

A NEW SPECIES OF THE MARKER CHRYSALIDINID FORAMINIFER *RIYADHELLA* FROM THE UPPER JURASSIC OF JAISALMER, WESTERN INDIA

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ABSTRACT

A new species *Riyadhella redmondi* is created to accommodate the youngest species in the lineage of marker Middle-Late Jurassic chrysalidinid foraminiferal genus *Riyadhella* Redmond (1965) recovered from the Rupsi Shale of Jaisalmer, western India. Kimmeridgian age has been assigned to the new species in view of its association with age-diagnostic ammonite assemblage of *Torquatisphinctes-Pachysphinctes*.

Key words: Foraminifera, Jaisalmer Formation, Upper Jurassic, *Riyadhella*.

INTRODUCTION

The agglutinated foraminiferal assemblage of *Pseudomarssonella* and *Riyadhella* was first documented by Redmond (1965) from the Late Bajocian - Early Callovian sequences of Saudi Arabia and utilized for dating, zonation and correlation on a regional scale. These seemingly highly provincial foraminifers have subsequently been documented from Bathonian-Callovian sequences of western India by Garg (1983), Garg and Singh (1983); Mandwal and Singh (1989, 1993a, b) and Mandwal (1993). Banner, Simmons and Whittaker (1991) have recently made an extensive taxonomic revision of the Redmond's Saudi Arabian type material and have placed these two genera into the sub-family Paravalvulininae under the family Chrysalidinidae. According to them, *Riyadhella* Redmond, 1965; *Pseudoeggerella* Septfontaine, 1988 and *Eomarssonella* Lavina, 1972 are synonymous. Out of the eight species of *Riyadhella*, erected by Redmond (1965), Banner *et al.* (1991) maintained only four viz. *R. elongata*, *R. arabica*, *R. inflata*, and *R. regularis*, whereas *R. intermedia*, *R. nana*, and *R. hemeri* are considered by them to be conspecific with *R. regularis*. Close morphological similarity between *R. regularis* and *R. intermedia* and their possible conspecific status had earlier been also noted by Garg and Singh (1983). Banner *et al.* (1991) further mentioned an unnamed species of

Riyadhella in random thin sections of the Kimmeridgian Arab Zone Limestone of Qatar. A new species of *Riyadhella* is described herein from the Upper Jurassic (Kimmeridgian) sequence of Jaisalmer, western India (fig. 1).

Material for the present study was collected from the Rupsi Shale Member of the Baisakhi Formation. The Rupsi Shale consists of a thick shale-sandstone sequence (fig.2) exposed in a scarp section in the vicinity of Rupsi, near Jaisalmer,

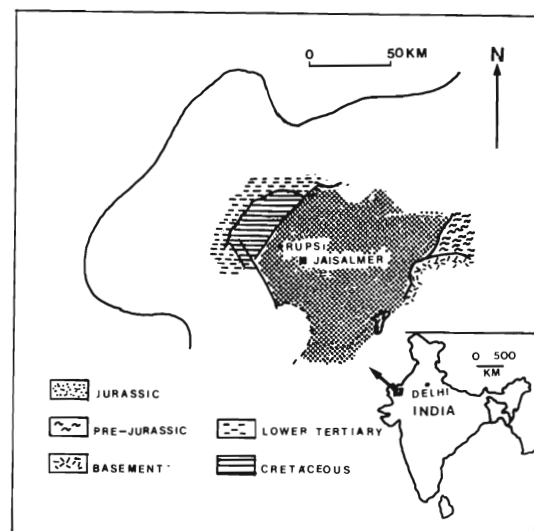


Fig. 1. Generalized geological map of Jaisalmer area (adapted from Datta, 1983).

western India (fig.1). The foraminiferal fauna is recovered from gray carbonaceous-micaceous silty shale (sample nos. JR3a, JR3b) and the overlying grey sandy shales containing ferruginous-ocherous nodules enclosing ammonites, often completely filled with gypsum (Sample JR4). The lower shale bed contains dominantly *Bathysiphon-Rhabdammina-*

