



THE DISTRIBUTION OF THE GONDWANINE OSTRACODE GENUS *MAKATINELLA* DINGLE FROM THE BAGH FORMATION (UPPER CRETACEOUS) OF NARBADA BASIN.

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ABSTRACT The genus *Makatinella* Dingle, 1984 is strictly gondwanine in its distribution and in Southern Africa and Falkland Plateau it is restricted to Aptian to Cenomanian of Zululand. Two species of the genus reported by Dingle (1984) viz. *M. tritumida* and *M. inflata* from Zululand. The genus migrated to India during Turonian time in Jaisalmer and Narbada Basins. In Narbada Basin three species of the genus recorded viz. *M. bilthanaensis* n. sp., *M. punctata* n. sp. and *M. thutiensis* (Jain). The systematics of all the species are given in the paper.

KEYWORDS : Ostracoda, Bagh Formation, Upper Cretaceous, stratigraphy, Narbada basin

INTRODUCTION:

Dingle (1984) erected the genus *Makatinella*, with the type species *Makatinella tritumida*. The genus is characteristic element of the South Gondwana Fauna. It is a Trachyleberid genus having asymmetrically rounded anterior margin; a hinge ear in left and right valves; a subcentral tubercle; three longitudinal ribs/ reticulate to smooth valve surface.

Two species of the genus viz. *M. tritumida* and *M. inflata* were described by Dingle 1984 from Aptian to Cenomanian of Zululand. While studying the subsurface ostracodes from Cretaceous (Albian-Coniacian) of Jaisalmer Basin, Andreu *et al.*, 2007 recorded *Makatinella* sp. from Turonian. During course of study of Upper Cretaceous (Cenomanian-Coniacian) ostracode of Narbada Basin present author came across three species of the genus. These are: *M. bilthanaensis* n. sp., *M. punctata* n. sp. and *M. thutiensis* (Jain).

STRATIGRAPHY:

Marine Cretaceous rocks of Narbada valley termed as Bagh Formation occur along the edges of Deccan basalt or around inliers of Precambrian rocks as disconnected out crops from Barwaha (M.P.) in east to Rajpipla (Gujarat) in the west (Fig. 1).

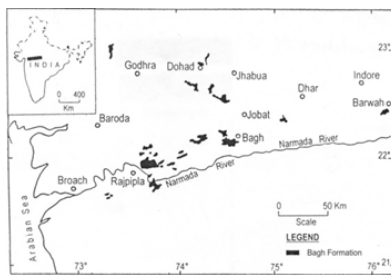


Figure 1. Outcrops of Bagh Formation along Narbada Valley (Modified after Jain, 1975)

The first geological account of Narbada Valley given by Stewart (1821). These observations have been summarized by Carter (1857). Later on Blanford (1869) gave a comprehensive geological account of the region. After this several stratigraphical classifications (Bose 1884; Murty *et al.*, 1963; Poddar 1964; Sastry and Mangain 1971; Dassarma and Sinha 1975; Guha 1976 and Chiplonkar *et al.*, 1977) has been proposed. However, among the all, the most widely accepted classification is the one proposed by Bose (1884).

Classification proposed by Bose (1884):

Upp. Cretaceous	<ul style="list-style-type: none"> Deccan Traps Lametas (Lacustrine) Coralline Limestone Deola-Chirakhani Marl Nodular Limestone 	} Bagh Beds
Lr. Cretaceous (Neocomian)	— Nimar Sandstone	
Jurassic	— Mahadevas	
	— Vindhyan	
	— Bijawars	
	— Metamorphics	

The marine exposures in the eastern part of Narbada valley are lithologically quite different to those of western part of the river valley. Thus on this basis, these marine formations, broadly divided into two main regions. 1. Eastern exposures 2. Western exposures.

Present author during course of study of ostracodes from this formation, carried out detailed sampling from Ratitalai, Hanumanpura (eastern exposures) and Bilthana (western exposure) localities in Narbada valley (Fig.2).

