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FORAMINIFERAL BIOSTRATIGRAPHY AND RECONNAISSANCE MICROFACIES OF PALEOCENE LOCKHART LIMESTONE OF JABRI AREA, HAZARA, NORTHERN PAKISTAN.

BY

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Abstract:- *The Lockhart Limestone of Paleocene age is well exposed in Jabri area. A section along the Lora-Maqsood road is measured and sampled for foraminiferal and micrfacies studies. The total thickness is 73 meters and total 12 samples were collected at different intervals. Ten species of Benthic Forminiferas are observed including age diagnostic* Miscellanea miscella *and* Lockhartia haimei *along with* Bigenerina sp. *and* Milliolids. Three *major types of microfacies are observed including Mudstone, Packstone and Wackstone.The variation in faunal assemblages are used to recognize subenvironments within the shelf. The age of the Lockhart Limestone on the basis of observed fauna is Thanetian (Upper Paleocene).*

INTRODUCTION

The Hazara mountains form the northern border of Potowar Basin, it is a NE-SW trending acute trough situated along the northern margin of Indo-Pakistan Plate and has been formed as a continent to continent collision. The Jabri area of southern Hazara is easily accessible from Rawalpindi-Islamabad via Ghora Gali, located on Lora-Maqsood road (long. 73 10' 15", lat. 35 54' 45") where rocks exposed from Jurassic to Eocene are as follows.

Eocene	Margala Hill Limestone
Paleocene	Patala Formation Lockhart Limestone Hangu Formation
Cretaceous	Kawagarh Formation Lumshiwal Formation Chichali Formation
Jurassic	Samana Suk Formation

Davies (1930a) gave the name " Lockhart Limestone" to the Paleocene limestone unit in Kohat area and this name was extended by the Stratigraphic Committee of Pakistan (Fatmi 1973) to the "Mari Limestone" of Latif (1970a) in Hazara area. Waagen and Wynne (1872) are the pioneers of the work in this area, they have explained the basic geology of this area, Wynne (1873) had worked on the geology of the northern Punjab, Wynne (1874) had explained the geology of the Murree Hills and its surroundings. Waggen (1895) had given the comprehensive study of the geology of Sirban mountains near Abbottabad. Middlemiss (1896) had given a brief description of the geology of the Hazara and Black Mountains. Pinfold (1918) had explain the structure and stratigraphy of the north western Punjab. Cotter (1933) had given a brief description of the geology around the Attock area. Eames (1952) had explained the Eocene rocks of the Western Pakistan. Latif (1970, 1970a, 1970c) had maped the Hazara area and explained the detailed stratigraphy and micropaleontology of all rocks from Pre-Cambrian to Recent, Latif (1976) has given a comprehensive account of the micropaleontology of Gallis Group of Hazara. Butt (1972) had discussed the problems of the stratigraphic nomenclature of the Hazara area. Shahnawaz and Sameeni et. al. (1992) have describe the preliminary microfacies of the Margala Hill Limestone of Jabri area. Sameeni (1993) have given a comprehensive study of the microfauna of the Margala Hill Limestone of

Bandi area. Kamran and Sameeni et. al. (2000) explained the stratigraphy and microfauna of the Patala Formation of the Jabri area only. Munir et. al. (2006) have explained the stratigraphy and microfauna of the Paleogene rocks of Hazara and Kashmir area. First time the comprehensive study of the microfauna and reconnaissance microfacies of Lockhart Limestone of Jabri area is carried out.

OBSERVATIONS

The Lockhart Limestone is well exposed on both sides of Harro River in Jabri area. A section on the northern bank of the river is selected for the present study (Fig-1) where its lower contact with Hangu Formation and upper contact with Patala Formation are sharp and conformable. The total thickness of Lockhart Limestone is 73 meters. Its lithology from bottom to top as observed is, in its lower part, 05 meters thick bedded dark grey, fossiliferous limestone is exposed, followed by 01 meter thick greenish grey shale having no fossils, then 14 meters thick massive, nodular, grey to dark grey fossiliferous limestone is present, 02 meters thick arenaceous unfossiliferous limestone of grey colour, 18 meters thick massive grey coloured nodular poorly fossilferous limestone, 04 meters thick bedded limestone of grey to dark grey in colour with less fossils, 12 meters thick massive fossiliferous limestone of grey to dark grey in colour, 01 meter thick band of light grey calcarious shale with no fossils, 04 meters thick bedded fossiliferous limestone of dark grey colour, 01 meter thick band of light grey shale and at the top 01 meter thick band of dark grey sandy/shaly limestone is exposed (Fig-2). Total 12 samples were collected from bottom to top at different levels as shown in fig-2 and total 30 thin sections were prepared for micropaleontological and microfacies studies. The recorded species of foraminifera are as follows.