Rhizammina Association characterized by coarse to very coarse agglutination, twisting and distortion in tests. It is succeeded by a simple agglutinated foraminiferal fauna belonging to *Trochammina-Reophax-Ammobaculites* Association characterized by high species diversity and individual richness. However, occurrence of rare moulds of

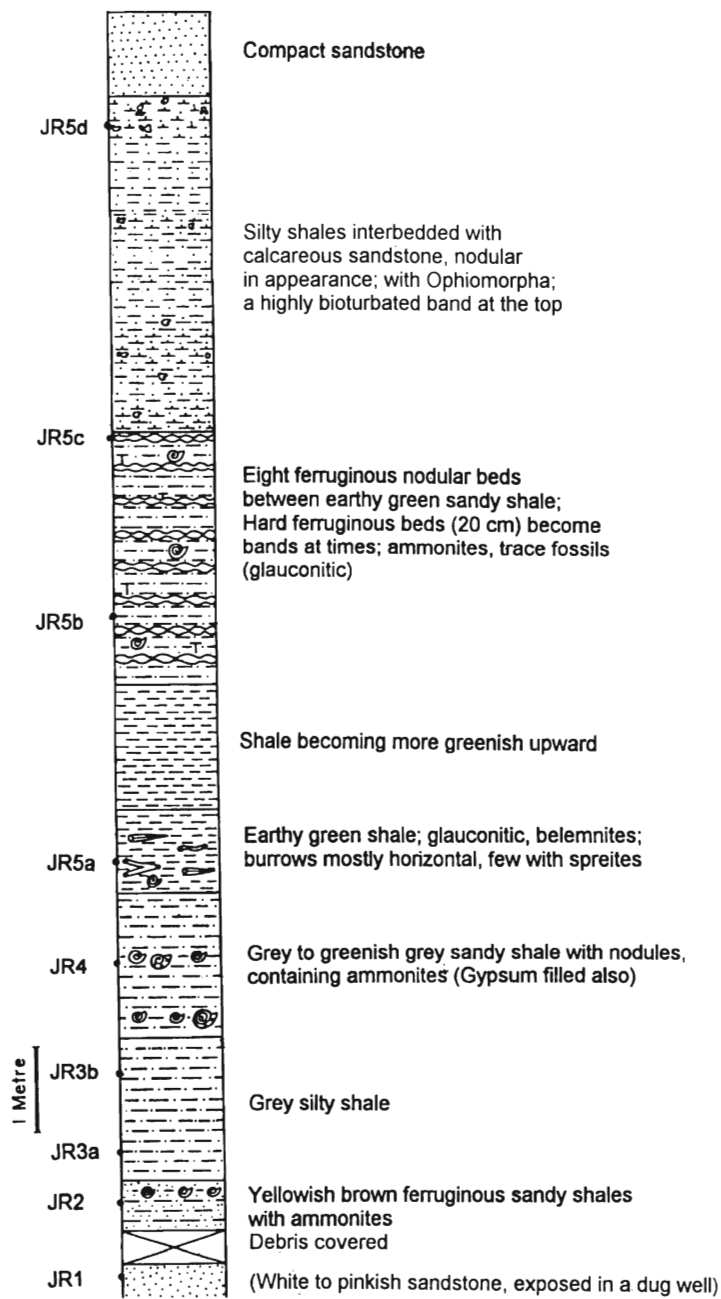


Fig. 2. lithologic column exposed in the Rupsi scarp section.

polymorphinids and lenticulinids is suggestive of some degree of post-depositional dissolution of calcareous tests. The specimens of *Riyadhella* were recovered from both these levels; however, those from samples JR3 commonly show evidences of distortion/compression of the tests.

SYSTEMATIC PALAEOONTOLOGY

Order **Foraminiferida** Eichwald, 1830

Suborder **Textulariina** Delage and Herouard, 1896

Superfamily **Textulariaceae** Ehrenberg, 1838

Family **Chrysalidinidae** Neagu, 1968

Subfamily **Paravalvulininae** Banner, Simmons & Whittaker, 1991

Genus ***Riyadhella*** Redmond, 1965 emended Banner *et al.* 1991

Riyadhella redmondi n. sp.
(Pl. I, figs.1-13)

Material: 26 specimens.