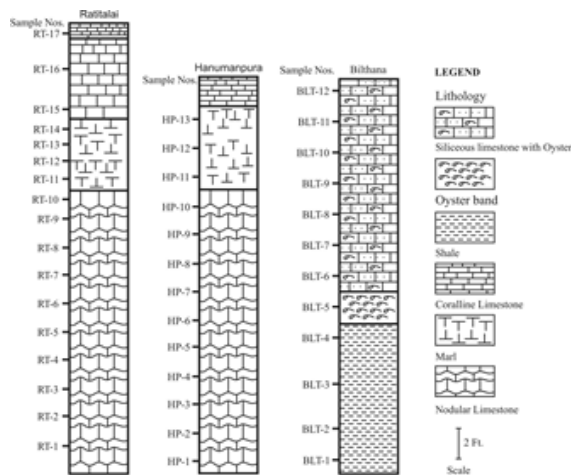


Fig.2: Stratigraphic columnar sections of Upper Cretaceous, Bagh Formation at Ratitalai, Hanumanpura and Bilthana localities.

PALEOBIOGEOGRAPHY:

So far restricted occurrence of composition of Cenomanian ostracode assemblages from Austral Bioprovince, the genera Arculicythere, Rostrocytheridea, Makatinella, Majungaella are remnants from the Early Cretaceous.

The genus *Makatinella* was until known considered to be an endemic in South Africa (inshore and offshore) and known from the Aptian to Cenomanian (Dingle, 1984, 1996). The genus has also been reported by Andreu *et al.*, 2007 from Turonian of Jaisalmer Basin and three species of the genus present in the Bagh Formation (Turonian-Coniacian).

Marine transgression took place in the Bagh area as well as in Jaisalmer Basin, Rajasthan during Cenomanian period (about-100 Ma). This was the period when India and Madagascar was joined together and was also not much far away from Eastern and Southern part of Africa. Due to this reason many ostracode taxa which inhabits in these different basins migrated from one basin to another via through continental margins. (Babinot and Colin 1992).

Repository: All the described specimens are deposited in the micropaleontology laboratory, Department of Geology, Mohanlal Sukhadia University, Udaipur.

SYSTEMATICSSubclass **Ostracoda** Latreille, 1806Order **Podocopida** Müller, 1894Suborder **Platycopina** Sars, 1866Family **Trachyleberididae** Sylvester-Bradley, 1948Genus **Makatinella** Dingle, 1984***Makatinella bilthanaensis* n. sp.**

Plate 1, figures 1-4

Name: After village Bilthana (Rajpipla) Gujarat.*Material:* 135 carapaces and 6 valves.*Type level and locality:* Sample No. BLT-10, Siliceous Limestone with Oyster, Bagh Formation, Upper Cretaceous, Bilthana (Rajpipla), Gujarat.

Diagnosis: Carapace elongate, subtrapezoidal in lateral outline; left valve larger than right valve, overlapping distinctly along anterior cardinal angle and posterior margin. Anterior margin subrounded, with minute spines, posterior margin subangulate. Dorsal margin undulating, ventral margin concave in the middle. Valve surface marked by a high anterior and posterior marginal ridge. A depression in front of anterior and posterior region. Surface marked with three ridges, of which dorsal ridge runs parallel to margin and curves down at posterior cardinal region and joins median ridge, median ridge runs from anteromedian region to slight away to mid-posterior part, a ventral ridge nearly parallel to median ridge, runs away from ventral margin, both median and ventral ridges joined anteriorly and posteriorly by short vertical ridges forming a loop shape. Surface of each valve smooth to punctate.

Inner lamella wide along anterior and narrow along posterior margins. Selvage peripheral. Hinge amphidont/heterodont, in right valve it consists of an anterior stepped tooth followed by an anteromedian socket, a long median groove and a posterior tooth. Hinge complementary in left valve.

<i>Dimensions (mm)</i>	<i>Length</i>	<i>Height</i>	<i>Width</i>
Holotype (No. 1373), a male carapace	0.71	0.29	0.27
Paratype I (No. 1374), a female carapace	0.58	0.28	0.28
Paratype II (No. 1375), a male carapace	0.66	0.29	0.27
Paratype III (No. 1376), a male right valve	0.65	0.26	--

Discussion: *Makatinella bilthanaensis* n. sp. closely resembles with *Makatinella* sp., reported by Andreu et al., 2007, from Turonian of Jaisalmer basin in overall shape but it clearly differs in the median and ventral ridge pattern.

***Makatinella punctata* n. sp.**

Plate 1, figures 5-8

Name: From Latin word *punctus*, meaning dotted; with reference to its surface ornamentation.*Material:* 89 carapaces and 10 valves.*Type level and locality:* Sample No. RT-12, Marl, Bagh Formation, Upper Cretaceous, Ratitalai village, Dhar District, Madhya Pradesh.