- *Miscellanea miscella* (d'Archaic & Haime)
- *Lockhartia haimei* (Davies)
- *Lockhartia conditi* (Nuttall)
- *Lockhartia tipperi* (Davies)
- *Ranikotalia sindensis* (Davies)
- *Ranikotalia sahnii* (Davies)
- *Operculina salsa* Davies & Pinfold
- *Operculina patalensis* Davies & Pinfold
- *Assilina subspinosa* Davies & Pinfold
- *Discocyclina ranikotensis* Davies
- *Bigenerina* sp.
- Milliolids

SYSTEMATIC PALEONTOLOGY

Miscellanea miscella (d"Archaic & Haime)
(Figs.A,B Plate 1)

Miscellanea miscella (d'Archiac and Haime), Pfender 1934. Bull. Soc. Geol. France, vol. IV, pp.231-235 and Text figs. 1-4, pl. 1 1 , figs. 6-7, pl.13, figs. 2-4.

Remarks: This is the most common species present throughout the formation from bottom to top. Microspheric and megalospheric both types were observed.

*Lockhartia haimei (*Davies)
(Figs.A Plate 2)

Lockhartia haimei (Davies) Davies & Pinfold 1937. Mem. Geoi. Surv. India, Pal. Indica, New Series, vol.24(1), pl.7, figs.9-13,15.

Remarks: This species is a guide fossil for upper Paleocene rocks so very common in this formation from bottom to top.

Lockhartia conditi (Nuttall)
(Figs. B,D Plate 2)

Lockhartia conditi (Nuttall) Davies 1932. Trans. Roy. Soc. Edin. Vol.57P1. 2, fig. 7; P1. 4, fig.7.

Remarks: This species is common to upper Paleocene and lower Eocene and is observed throughout the formation from bottom to top.

Lockhartia tipperi (Davies)
(Figs. D Plate 3)

Lockhartia tipperi (Davies) Davies 1932. Trans. Roy. Soc. Edin., vol. 57.

Remarks: This species is recorded from the upper half of the formation where it is common.

Ranikothalia sindensis (Davies)
(Figs.C,D,E Plate 1)

Nummulites sindensis (Davies), Davies & Pinfold 1937. Mem. Geol. Surv. India, Pal. Indica, New Series, vol.24(1), pi.4, fig. 21.

Remarks: This species is common to the upper Paleocene and lower Eocene deposits and recorded from the formation from bottom to top.

Ranikothalia sahnii (Davies)
(Figs. A,B Plate 3)

Nummulites sahnii Davies 1927, Quart. Journ. Geol.Soc. Lond, vol.83, pl. 19, figs.10-13.

Remarks: This species is not so common, only recorded from the middle upper part of the formation.

Operculina salsa Davies & Pinfold
(Figs. C Plate 3)

Operculina salsa Davies & Pinfold 1937. Mem. Geol. Surv. India, Pal. Indica, New Series, vol.24(1), pl.5, figs. 1,3, 7,10,15.

Remarks: This species is recorded from the upper part of the formation.

