

A NOTE ON OCCURRENCE OF OSTRACODES FROM THE VASTAN LIGNITE MINE, GUJARAT

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ABSTRACT

Five species of ostracodes are recorded from greenish-grey, whitish clay/marl within coal/lignite seam horizon II of the Vastan lignite mine, Gujarat. The ostracodes recorded are: *Alocopocythere abstracta* Siddiqui, *Acanthocythereis vastanensis* n.sp., *Cytherella kimensis* n.sp., *Neocyprideis suratensis* n.sp. and *Phlycetenophora meridionalis* (Lyubimova and Mohan). The above ostracode assemblage suggests an early Eocene age and sediments were deposited in a marginal marine to very shallow marine environment. The ostracode taxa are systematically described and illustrated.

Key words: Ostracodes, early Eocene, Vastan Lignite, Gujarat

INTRODUCTION

The Vastan lignite mine is situated 60 km NE of Surat and 29 km ENE of Kim town (fig. 1, latitude 21°25'47" and longitude 73°06'30"E). The lignite in this area is mined by Gujarat Industrial Power Corporation. It is excavated in nearly 10 km and mined up to 110m depth. Little is known about age and depositional environment of the Vastan lignite sequence of Gujarat. In order to date and understand the depositional environment of lignite seams, a detailed systematic biostratigraphic study was carried out. Two of us (Hukam Singh and R.S. Rana) collected 13 samples from grey-greenish-white clay/marl beds within the coal/lignite seam. Of these, 9 samples have yielded Ostracoda (fig. 1). They are briefly described and illustrated in Pl. I. All the illustrated specimens are deposited in the museum of Paleontology Lab., Keshava Deva Malaviya Institute of Petroleum Exploration, Oil and Natural Gas Corporation Limited, Dehradun and references to them are designated by catalogue nos. IPE/04/9051-9063.

PREVIOUS WORK

The Palaeogene sediments of the Vastan lignite mine are poorly fossiliferous. However, equivalent sediments in the subsurface of the Cambay Basin are relatively fossiliferous. The Paleogene Ostracoda and foraminifera of the Cambay Basin have been studied in detail. Important contributions are: Raju *et al.* (1970), Pandey and Nath (1974), Datta (1964), Datta and Mehrotra (1964), Guha (1965, 1974), Mohan (1982), Bhandari *et al.* (1991), Bhandari (1998), Bhandari and Raju (1991, 2000) and Singh and Porwal (1999).

STRATIGRAPHY

The Paleogene strata in this area rest on Deccan Trap basalt which is exposed in the eastern margin. This is followed by the Vagadkhol Formation which is overlain by alternating lignite seam and greenish-grey-whitish clay and marl equivalent to the Cambay Shale Formation. This in turn is overlain by the nummulitic limestone and marl of the Amrawati Formation. The topmost part is variegated color bentonitic clay overlain by black soil.

Table 1. Generalized stratigraphy of the Vastan lignite mine.

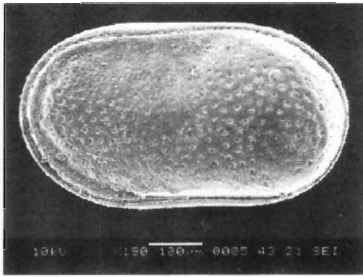
Formation	Lithology	Age
Alluvium/ Black soil	Soil and recent alluvium	Recent and Sub recent
Amarawati	Nummulitic limestone and marl, calcareous bentonitic variegated clay, unfossiliferous	Late Eocene
Cambay Shale	Greenish grey, whitish clay and marl, black and brown fissile shale, clay and marl with carbonaceous zone including lignite seam with vertebrate, invertebrate, plant, pollen and spore fossils.	Early Eocene
Vagadkhol	Variegated clay	Paleocene-Early Eocene
Deccan Trap	Basalt	Late Cretaceous

