain, 1971). Several genera recently identified from the Cretaceous of Europe are now also known to occur in South India. These are *Curfsina*, *Dumontina*, *Golcocythere*, *Limburgina*, *Mosaleberis*, *Veenidea*, *Rehacythereis* and *Sphareoleberis*. Almost 33% of the Cretaceous ostracod species belong to such cosmopolitan genera as *Bairdia*, *Cytherella*, *Cytherelloidea*, *Bythocypris* and *Paracypris*.

A comparison between the ostracode faunas of the South Indian Cretaceous and the Bagh Beds of Madhya Pradesh reveals that of the 30 taxa described from the latter (Jain 1975c), only 6 are common to the two areas. However, the Bagh fauna, though meagre, has some characteristic elements of the European and North African ostracode faunas. It is thus evident that the Cretaceous ostracode faunas of south India and

Bagh Beds in general and of South India in particular have greater affinities with the Northern Hemisphere faunas. The marine ostracodes in Argentina and South America are found only in the Upper Cretaceous. The fauna principally composed of species belonging to the genera *Wichemenella*, *Trachyleberis Alatacythere*, ? *Platycythereis* and *Wolburgia* has affinities with the ostracode fauna from West Africa rather than with Northern Hemisphere faunas (Bertels, 1973, 1975). The ostracode fauna of West Africa is dominated by the occurrence of *Buntonia*, *Protobuntonia*, *Brachycythere*, *Orocytheridea* and *Veenia* (Reyment, 1960, 1966). These genera are also known to occur in North Africa (Bold, 1964) and India (Jain, 1971 and other references). Except for the genus *Brachycythere*, the above mentioned genera are not found either in South Africa (Dingle, 1969, 1971) or East Africa (Bate, 1969). *Majungaella*, an important Jurassic-Cretaceous genus is known to occur in East and South Africa (Bate, 1969), Spiti (Jain and Mannikeri, 1975), Kutch (Guha, 1976) and Australia (Bate, 1972, Neale, 1975; Krommelbein, 1975). It has, however, not been recorded from South India. According to Bate (1972) and Neale (1975), the Upper Cretaceous ostracode fauna from Western Australia shows an admixture of endemic and cosmopolitan genera. The dominant genera of West and North Africa are absent in Australia. *Majungaella* and *Rostrocytheridea* are common to Australia and East and South Africa. Most of the species, however, are endemic.

From the foregoing, it is evident that there was a free movement of ostracode faunas between West Africa, North Africa, North America, West Europe and India during Cretaceous, although at that time the Indian subcontinent lay to the south of 30°S latitude (Klootwijk, 1979). There is no evidence of any similarity whatsoever between the Upper Cretaceous ostracode faunas of South India and Western Australia (Jain, published works and personal communication). These views are in harmony with the views of Bate (1972) that any paleogeographic reconstruction of the Gondwanaland showing India in close proximity to Australia would not be correct.

TERTIARY

The marine Tertiary ostracoda of the Indian subcontinent are very well dominated, particularly from Kutch, Rajasthan, Cambay Basin, Bombay High, Lesser Himalayas and Inter-Trappean beds of Peninsular India and less so from Assam. The more important works are by Bhalla (1979), Bhatia and Mandwal (1960), Bhatia and Rana (1984), Guha (1961-1979), Guha *et al.* (1965), Jain (1978, 1980), Khosla (1967-1976), Khosla and Pant 1978-1981 a, b) Lubimova *et al.* (1960) Mathur *et al.* (1977) Rajgopalan (1962),

Siddiqui (1971, 1983), Singh and Misra (1968), Sohn (1970) and Tewari and Singh (1966), among others (The list of works is by no means exhaustive or complete).

During the Tertiary, the Tethyan corridor continued to play a very significant role in the distribution of ostracode faunules and dispersion of genera especially during Paleogene. According to McKenzie (1967) who discussed at length the distribution of Cenozoic marine ostracoda from the Gulf of Mexico to Australia, over 500 ostracode genera have been described from Paleocene to Recent environments with more significant qualitative development taking place in the families Cyprididae, Cytheridae and Cypridinidae. Further, according to him, the region from the Gulf of Mexico to Australia is an ideal marine situation for applying Simpson's continental concepts of corridors, filters and sweepstake routes. The period witnessed a major adaptive radiation among ostracoda for which no single region has provided the principal locus.

