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A new record of foraminifera species (*pseudorbitolina marthae* douville) indicting the late maastrichtian stage within the Aqra Formation in Chwarta area, Sulaimaniyah governorate, ne Iraq

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Abstract

The Late Maastrichtian foraminifera of Aqra Formation were identified by studding 53 samples from one outcrop section (Mukaba section) in the north eastern limb of Azmar Anticline , Chwarta area, Sulaimaniyah governorate, NE Iraq. Three formations are exposed in the section (from the oldest to the youngest) Shiranish Formation; composed of marl and marly limestone, Tanjero Formation; composed of calcareous sandstone, shale, siltstone and claystone and Aqra Formation composed of massive dolomitic limestone.76 species of benthonic and planktonic foraminifera related to (35) genera were identified. An importuned Maastrichtian species of foraminifera (*Pseudorbitolina marthae* DOUVILLE) was founded and recorded for the first time within the Aqra Formation According to the identified foraminifera, suggest that the age of Aqra Formation was of Late Maastrichtian.

Introduction

This study deals with the biostratigraphy of Aqra Formation in Chwarta area, Sulaimaniyah governorate, north eastern Iraq, its shows that Aqra Formation interfering with Tanjero Formation ([***1***]; ***[2]***; ***[3]***; ***[4]*** and ***[6]***). The Aqra Formation was first described by ***[7]***, from its type locality in Aqra area, north eastern Iraq, it runs along the Geli Sheikh Abdul Aziz, with base in the lowest exposed beds about 1 Km northwest of Aqra, and top at about 300 m northwest of Aqra Police Post. The both type sections are defined by the following coordinates, respectively ***[1]***:

Longitude 43° 55' 26" E Latitude 36° 46' 43" N
Longitude 44° 16' 30" E Latitude 36° 41' 45" N

Lithologically of the formation in its type section consists of limestone rich with bitumen and identifed deferent fauna like: *Lepidorbitoides socialis* (LEYMERE); *Loftusia elongata* COX; *L. persica* BRADY and *Omphalocyclus macroporus* (LAMARCK), porifera, bryozoa, echinodermata and brachiopoda, and give the formation Late Companion- Maastrichtian age.

Study area

The studied section (Mukaba) is located in the north eastern limb of Azmar Anticline, Chwarta area, Sulaimaniyah governorate, north eastern Iraq in the line between the High Folded Zone and Imbricate Zone, lies 15 Km northwest of Chwarta city on the road between the Chwarta and Mawat (*Figure:1*).