AGE

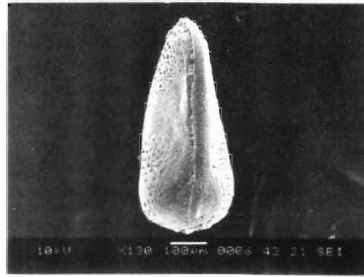
1. The ostracode fauna of the Vastan lignite comprises of 5 taxa. Of these, *Alocopocythere abstracta* is the most characteristic taxon, recorded by Siddiqui (1971) from Pakistan and it is restricted to early Eocene. This species has been recorded subsequently from early Eocene of Kutch, (Khosla and Pant, 1982), Himachal Pradesh (Bhatia and Bagi, 1990), Himachal and Garhwal Himalayas (Juyal and Mathur, 1990), Cambay Basin (Bhandari *et al.*, 1991) and Jaisalmer Basin (Bhandari, 1995).
2. Three taxa namely *Acanthocythereis vastanensis*, *Cytherella kimensis* and *Neocyprideis suratensis* are new.
3. One taxon *Phlycetenophora meridionalis* (Lyubimova and Mohan) is ranging from early Eocene to early Miocene.
4. The presence of *Alocopocythere abstracta* Siddiqui and *Nummulites burdigalensis* suggest an overall early Eocene age for the Vastan lignite sequence (=Cambay Shale Formation).

PALAEOECOLOGY

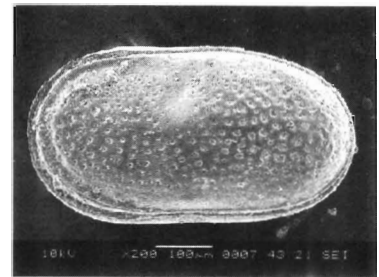
The paleoecology of the lignite seam is deduced on the basis of evidence furnished by ostracodes. The most dominant ostracode taxon in this assemblage is *Neocyprideis* which



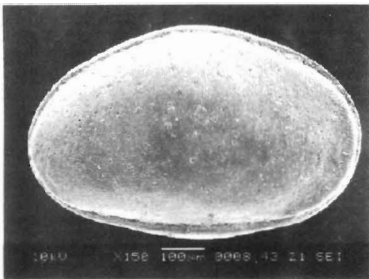
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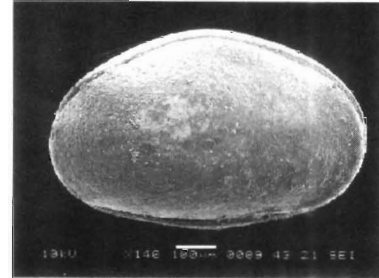
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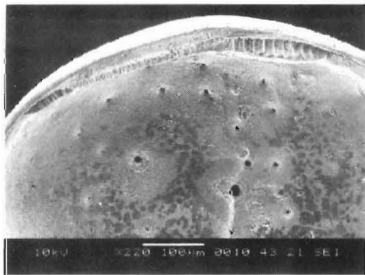
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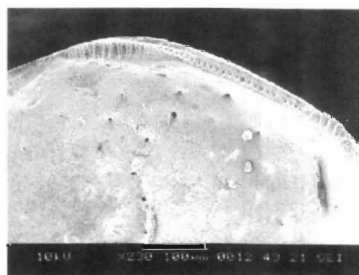
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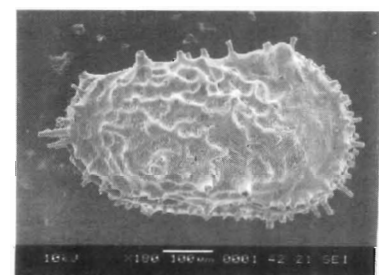
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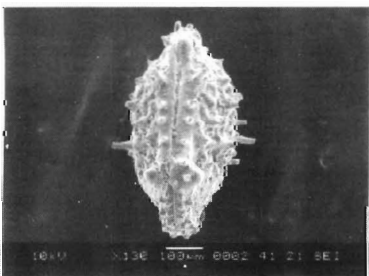
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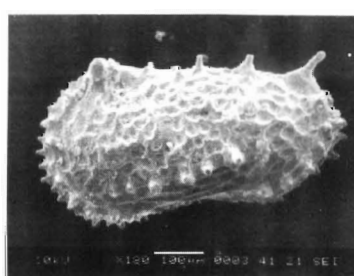
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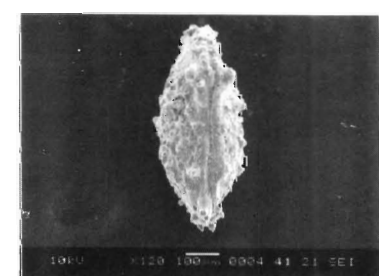
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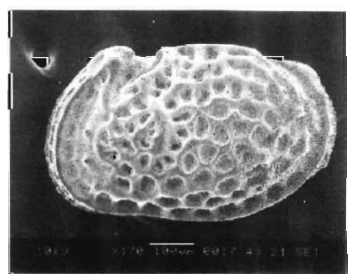
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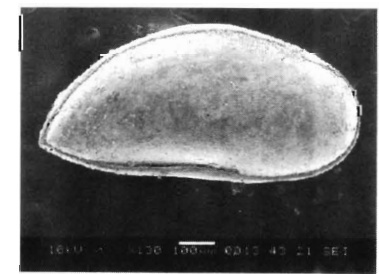
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Description: Carapace subrectangular in lateral view with greatest height anteriorly; right valve larger than left valve, overlapping along all margins; anterior margin obliquely rounded with anterior marginal rim; posterior margin narrow; in male carapace posterodorsal is sloping while in females it is rounded; dorsal and ventral margins nearly straight. Valve surface punctuate; a broad shallow depression anterior to middle; in dorsal view anterior margin compressed; posterior inflated and maximum width posteriorly.