Several Paleogene genera like *Alococythere*, *Gyrocythere*, *Phalcoythere*, *Stigmatocythere*, *Anommatocythere*, *Schizocythere*, *Clinocythere*, *Holcopocythere*, *Paragrenocythere*, *Phyrocythere* and *Hapsicytheridea* and subgenera like *Phalcoythere*, *Prophalcoythere* and *Otanocythere* had their origin in the Tethyan corridor and spread rapidly during Early Paleogene. Siddiqui (1971) who described the first four genera listed above discussed their biostratigraphic significance and paleozoogeography (Siddiqui, 1983). Of these four genera only *Alococythere* has a few extant species. Fossil representatives have been found in Burma (Tertiary), Tibet (Early Tertiary), Western India (Miocene), Pakistan (Paleocene-Eocene), Sub Himalayas (Eocene), Saudi Arabia (Paleocene) and Ethiopia (Pliocene-Pleistocene). Recent species are known from Indian Ocean, Arabian Sea, Persian Gulf and the Red Sea. The genus *Gyrocythere* is known from Western India (Eocene and Miocene) and Pakistan (Eocene) while *Phalcoythere* is widely distributed in the Paleogene of Pakistan, Saudi Arabia, Nigeria, Tanzania and France and Belgium. *Stigmatocythere* occurs in Western India (Miocene), Pakistan (Eocene), Central Sahara and Nigeria (Paleocene), Tanzania (Oligocene and Miocene) and Offshore South Africa (Eocene). The genera *Anommatocythere* and *Schizocythere* are known to occur in the Paleogene of Saudi Arabia, Pakistan and Western India. The general *Clinocythere*, *Holcopocythere*, *Paragrenocythere*, *Phyrocythere* and *Hapsicytheridea* along with the three subgenera listed above were described by Al-Furaih (1980) from the Paleocene of Saudi Arabia and so far have not been recorded from other areas. We thus find that the marine Paleogene ostracode faunas of Western India, Pakistan, Saudi Arabia and West Africa have

several taxa in common suggesting sea connections through Sahara in the Early Tertiary times as suggested by Reyment (1981) and supported by Siddiqui (1983).

The Tertiary Tethyan corridor which witnessed a large scale origin and rapid dispersal of several ostracode taxa gradually disrupted during Neogene and Quaternary and provincial faunules developed more or less independently. During Neogene, the ostracode faunas continue to be dominated by Tethyan taxa, but a number of Indo-Pacific genera like *Atjehella*, *Neomocerotina*, *Kangarina*, *Triebelina* and *Haplocytheridea* have been recorded from Kutch, Saurashtra, Bombay High and Andaman Nicobar Islands. The genus *Triebelina* which had a wide distribution in the Caribbean and Mediterranean region during Paleogene and Neogene is absent since Aquitanian from the Mediterranean. At present it is confined to warm shallow marine waters of the Indo-Pacific and Caribbean regions (McKenzie, 1967).

In the subfamily Cytherideina, the *Cyprideis*, which is holoeuryhaline, but characteristic of brackish water environments had a cosmopolitan distribution. The only Paleogene occurrence from India is by Jain (1980) from the Chattian of Kutch (The genus, however, is more widespread and abundant during late Pleistocene times). The genus *Miocyprideis*, which originated in Europe during the Aquitanian but now occurs more commonly in the Indo-Pacific and probably got there by active migration prior to disruption of the Tethyan corridor (McKenzie, 1967). The genus occurs abundantly in the Miocene of Western India. The genus *Gujratella* Khosla (1978) of the subfamily Hemicytherinae from the Lower Miocene of Gujarat seems to be endemic to the region. For a more exhaustive review of the paleozoogeographic distribution of the Cenozoic ostracoda a reference may be made to the work by McKenzie (1967).

Insofar as the paleozoogeographic implications of the Tertiary nonmarine ostracoda are concerned, a reference may be made to the work of Bhatia and Rana (1984) who described an interesting Late Cretaceous-Paleocene assemblage from the Inter-Trappean beds of Nagpur area in Peninsular India. The ostracode fauna which is largely endemic at the specific level comprises *Paracyprretta jonesi* (a new species), *Mongolianella hislopi*, *Candoniella* sp. and *Cyprois* sp. (all Cyprididae) and the Cytherid, *Metacypris strangulata*. The occurrence of the Ethiopian genus *Paracyprretta* and of the Laurasian genera *Mongolianella* and *Candoniella* suggests either the close proximity of the Indian Plate and the African and Laurasian continents or dispersal via the Afghanistan-Iranian Plate during the Upper Cretaceous-Paleocene transition period. As pointed out by Bhatia and Rana (1984), the paleogeographic

distribution of Inter-Trappean ostracodes (and Charophytes) is in harmony with that of pelobatid frogs and other vertebrates as envisaged by Sahni *et al.* (1982), but then, again inconsistent with the paleogeographic reconstruction of the Indian Plate based on geophysical data which envisages a rapidly northward drifting Indian Plate isolated from other contiguous landmasses.

