The band of the Raghavapuram shales is exposed about 60 miles west of the present shore line of the east coast of India. This implies that the early Cretaceous sea must have invaded at least 60 miles inside the present Andhra Pradesh and covered a vast area, most of which is now occupied by the younger formations and alluvium of the Godavari river. As mentioned earlier, the upper part of the Raghavapuram shales was deposited during the regressive phase of the sea in a marginal marine marsh environment, and not under truly marine conditions. It is obvious that during this time, sedimentation must also have taken place in the deeper and truly marine parts of the basin towards east and southeast of Raghavapuram. Such truly marine contemporaries of Raghavapuram shales, though not exposed, must occur below the Godavari delta and even beyond. In all probability, they are covered by the fresh water sandstones of Tirupati stage, and further east by the infra-trappean beds, traps, the intertrappean beds, Rajahmundry sandstones, and alluvium, which belong to different ages but are younger than the Raghavapuram shales.

It is the surmise of the author that if a thorough search for the marine contemporaneous beds of the Raghavapuram shales is made, there is every reason to expect some such beds, either exposed or concealed below the younger formations in the Kakinada-Rajahmundry-Masulipatam region of Andhra Pradesh. It is quite possible that a small outcrop of Raghavapuram shales recently discovered by Sarma and Ramesam (1962) near Duddukuru, may represent the truly marine facies. If such beds are found, there will be complete transition from marginal marsh conditions to truly marine environment, and this will be reflected in the nature of the fossil content. These beds will eventually help in understanding not only the nature of the early Cretaceous sea and the marine life of that time flourishing along the east coast of India, but will also contribute towards the reconstruction of paleogeography and precise age determination of the Raghavapuram stage which has not yet been possible with the available data.

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PERMIAN FUSULINIDS FROM THE HIMALAYAS

V. J. GUPTA, P. C. BISARIA, D. K. CHADHA, G. MAHAJAN, S. KUMAR, S. R. KASHYAP, N. KOCHHAR AND N. S. VIRDI*

Centre of Advanced Study in Geology, Panjab University, Chandigarh

Introduction: The present communication records for the first time the occurrence of Fusulinids from India on the basis of which recognition of Permian rocks in Ladakh has been done for the first time. The beds from which these Fusulinids are being described are exposed on the left bank of Yunnam river near Sarchu bridge

* Order of names does not indicate seniority.

(32°48'00"N : 77°30'50"E), Ladakh. The strata yielding Fusulinids are overlain by an enormous thickness of unfossiliferous limestone which in turn are overlain by fossiliferous early Triassic limestones and shales. Fusulinid bearing beds are underlain by siliceous limestones containing brachiopods and bryozoans of late Carboniferous age, the contact being a thrust.

So far, there has been only one published record of Fusulinids from the Indian subcontinent, i.e. Salt Range region of Pakistan (Dunbar 1933). The only published work on the geology of the area is by Lydekker (1883), who assigned a Carboniferous age to the beds from whence the fauna is being described.

The present collection includes about 200 well preserved individual Fusulinids extracted from a sample of limestone. The fauna is dominated by species of *Schwagerina,* although other individuals are also present. Most of the fossils are fragmentary, although detailed preservation of the specimens is good.

The importance of the present fauna lies partly due to the fact that these fossils come from an altitude of more than 14,000 feet and the nearest known fauna of comparable age are those from the Amb beds of the Lower Productus limestone of Salt Range (Dunbar 1933), Pakistan. A detailed analysis of the fauna shows that most of the species of *Schwagerina* are similar to those described by Williams (1966) from the Hueco Canyon formation of the Franklin Mountains, Texas. One rock specimen collected from the river bed yielded several individuals of a Lower Pennsylvanian species *(Fusulina prolifica)*. The exact stratigraphic horizon from where this specimen was derived could not be established due to limited time at our disposal.

The figured specimens are catalogued in the collections of the Centre of Advanced Study in Geology, Panjab University (CASG), Chandigarh.

The following is the check list of the species found:

Schwagerina diversiformis
Schwagerina nelsoni
Schwagerina laxissima
Schwagerina garlockensis
Pseudofusulina kataensis
Fusulina prolifica

SYSTEMATIC DESCRIPTIONS

Order : FORAMINIFERA
Family: FUSULINIDAE
Genus: *Schwagerina* Moller

Schwagerina diversiformis Dunbar and Skinner, 1937
(Fig. 12)

Schwagerina diversiformis Dunbar and Skinner 1937. *The Geology of Texas, Texas Univ. Bull., 3701,* p. 654, pl. 69, Figs. 1-10.

Shell elongate fusiform attaining length of 8 mm and diameter of 1.75 mm in 4 volutions. This form is characteristic of the Hueco Canyon formation of the Hueco group, CASG Cat. No. F/81 in the Franklin Mountains, Texas.

Schwagerina nelsoni Dunbar and Skinner 1937
(Figs. 1, 8 and 11)

Schwagerina nelsoni Dunbar and Skinner, 1937. *The Geology of Texas, Texas Univ. Bull., 3701,* pp. 650-652, Pl. 67, figs. 1-14.

Shell elongate subcylindrical attaining length of 10.00 mm and diameter of 3.5 mm in 6 volutions. This species has been recorded from the Hueco Canyon formation and Alacran mountain formation of the Franklin mountains. It is also known from the Lenon Hill formation of Glass mountains.