<i>Dimensions (mm)</i>	Length	Height	Width
Holotype (IPE/H02/04/9051), a female carapace	0.58	0.30	0.26
Paratype (IPE/P02/04/9052), a male carapace	0.58	0.28	0.24

Discussion: *Cytherella kimensis* n.sp. resembles *Cytherella pandeyi* Bhandari, 1995, described from the early Eocene of Rajasthan in overall shape and ornamentation pattern. Unlike present species, *C. pandeyi* Bhandari, is subovate in lateral view, greatest height has a little two-thirds of length posterior to middle; dorsal margin asymmetrically convex.

Suborder Podocopina Sars, 1866

Superfamily Cytheracea Baird, 1850

Family Cytherideidae Sars, 1925

Subfamily Cytherideinae Sars, 1925

Genus Neocyprideis Apostolescu, 1975

Neocypridis suratensis n. sp.

(Pl. I, figs. 4-8)

Etymology: After Surat district, Gujarat.

Material: Seven hundred and fifty carapaces and thirty valves.

Type locality and horizon: About 60 km. NE of Surat and 29 km. ENE of Kim, Vastan lignite mine, sample no.3, highly fossiliferous greenish, grey clay marl, Cambay Shale Formation.

Diagnosis: Carapace ovate, subrectangular in lateral view, with greatest height near middle. Valve surface smooth.

Description: Carapace ovate, subtriangular in lateral view, with greatest height near middle; left valve larger than right valve, overlap all along margins; dorsal margin arched, sloping anteriorly and posteriorly from greatest height; ventral margin straight in right valve and convex in left valve; anterior margin broadly rounded; posterior margin less so. Valve surface smooth. In dorsal view carapace biconvex with maximum width near middle, posterior end truncated.

<i>Dimensions (mm)</i>	Length	Height	Width
Holotype (IPE/H02/04/9053) a female carapace	0.78	0.51	0.45
Paratype I (IPE/P02/04/9054) a male carapace	0.82	0.52	0.42
Paratype II (IPE/P02/04/9055) LV	0.81	0.50	-
Paratype III (IPE/PO2/04/9056) RV	0.81	0.50	-

Discussion: The present species resembles *Neocyprideis simplex* Siddiqui, 2000 described from the Rakhi Nala Section, Sulaiman Range (early Eocene) in lateral outline, but differs in details. Unlike the present species, *N. simplex* has a pitted/punctuate surface, greatest height at anterior cardinal angle and straight ventral margin.

Family Trachyleberididae Sylvester-Bradley, 1948

Genus Acanthocythereis Howe, 1963

Acanthocythereis vastanensis n. sp.

(Pl. I, figs. 9-12)

Etymology: After lignite mines Vastan, Kim, Gujarat.

Material: Twelve carapaces and two valves.

Type locality and horizon: About 60 km. NE of Surat and 29 km. ENE of Kim, Vastan lignite mine, sample no.3, highly fossiliferous greenish, grey clay marl, Cambay Shale Formation.