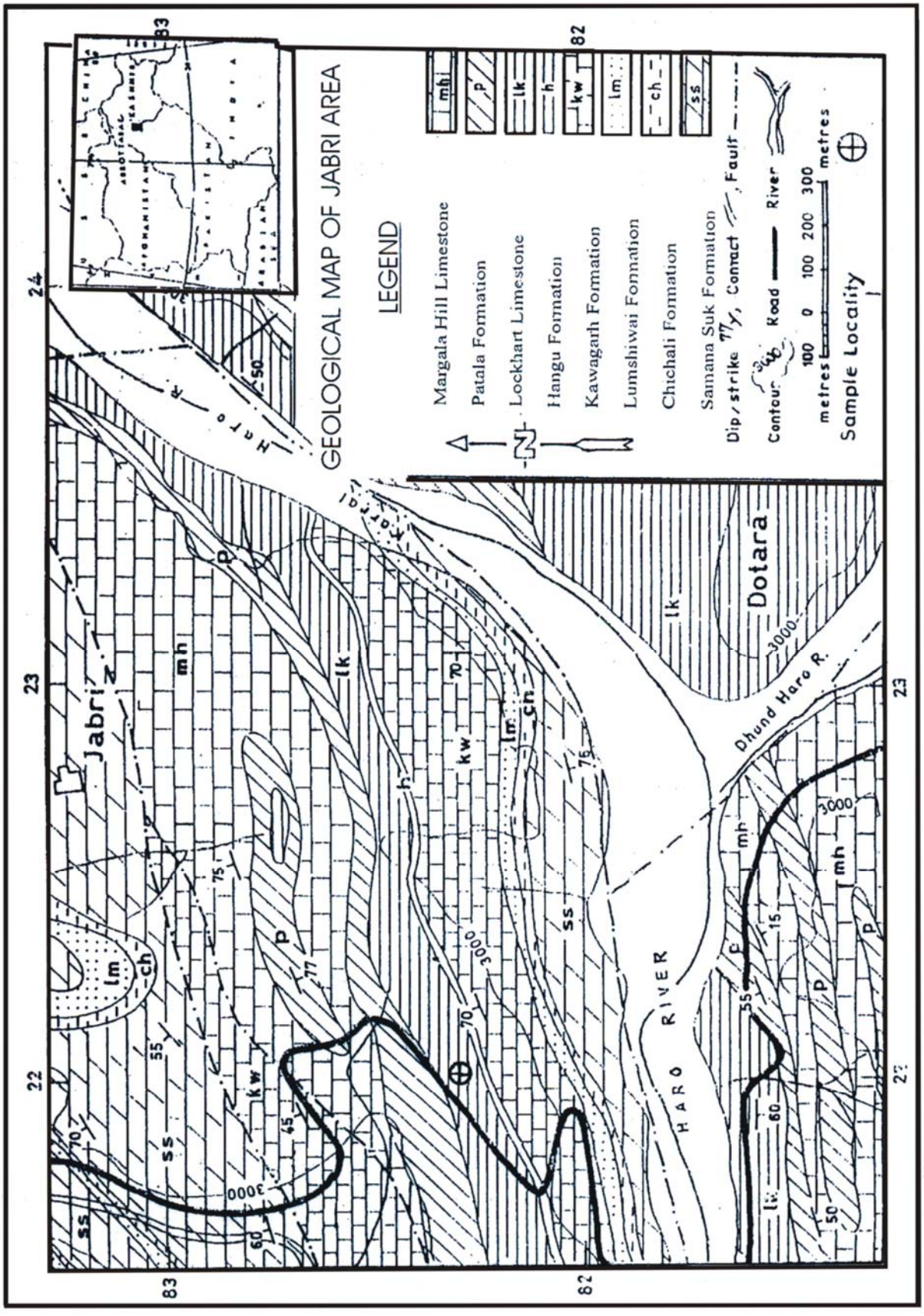

GEOLOGICAL MAP OF JABRI AREA
LEGEND
Margala Hill Limestone
Patala Formation
Lockhart Limestone
Hangu Formation
Kawagarh Formation
Lumshiwai Formation
Chichali Formation
Samana Suk Formation
Dip / strike
Contact
Fault
Contour
Road
River
metres
Sample Locality
Jabri
Dotara
HARO RIVER
Dhund Haro R.
mh
P
lk
h
kw
lm
ch
ss
22
23
24
82
83

Fig. 1.