Derivation of name : This species is named in honour of the late Dr. Charles D. Redmond, for his valuable contribution to the study of the Jurassic foraminifera from Saudi Arabia.

Diagnosis: A species of *Riyadhella* having an elongate, sub-cylindrical test, subtriangular in cross-section, with a short, broadly conical, quadriserial initial stage of 2 to 3 whorls and more than twice to thrice longer triserial stage very gradually increasing in breadth; chambers in the triserial stage are slightly inflated, giving a faintly lobulate outline; chamber of the final whorl more than twice to thrice higher than broad, much larger and inflated than those of the previous whorls; aperture an interiomarginal slit.

Holotype: LUGM JF 679.

Paratype: LUGM JF 678-680.

Description: Test elongate, slender, subcylindrical with a faintly lobulate outline, broadly tapered at the base, subtriangular in cross-section; early stage short, trochospiral with 4 to 5 chambers to a whorl, followed by a well developed triserial stage with faintly to distinctly lobulate outline. Chambers numerous, small and short in the initial whorl, increasing very gradually in size as added, initial whorl reduced to quadriserial stage in the subsequent 2-3 whorls, followed by slightly inflated triserially arranged chambers in 5 to 6 whorls, increasing more in height than breadth as added, the break-off stage between quadriserial and twice to thrice longer triserial portion of test often quite distinctive; chambers of the final whorl distinctly higher than broad, more inflated, broadly triangular to subtriangular in shape. Intercameral sutures straight and parallel or oblique to slightly curved, slightly depressed. Wall simple, finely agglutinated, smoothly finished and non-canalliculate. Aperture interiomarginal, a low umbilical to extraumbilical slit lying between a swollen apertural face.

Variations: Variations are noted in the development of the initial trochoid stage which may be broadly rounded or sharply conical. The test often shows some twisting along its axis. Distorted or flattened tests are also found, possibly because of their relatively fragile nature and post-depositional deformation during preservation.

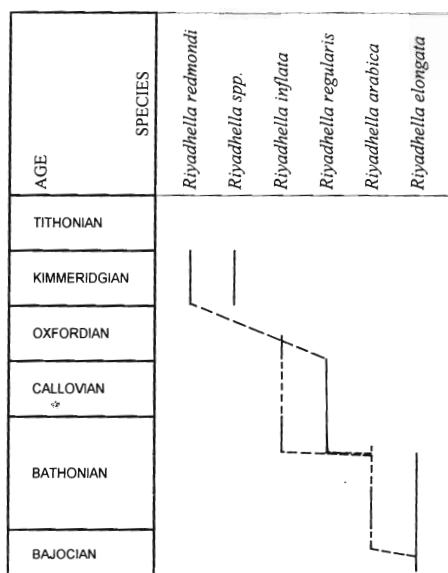


Fig. 3. Global stratigraphic ranges and probable lineage of *Riyadhella* species.

| SAMPLE NO. | AMMONITE ASSOCIATION | AGE | FORAMINIFER ASSOCIATION |
|------------|---|-----------------|---|
| JR5a-d | <i>Hildoglochiceras-Aulacosphinctoides</i> | LOWER TITHONIAN | Rare |
| JR4 | <i>Torquatisphinctes</i> <i>Pachysphinctes</i> | KIMMERIDGIAN | <i>Trochammina-Reophax-Ammobaculites Association</i> |
| JR3a-b | No Ammonites | | <i>Bathysiphon-Rhabdammina-Rhizammina Association</i> |
| JR2 | <i>Torquatisphinctes</i> | | Rare |

Fig. 4. Correlation of Ammonite and Foraminiferal Assemblages in the Rupsi Shale.