Diagnosis: Carapace subrectangular in lateral view, posterior margin subrounded fringed with 6-8 spines; valve surface ornamented with reticulations and superimposed by spines, ventral region has 4-5 prominent spines.

<i>Dimensions (mm)</i>	Length	Height	Width
Holotype(IPE/H02/04/9057) a female carapace	0.56	0.33	0.28
Paratype I(IPE/P02/04/9058) a female carapace	0.56	0.34	0.30
Paratype II (IPE/P02/04/9059) a male carapace	0.58	0.33	0.24
Paratype III (IPE/P02/04/9060) a male carapace	0.55	0.33	0.30

Description: Sexual dimorphism distinct, males being more elongate, higher and wider than females. Carapace subrectangular in lateral view, with greatest height anteriorly near eye tubercle; left valve slightly larger than right valve; dorsal margin straight; ventral margin concave near middle; anterior margin broadly rounded, fringed with 18-20 small spines; posterior margin subrounded, fringed with 6-8 spines;

in dorsal view carapace biconvex with maximum width posterior to middle; posterior end compressed. Eye tubercle glassy and prominent at anterior cardinal angle; subcentral tubercle distinct. Valve surface ornamented with reticulation, superimposed by spines, ventral region has 4-5 prominent spines.

Discussion: Present species resembles *Acanthocythereis retispinata*, described by Bhandari, 1992 from the late Paleocene of Jaisalmer Basin, Rajasthan, in overall shape and ornamentation. Unlike the present species *A. retispinata* tapers posteriorly, anterior end more broadly rounded, posterior end narrow and angulate, anteroventral margin sinuate and in dorsal view anterior and posterior ends very much compressed, and differs in length/height ratio.

Genus Alococythere Siddiqui, 1971

Alococythere abstracta Siddiqui 1971

(Pl. I, figs. 13-14)

Alococythere abstracta Siddiqui, 1971, p.17, pl.3, figs.5-11, pl.4, fig 1, -Bhatia and Bagi, 1990, p.28, pl.1, fig.11 – Juyal and Mathur, 1990, p.218-219, pl.2, figs.6-9. – Juyal and Mathur, 1992, p.30-32, pl. II, figs.16-20. – Bhandari, 1996, p.32, pl.8, figs.1-4.

Alococythere siddiquii Singh and Porwal, 1999, pp.107-108, pl.10, fig.4.

Material: More than 500 carapaces and 30 valves.

<i>Dimensions (mm)</i>	<i>Length</i>	<i>Height</i>	<i>Width</i>
Hypotype I (IPE/B02/04/9061) a female carapace	0.61	0.37	0.36
Hypotype II (IPE/B02/04/9062) a male carapace	0.64	0.37	0.34

Remarks: The species described as *Alococythere siddiquii* by Singh and Porwal, 1999 from Cambay-Tarpura Block is in fact conspecific with *Alococythere abstracta* and put here in synonymy.

Family Paracyprididae Sars, 1923

Genus Phlyctenophora Brady, 1880

Phlyctenophora meridionalis (Lyubimova and Mohan)

(Pl. I, fig. 15)

Paracypris meridionalis Lyubimova and Mohan, 1960, pp.23-24, pl.II, fig.3; *Paracypris gajensis* Tewari and Tandon, 1960, pp.151-152, text.fig.2, figs.3a=b; *Paracypris meridionalis* Lyubimova and Mohan, Khosla, 1972, p.484, pl.2, fig.23; - Guha, 1978, p.134

Phlyctenophora meridionalis (Lyubimova and Mohan), Khosla, 1978, pp.262, pl.2, fig.7; pl.6, fig.1; -Khosla and Nagori, 1989, p.14, - Bhandari, 1996, p.122, pl.97, figs.1-2. -Singh, 1997, p.154, pl.1, fig.4, pl.2, figs.1-3, pl.26, fig.3.

Material : Twelve carapaces and 4 valves.

<i>Dimensions (mm)</i>	<i>Length</i>	<i>Height</i>	<i>Width</i>
Hypotype (IPE/B02/04/9063)	0.89	0.44	0.37

Remarks: The present species is identical with *Phlyctenophora meridionalis* (Lyubimova and Mohan) described from the early Eocene of Rajasthan and early Miocene age strata of Kachchh, Saurashtra, Kerala and Bombay High.

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