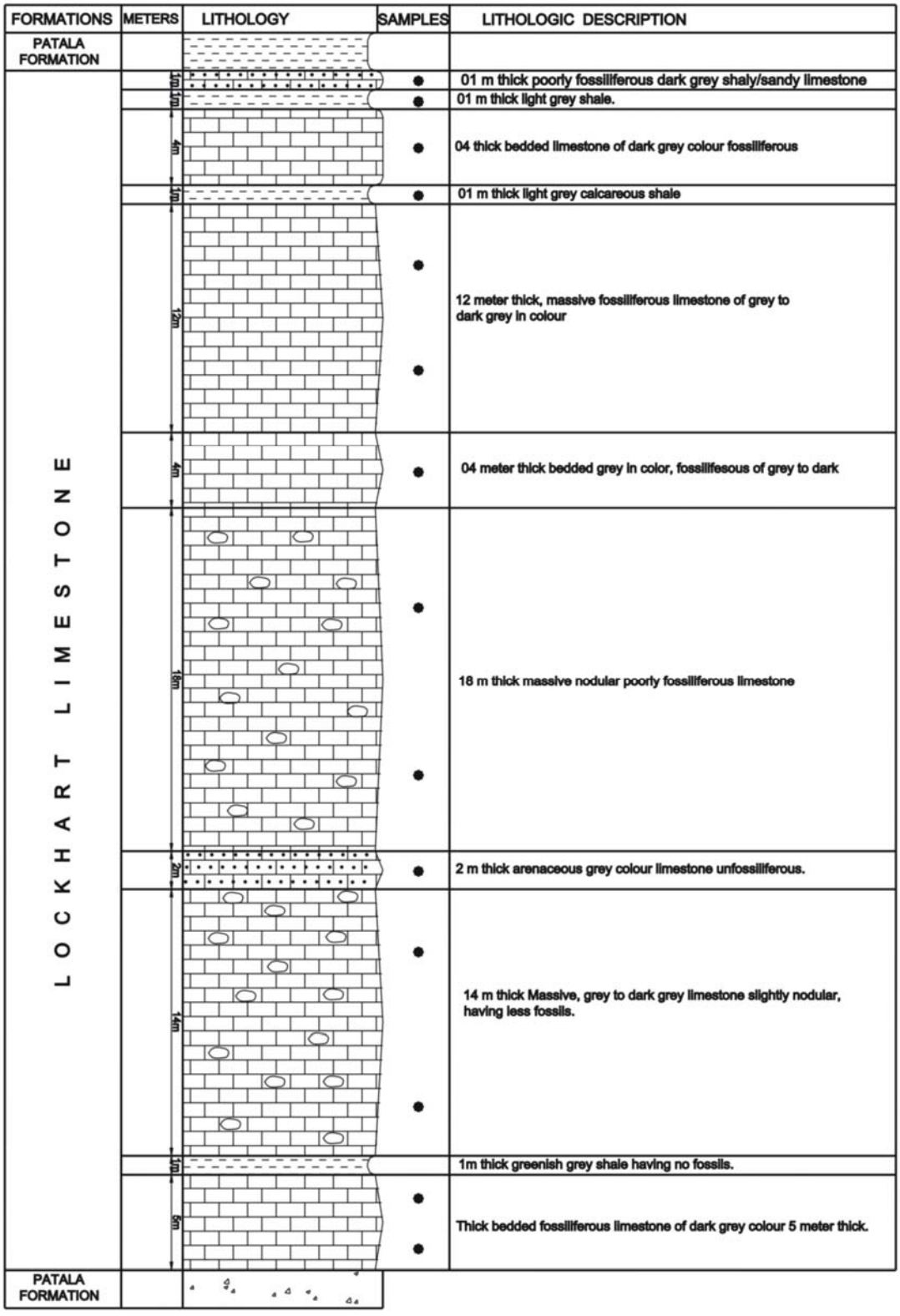


Fig. 2. Stratigraphic column of Lockhart limestone, Jabri, Hazara

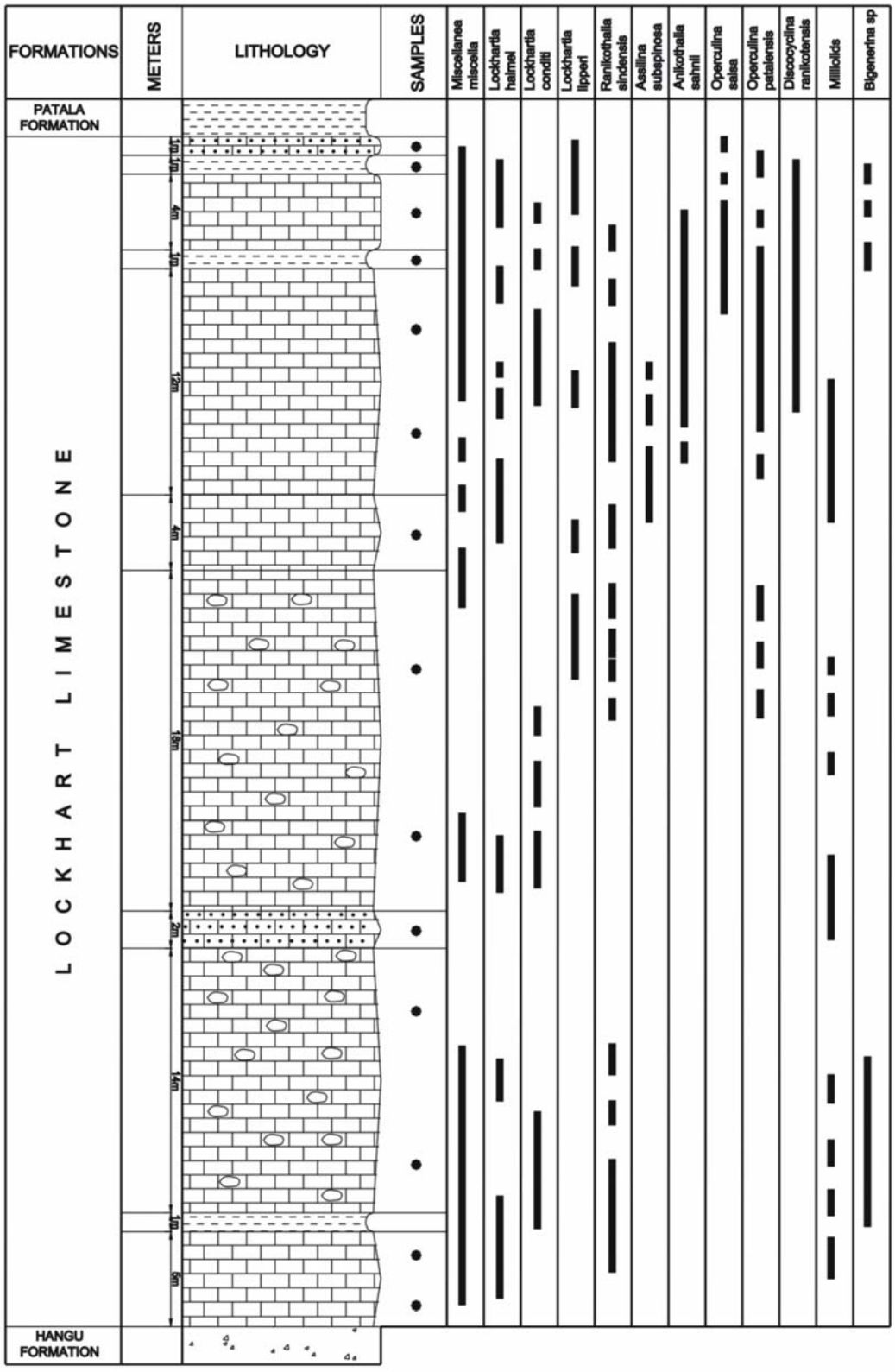


Fig. 3. Vertical range of Formation recorded in Lockhart limestone, Jabri, Hazara