Description: Carapace elongate, subrectangular in lateral view; dorsal margin straight; ventral margins slightly concave in the middle; anterior margin obliquely rounded with extremity below mid-height, posterior narrowly rounded in left valve, subangulate in right valve. Left valve larger than right valve, overlapping distinctly along dorsal, posterodorsal and ventral margins. Maximum height anteriorly, maximum length medially; in dorsal view ends compressed; maximum width behind middle. Anterior marginal rim broad, with a furrow behind it, posterior marginal rim somewhat narrow. Surface of each valve covered with fine pits.

Inner lamella wide along anterior and posterior margins, narrow along ventral margin. Selvage peripheral. Hinge in left valve consists of an anterior socket, followed by an anteromedian tooth, a long median bar and then a posterior socket. Hinge complementary in right valve.

<i>Dimensions (mm)</i>	<i>Length</i>	<i>Height</i>	<i>Width</i>
Holotype (No. 1377), a female carapace	0.60	0.30	0.32
Paratype I (No. 1378), a male carapace	0.69	0.29	0.30
Paratype II (No. 1379), a female carapace	0.63	0.28	0.32
Paratype III (No. 1380), a female left valve	0.63	0.28	--

Remarks: *Makatinella punctata* n. sp. resembles closely with *Makatinella thuatiensis* (Jain, 1975), in overall shape, but clearly differs in having punctate surface ornamentation only. However, in the later species ribs along with faint pits are present.

***Makatinella thuatiensis* (Jain)**

Plate 1, figures 9-10

Leniocythere? thuatiensis Jain, 1975, p. 208, pl. 3, figs. 42 a-b.*Material:* 38 carapaces and 3 valves.

Diagnosis: Carapace elongate, subrectangular in lateral outline. Dorsal margin straight, ventral margin nearly straight, except in the middle. Anterior and posterior margins broadly rounded in left valve, in right valve posterior margin subangulate. A high anterior marginal rim, a deep sulcus in front of it. Surface of each valve with fine pits and three indistinct low longitudinal ridges, one each in dorsal, median and ventral regions. Dorsal ridge short, runs from mid dorsal region to postero-dorsal region; median ridge long, thin in posterior region and thickened in anterior region, forming a knob; ventral ridge thin and joined anteriorly and posteriorly to median ridge. Inner lamella moderately wide along anterior and posterior margins, narrow along ventral margin. Hinge amphidont.

<i>Dimensions (mm)</i>	<i>Length</i>	<i>Height</i>	<i>Width</i>
A male carapace (No. 1381)	0.74	0.31	0.28
A male right valve (No. 1382)	0.77	0.31	--

Remarks: Present specimens recorded herein are identical with *Leniocythere? thuatiensis* (Jain, 1975) described from Coniacian of Bagh Formation. The present species is herein transferred to the genus *Makatinella* Dingle on the basis of surface characters. The species can no longer be placed in *Leniocythere*, which is typical genus of Laurasia, and hence its assignment in the genus *Makatinella* is more appropriate.

PLATE 11-4 *Makatinella bilthanaensis* n. sp.

- 1, holotype (No. 1373), a male carapace, right valve view, x98;
- 2, paratype I (No. 1374), a female carapace, right valve view, x117;
- 3, paratype II (No. 1375), a male carapace, dorsal view, x109;
- 4, paratype III (No. 1376), a male right valve, 3, internal view, x111.

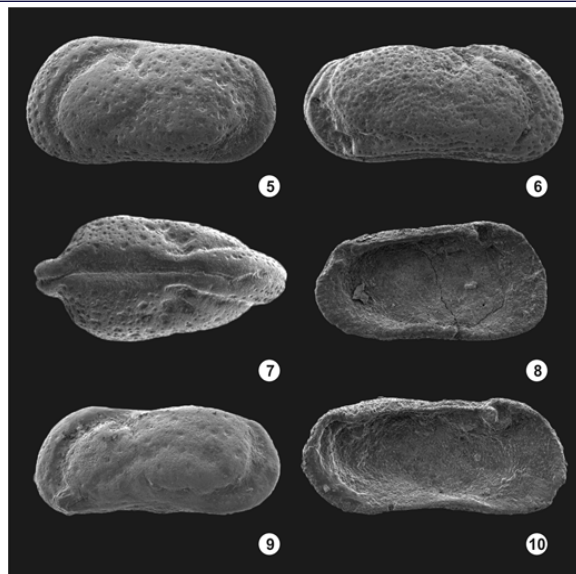
5-8 *Makatinella punctata* n. sp.