Dimensions:

| | |
|--------------------------|-------------------------|
| Holotype | Range |
| | (Based on 10 specimens) |
| Length of test: 0.48 mm | 0.40 mm to 0.48 mm |
| Breadth of test: 0.16 mm | 0.14 mm to 0.18 mm |

Remarks: *Riyadhella redmondi*, n. sp. is distinguished from all other species of *Riyadhella* by its subtriangular cross-section and very high and inflated chambers in the last whorl. *R. regularis* somewhat resembles *R. redmondi* but differs in having subcircular cross-section in axial view and a low flattened apertural face. *R. inflata* displays inflated chambers but is distinguished by its characteristically equal length/breadth ratio of chambers.

Species of *Riyadhella* have very short stratigraphic ranges (fig.3). Majority of the species are confined to the Upper Bajocian - Callovian interval. Morphologically, *R. redmondi* displays mixed characters of *R. regularis* and *R. inflata* and appears to have evolved from either of the two species. A detailed morphological study of *Riyadhella* sp. reported by Banner *et al.* (1991) in thin sections from Kimmeridgian of Qatar would shed light on the true nature of its linkage with *R. redmondi* and the older suite of *Riyadhella* species.

Locality and horizon: Sample JR4, gypseous grey sandy shale, Rupsi Shale Member, Jaisalmer Formation, Kimmeridgian. Rupsi village, northwest of Jaisalmer, western Rajasthan, India.

AGE AND AFFINITY

Among the predominantly agglutinated foraminiferal assemblage of the Rupsi Shale, *Trochammina quinqueloba*, a common element of the *Trochammina - Reophax - Ammobaculites* Association, has stratigraphic significance. This species is known to date only from Kimmeridgian - Tithonian sequences (Gradstein, Gibling, Jansa, Kaminskli, Ogg, Sarti, Thurov, von Rad and Westermann, 1989; Gradstein, Gibling, Sarti, von Rad, Thurov, Ogg, Jansa, Kaminski and Westermann, 1991).

However, the association of ammonite fauna provides a firm basis for precise dating of the Rupsi Shale sequence (fig. 4). The *Bathysiphon - Rhabdammina - Rhizammina* Association overlies a moderate ammonite assemblage of small perisphinctins referable to *Torquatisphinctes*, closely resembling *Perisphinctes* sp. of Fatmi (1972) recorded from northwestern Pakistan. This assemblage suggests Kimmeridgian age. The *Trochammina - Reophax - Ammobaculites* Association co-occurs with a common ammonite assemblage of *Torquatisphinctes - Pachysphinctes* considered to be of Kimmeridgian age in the Himalayan and Kachchh sequences. (Pathak and Krishna, 1993; Krishna and Pathak, 1991, 1994; Krishna, Pathak and Pandey, 1995). This is followed higher up in the sequence by a scarce ammonite fauna represented by *Aulacosphinctoides - Hildoglochiceras* of early Lower Tithonian age. Thus, the stratigraphic range of *Riyadhella redmondi* is presently considered to be restricted to Kimmeridgian.

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EXPLANATION OF PLATE

Plate I

- 1-5. *Riyadhella redmondi* n. sp. (Camera lucida sketches drawn by Rahul Garg)
 1. Side View (Holotype) LUGM JR 681 x 110;
 2. Side View (Holotype) LUGM JF 681 x 110;
 3. Side View (Holotype) LUGM JF 681 x 110;
 4. Side View (Paratype) LUGM JF 680 x 110;
 5. Side View (Paratype) LUGM JF 680 x 110;
- 6-13. *Riyadhella redmondi* n. sp. (S.E.M. Photographs)
 6. Side view (Paratype) LUGM JF 682 x 220;
 7. Oblique apertural view LUGM JF 681 x 360;
 8. Oblique view showing inflation of chambers (Holotype) LUGM JF 681 x 320;
 9. Side View (Paratype) LUGM JF 680 x 135;
 10. Oblique side view showing inflation of chambers (Holotype) LUGM JF 681 x 160;
 11. Side view (Holotype) LUGM JF 681 x 135;
 12. Apertural view (Holotype) LUGM JF 681 x 600;
 13. Wall structure x 1600.