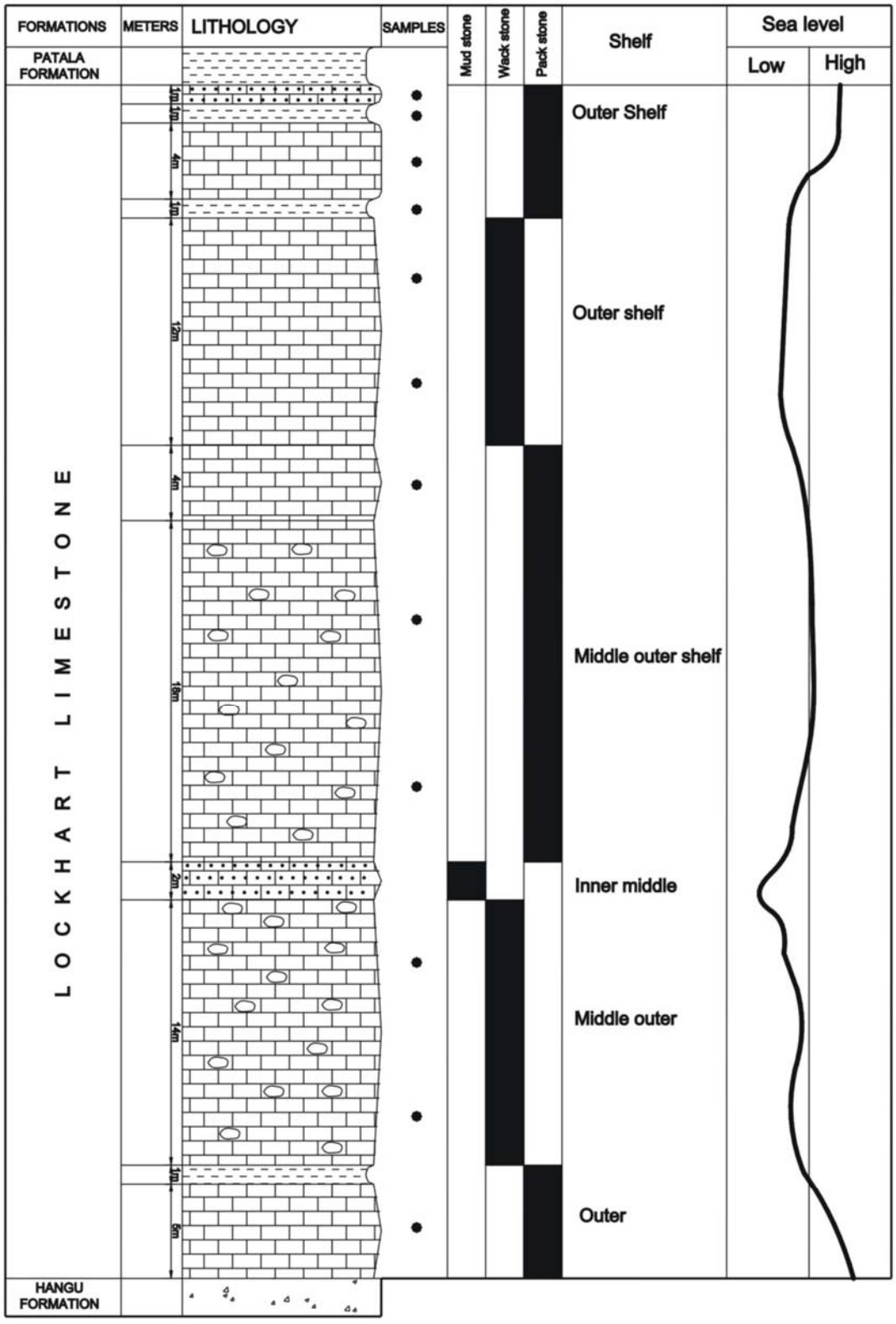


Fig. 4. Showing the microfacies and interpecrtion of subenvironments within the shelf of Lockhart limestone, Jabri, Hazara

DESCRIPTION OF PLATES

Plate-1

A, B *Miscellanea miscella* (d'Archaic & Haime)

C, D *Ranikothalia sindensis* (Davies)

E Upper- *Ranikothalia sindensis* (Davies)

Lower left- *Ranikothalia sahnii* (Davies)

Lower right- *Lockhartia tipperi* (Davies)

Plate-2

A *Lockhartia haimei* (Davies)

B, D *Lockhartia conditi* (Nuttall)

C Milliolid

E *Operculina patalensis* Davies & Pinfold

F *Assilina subspinosa* Davies & Pinfold

G *Discocyclina ranikotensis* Davies

Plate-3

A, B *Ranikothalia sahnii* (Davies)

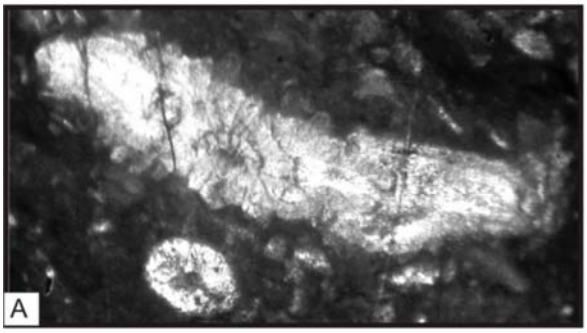
C *Operculina salsa* Davies & Pinfold

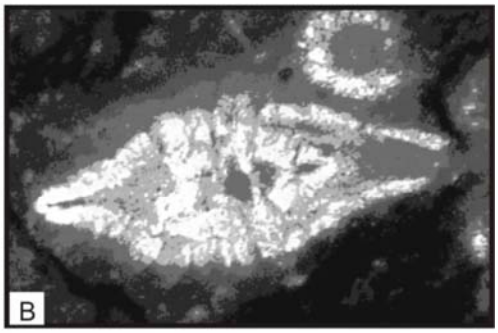
D *Lockhartia tipperi* (Davies)

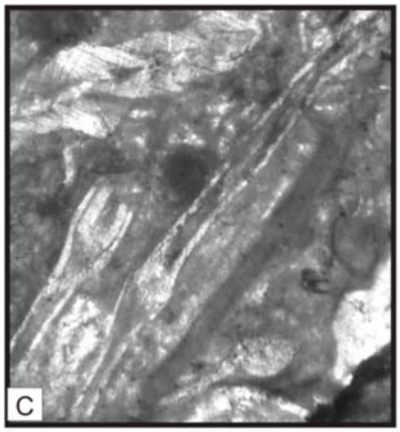
E *Bigenerina* sp.