QUATERNARY

The Late Neogene and Pleistocene freshwater ostracodes of the Siwalic Group are known through the works of Bhatia and Khosla (1967) and of Mathur (1972, 1977). While the Chinji fauna is dominated by Cypridids, the Tatrot and Pinjore faunas contain several taxa of Candonids besides Cypridids, Cytherids and Darwinulids. The Pleistocene faunas of the Karewa and terrace deposits of Spiti are perhaps the most thoroughly documented of all the fossil freshwater ostracode faunas of India through the works of Bhatia (1968, 1969), Singh (1969, 1970, 1973, 1974a, b), Jain *et al.* (1969) and Singh *et al.* (1982). The Karewa fauna is dominated by Holarctic taxa, though several Ethiopian and Oriental taxa also occur. The faunas not only confirm the lacustrine origin of the greater part of the Upper Karewa sediments, but also helps in delimiting precisely the deeper and shallower parts of the basin (*vide* Singh, 1973). In contrast to the affinities of the Karewa ostracodes, the Late Pleistocene ostracode faunas of the Indo-Gangetic Plain are dominated by Ethiopian and Oriental taxa. The occurrence of the Recent Palearctic/Ethiopian taxon *Microdarwinula* in the fossil state in the late Pleistocene tufa deposits in Hoshiarpur poses interesting paleozoogeographic problems. Similarly, Bhatia (1983) has postulated possible dispersal routes of *Cyprinotus cingalensis* and *Strandesia spinifera* based on hitherto known fossils and recent occurrences. The existence of brackish-water/saline lakes/marshes in parts of Haryana in the Punjab Basin during Late Pleistocene is evident by the presence of *Cyprideis torosa* and *Pseudoepionides* (a brackishwater foraminifer) in several samples. For a detailed account of the paleozoogeographic implications of the Quaternary ostracoda of the Indo-Gangetic Plain, a reference may be made to work of Bhatia (1983). The Recent freshwater ostracode taxa are also fairly well documented and over 44 taxa are known from the Indo Gangetic Plain and over 61 from the Peninsular India. Though the recent faunas are dominated by Ethiopian/Oriental taxa, they show a greater tendency towards endemism. The recurrence of closely related homeomorphic genera *Sclerocypris* Sars and *Bharatocypris* Battish in Rajasthan, Kutch and Punjab suggests adaptative evolution in more recent times (*vide etiam* Battish, 1978; Bhatia, 1983).

Insofar as the Recent marine ostracoda of the

Indian subcontinent (Arabian Sea) and their distribution patterns are concerned, a reference may be made to the comprehensive works of Jain (1977, 1978, 1981) and Bhatia and Kumar (1979). Of the 130 and odd currently recognised living podocopid ostracode taxa from the Arabian Sea and the adjoining areas, large majority appear to be endemic to the Arabian Gulf, the Red Sea, the East African Coast and the West Coast of India. A few species are definitely related to, and are even conspecific with the Mediterranean and Indo-Pacific and West Australian species. Some characteristic endemic taxa include *Henryhowella* (*Neohenryhowella*) *hartmani*, *Carinocythereis* (*Carinocythereis*) *batei*, *C.* (*Tanodonella*) *indica*, *Chrysocythere keiji*, *Moosella striata*, *Vijaiella mandviensis*, *Alocopocythere reticulata*, *Jainella karwrensis*, *Keijella neali*, *Lankacythere coralloides* and *Basslerites liebau*. It is also interesting to note that two new taxa described by Jain (1978) viz. *C.* (*T.*) *indica* and *V. mandviensis* from the West Coast of India, show close resemblance to, and affinities with, *Hillermannicythere bassiouni* and *Australimoosella liebau* respectively, described by Hartmann (1978) from the West Coast of Australia.

It is also interesting to note that the lineages of several living taxa e. g. *Alocopocythere reticulata* (and its subspecies), *Actinocythereis scutigera*, *Henryhowella* (*Neohenryhowella*) *hartmanni*, *Callistocythere flavidofusca intricatoides*, *Cyprideis mandviensis*, and others can be traced to several Paleogene and Neogene Tethyan taxa which evolved and diversified in the Tethyan corridor and subsequently migrated east and southeast wards in Quaternary times.

As against the above surmise, the close affinity/identity of several Arabian Sea taxa with the Cenozoic and Recent taxa from Indonesia and adjoining regions viz. *Tanella gracilis*, *Carinocythereis* (*C.*) *hamata*, *Cytherella* cf. *punctata*, *Neomonoceratina uelicata*, *Bradleya telisaensis*, *Caudites javana*, *Atjehella simplicata* and possibly also *Hemicytherura videns aegyptiaca* and several species of *Xestoleberis* and *Loxoconcha* suggests a westward migration of these taxa via the more northerly equatorial current, as opined by Bate (1971).

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