- 5, holotype (No. 1377), a female carapace, left valve view, x112;
- 6, paratype I (No. 1378), a male carapace, right valve view, x103;
- 7, paratype II (No. 1379), a female carapace, dorsal view, x109;
- 8, paratype III (No. 1380), a female left valve, 9, internal view, x101.

9-10 *Makatinella thuatiensis* (Jain)

- 9, a male carapace (No. 1381), left valve view, x90;
- 10, a male left valve (No. 1382), internal view, x93.

PLATE - 1



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REFERENCES

1. Andreu, B., Colin, J. P. and Singh, J. 2007. Cretaceous (Albian to Coniacian) ostracodes from the subsurface of the Jaisalmer Basin, Rajasthan, India. *Micropaleontology*, vol. 53, no. 5, pp.1-26, text-figs. 1-6, pl. 1-10.
2. Babinot, J. F. and Colin, J. P. 1992. Marine ostracode provincialism in the Late Cretaceous of the Tethyan realm and the Austral Province. *Palaeobiogeography, palaeoclimatology, palaeoecology*, vol. 92, pp. 283-293.
3. Blanford, W. T. 1869. On the geology of the Taptee and Lower Narbada valleys and some adjoining Districts. *Memoirs of the Geological Survey of India*, vol. 6, no. 3, pp. 163-384.
4. Bose, P. N. 1884. Geology of the Lower Narbada valley between Nimavar and Kawant. *Memoirs of the Geological Survey of India*, vol. 21, no. 1, pp. 1-72.
5. Carter, H. J. 1857. Neocomian fossils from Bagh and its neighbourhood presented by Lt. R. H. Keating in "On the Contributions to the Geology of Central and Western India. *Journal Bombay British Royal Asiatic Society*, vol. 5, pp. 614-638.
6. Chiplonkar, G. W., Badve, R. M. and Ghare, M. A. 1977. On the stratigraphy of Bagh Beds of the Lower Narbada Valley. *Proceedings of the 4th Indian Colloquium Micropaleontology and Stratigraphy*, pp. 209-216.
7. Dassarma, D. C. and Sinha, N. K. 1975. Marine Cretaceous Formations of Namada Valley, Bagh Beds, Madhya Pradesh and Gujarat. *Memoirs of the Geological Survey of India, Palaeontologia Indica*, new series, vol. 42, pp. 1-106.
8. Dingle, R. V. 1984. Mid-Cretaceous ostracoda from southern Africa and the Falkland Plateau. *Annals of the South Africa Museum, Cape Town*, vol. 93, part 3, pp. 97-211.
9. Dingle, R. V. 1996. Cretaceous ostracoda of the SE Atlantic and SW Indian Ocean a stratigraphical review and atlas. In: JARDINE, S.; de Klasz, I.; de Debenay J. P. (eds.), *Géologie de L'afrique et de L'atlantique Sud.- Bulletin des Centres de Research Exploration-Production Elf-Aquitaine, Mémoire 16*, Pau, pp. 1-17.
10. Guha, A. K. 1976. A lithostratigraphic classification of the Bagh Group (Beds), Madhya Pradesh. *Proceedings 6th Indian Colloquium on Micropaleontology and Stratigraphy*, Department of Geology, Banaras Hindu University, Varanasi, pp. 66-76.
11. Jain, S. P. 1975. Ostracoda from the Bagh Beds (Upper Cretaceous) of Madhya Pradesh. *Geophytology*, vol. 5, no. 2, pp. 188-212.
12. Murty, K. N., Rao, R. P., Dhokariker, B. G. and Verma, C. P. 1963. On the occurrence of plant fossils in Nimar sandstone near Umralli, Dt., Jhabua, Madhya Pradesh. *Current Science*, vol. 32, no. 1, pp. 21-22.
13. Poddar, M. C. 1964. Mesozoic of western India – their geology and oil possibilities. *Indian Geological Congress, 22nd session*, pp. 126-143.
14. Sastry, M. V. A. and Mungain, J. D. 1971. The marine Mesozoic Formations of India - A review. *Records of the Geological Survey of India*, vol. 101, no. 2, pp. 162-177.
15. Stewart, J. 1821. Geological notes on the strata between Malwa and Guzerat. *Transactions of Literature Society of Bombay*, vol. 3, pp. 538-541.