F *Discocyclina ranikotensis* Davies

PLATE-1







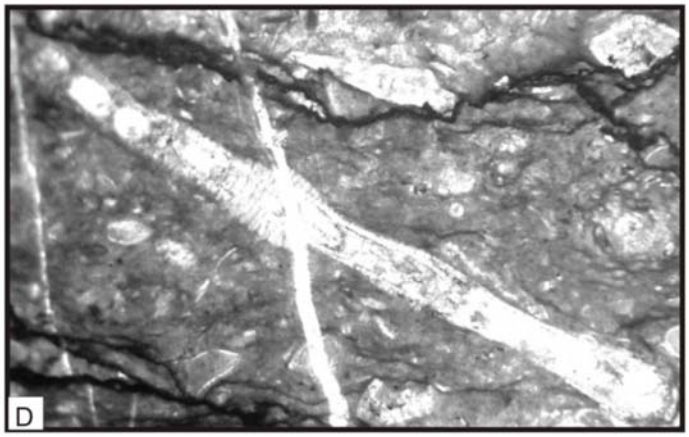


PLATE-2

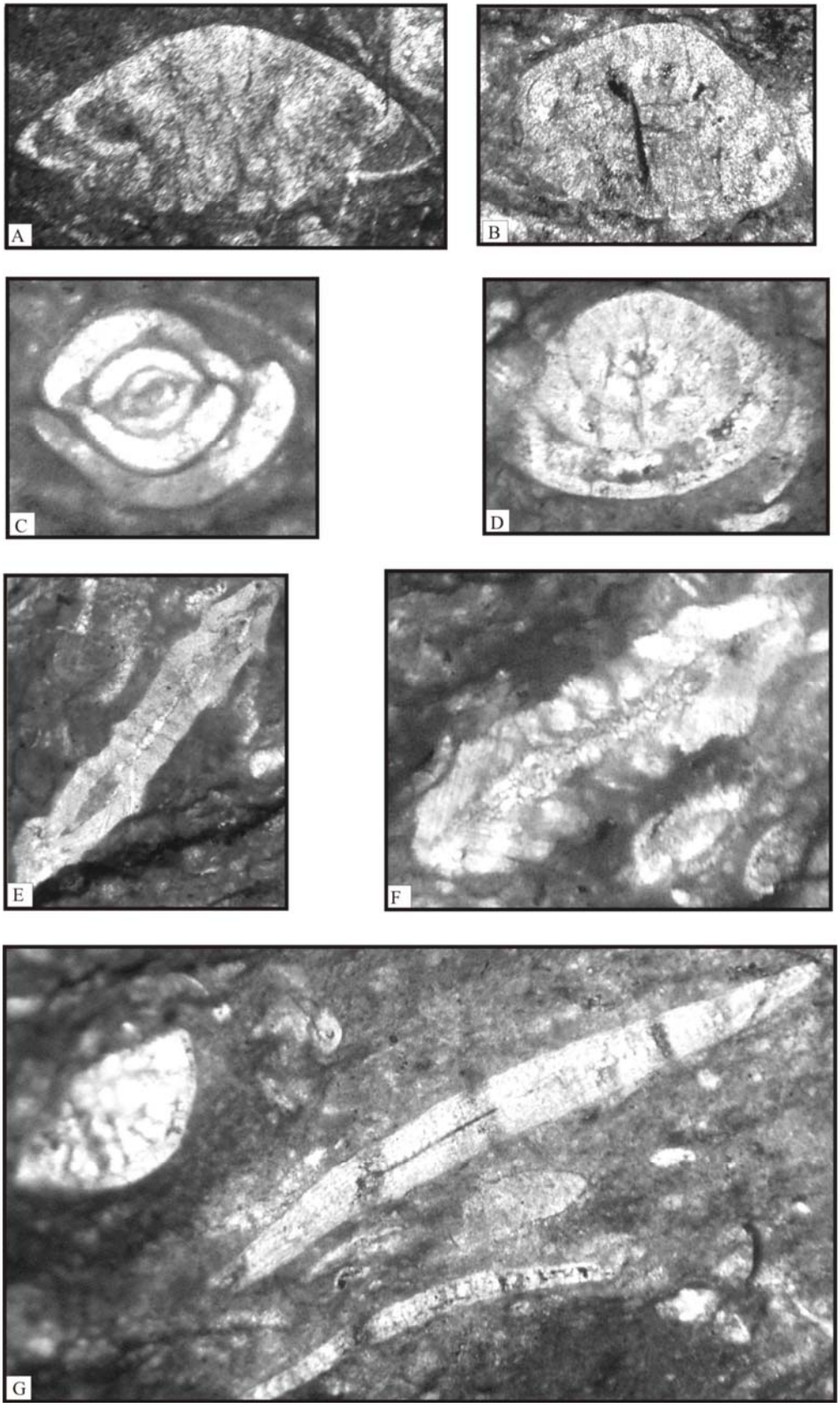
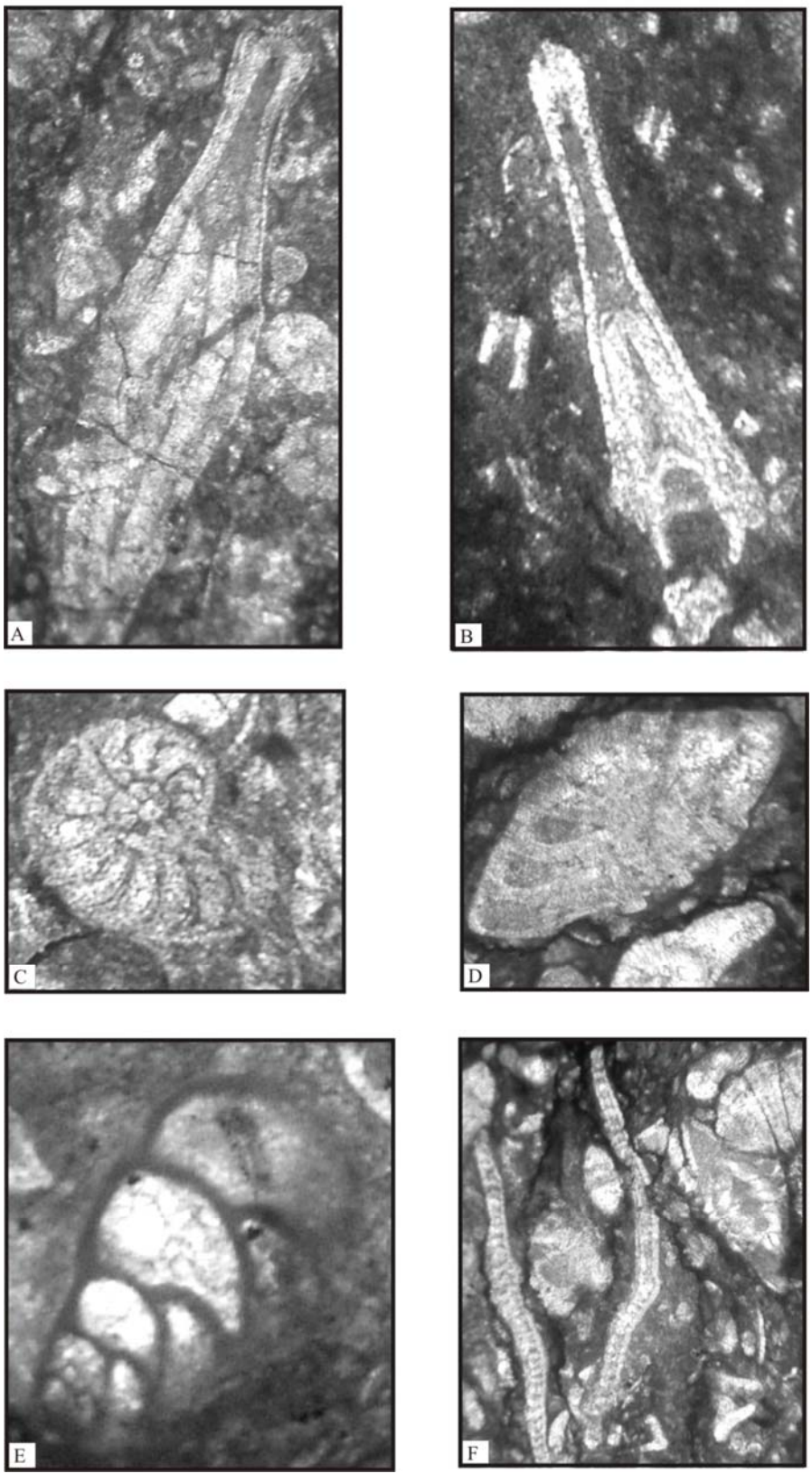