CASS Cat. Nos. F/82 to F/84.

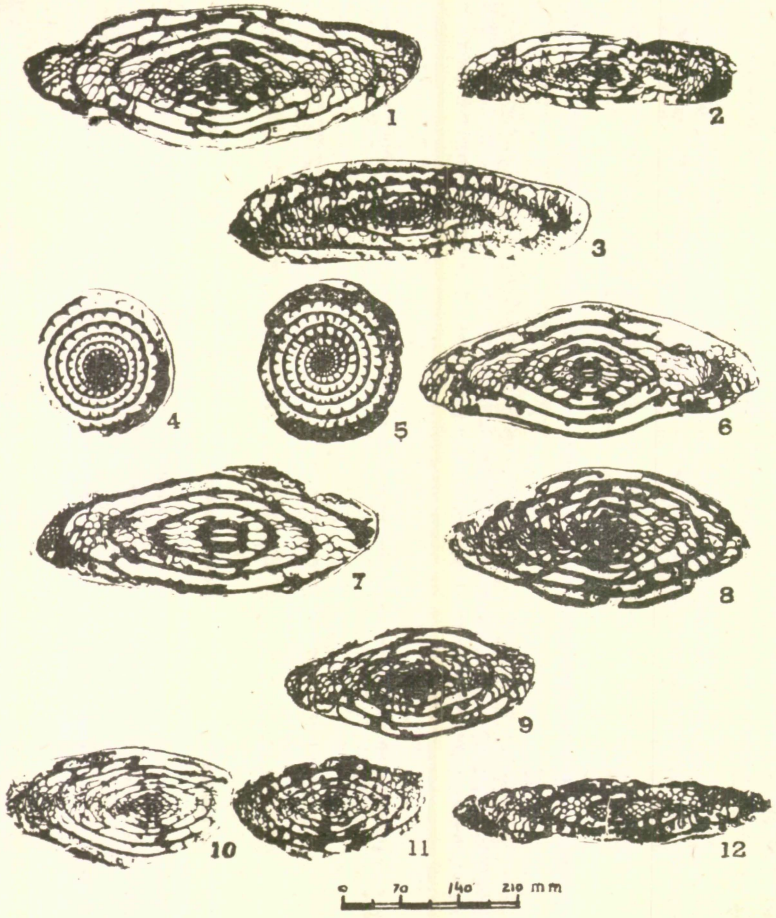

Figure 1.

1. *Schwagerina nelsoni;* axial section. 2. *Parafusulina kattaensis;* tangential section. 3. *Schwagerina laxissima;* axial section. 4. *Fusulina prolifica;* sagittal section. 5. *Parafusulina kattaensis;* sagittal section. 6. *Fusulina prolifica;* axial section. 7. *Fusulina prolifica;* tangential section. 8. *Schwagerina nelsoni;* axial section. 9. *Schwagerina garlockensis;* axial section. 10. *Fusulina prolifica;* tangential section. 11. *Schwagerina nelsoni;* axial section. 12. *Schwagerina diversiformis;* axial section.

Schwagerina laxissima Dunbar and Skinner 1937 (Fig. 3)

Schwagerina laxissima Dunbar and Skinner, 1937, *The Geology of Texas,* Texas Univ. Bull., 3701, p. 652-654, Pl. 58, figs. 5-11.

Shell elongate fusiform attaining a length of 9.00 mm and diameter of 2.5 mm in 5 volutions. This species has been recorded from the Hueco canyon formation of Franklin mountains, Texas; Sierra Diablo mountains, Texas; Phosphoria formation of Montana and Oquirrh formation of Utah.

CASG Cat. No. F/85.

Schwagerina garlockensis Ross, 1966
(Fig. 9)

Schwagerina garlockensis Ross, 1966, *Journ. Palaeontology,* vol. 40, p. 159, pl. 19, figs. 6-11.

Shell elongate fusiform attaining length of 6.25 mm and diameter of 3.00 mm in 4 volutions. This species is known from the Garlock series of the El Paso mountains in Kern country, California.

CASG Cat. No. F/86.

Genus: *Parafusulina* Dunbar and Skinner
Parafusulina kattaensis Schwager, 1887
(Figs. 2 and 5)

Fusulina kattaensis Schwager, 1887, *Pal. Ind.,* Vol. I, p. 985; Pl. CXXVI, figs. 1-11; Pl. CXXVIII, fig. 4.

Shell elongate fusiform attaining a length of 7.00 mm and width of 2.00 mm in 6 volutions. This species has been described from the Amb beds of Lower Productus Limestone of Salt Range, Pakistan.

CASG Cat. No. F/87 and F/88.

Genus: *Fusulina* Moller
Fusulina prolifica Thomson, 1935
(Figs. 4, 6, 7 and 10)

Fusulina prolifica Thomson, 1935, *Journ. Palaeont.*, vol. 9, p. 298, pl. 26, figs. 23-29.

Shell elongate subcylindrical attaining a length of 8.5 mm and width of 3.2 mm in 5 volutions. The exact stratigraphic horizon of the specimen is not known as the material under description was collected from the river bed. This species has been described from the Lower Pennsylvanian of Oklahoma and Atoka. It has also been recorded from the strata of similar ages of Texas, Arkansas, the northern mid continent region, eastern portion of the United States and Rocky mountains.

CASG Cat. Nos. F/89 to F/92.

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