PLATE-3



Operculina patalensis Davies & Pinfold
(Figs. E Plate 2)

Operculina patalensis Davies & Pinfold 1937. Mem. Geol. Surv. India, Pal. Indica, New Series, vol.24(1), pl.5, figs. 6,17-19, 26.

Remarks: This species is recorded only from the upper most part of the formation.

Assilina subspinosa Davies & Pinfold
(Figs. F Plate 2)

Assilina subspinosa Davies & Pinfold 1937. Mem. Geol. Surv. India. Pal. Indica New Series, vol.24(1), pl.4, figs. 19-20, 23-26.

Remarks: This species is recorded from the middle and upper part of the formation.

Bigenerina sp.
(Fig.E Plate 3)

Remarks: These are observed only in the upper most part of the formation.

Milliolids
(Fig.C Plate 2)

Remarks: Milliolids are present in the lower and middle part of the formation.

CONCLUSION

Ten species of larger foraminifera are recorded from the formation along with milliolids and *Bigenerina* sp. which confirm the Thanetian (Upper Paleocene) age of the Loickhart Limestone. The larger foraminifera are known to characterize the shallow shelf carbonate environments. The variation in faunal assemblage is used to recognize the subenvironments within the shelf, based on the salinity tolerance and habitate of various association of fauna. These subenvironments include inner, middle and outer shelf (Fig.4) where three major type of microfacies are deposited, these are Mudstone, Packstone, and Wackstone.

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