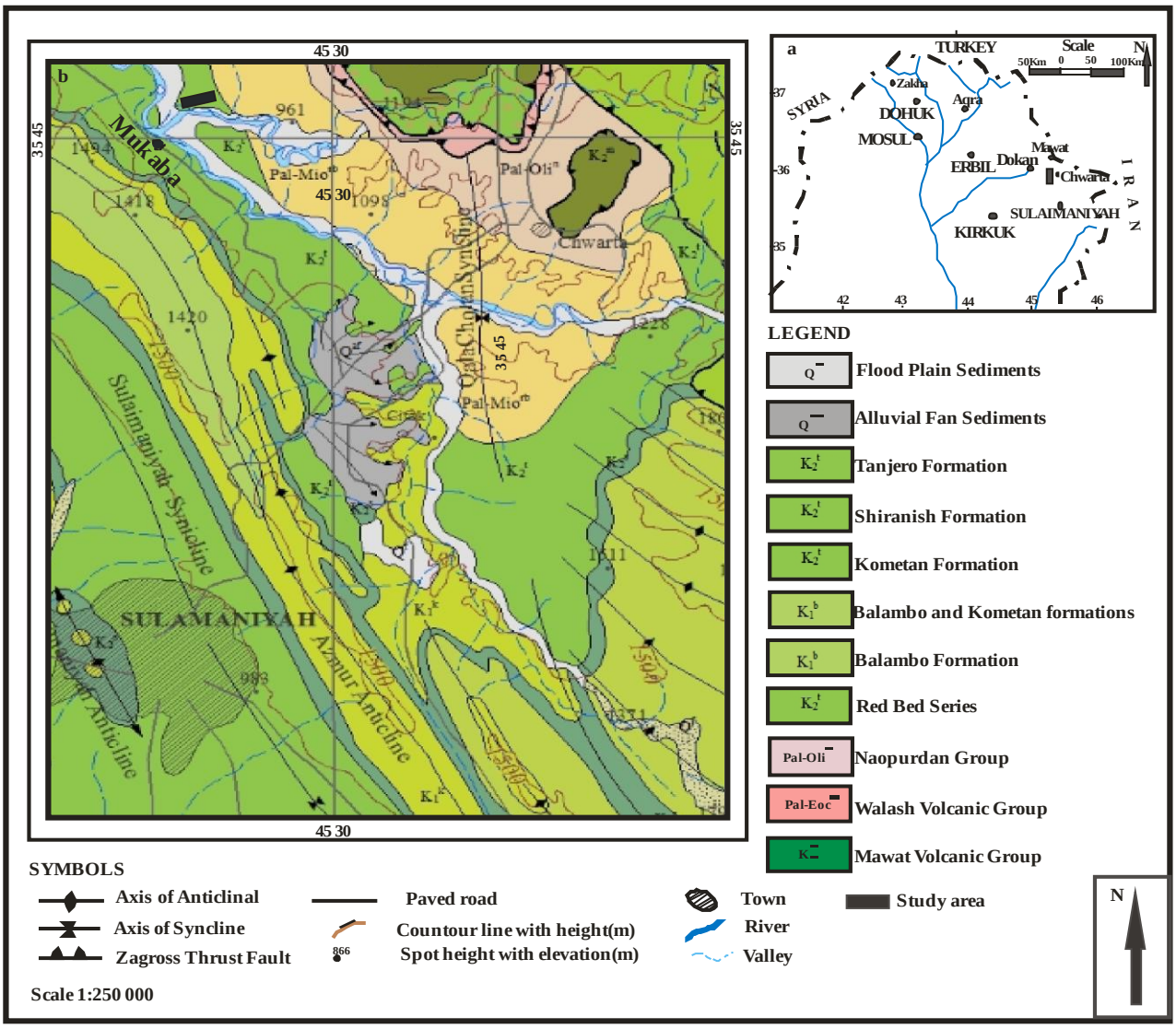

Figure-1: Map of the studied area showing; (a)Map of North Iraq, (b) Geological map for study area (after ***[7]***)

Method of study

53 samples were collected from outcrop section (Mukaba section), NW of Sulaimaniyah. Thin sections were studied by means of polarized microscope and phtting the fossils by using the petrographic microscope binocular microscope. For friable samples used the stereoscopic binocular microscope for studied there sections.

Lithostrtigraphic Description

In this study, three formations are recognized from the 53 studed samples. These are decribed from the oldest to the youngest, hereinafter (*Figure:2*):

- Shiranish Formation (Late Campanian- Maastrichtian): It is dominated by marl and marly limestone with 240 m thick.

System/Period	Age/Stage	Formation	Thickness (m)	Sample No.	Lithology	Description
TERTIARY		Red Bed	14	TOP 53 - 52		Pebbley sandstone, green red, reddish brown, violet in color interbedded with green siltstone and red shale, friable
LATE CRETACEOUS	LATE MAASTRICHTIA	AQRA	3	51		Massive dolomitic limestone, bluish grey, contain large foraminifera and echinoides
		TANJERO	13.5	50 - 48		Calcareous sandstone, reddish grey - grey, hard contain echinoides and large foraminifera
			10	47		Calcareous sandstone, reddish brown, friable, contain large foraminifera and rudsit
		AQRA	7	46 - 44		Massive dolomitic limestone, hard-very hard, grey -light grey,with thin lensess of sandstone, rich with rudist, large foraminifera and echinoides
		TANJERO	12	43 - 42		Friable sandstone, with thin beds of siltsone
		AQRA	10	41 - 40		Massive dolomitic limestone, hard, bluish grey, contain rudist, large foraminifera and echinoides
		TANJERO	4	39		Friable sandstone interbedded with friable silty shale contain echinoides and large foraminifera
		AQRA	30	38		Massive dolomitic limestone, bluish grey, contain large foraminifera, rudist and echinoides
		TANJERO	6.4	37 - 36		Coarse sandstone, olive green, interbedded with siltstone contain orging materal
		AQRA	25	35		Massive dolomitic limestone, yellowish-bluish grey, contain large foraminifera and rudsit
		TANJERO	25	34		Interbeeded of pebbly sandstone and calcareous sandstone, very hard, contain rudist, large foraminifera and echinoides
		AQRA	6	33		Massive dolomitic limestone, bluish grey, contain rudist, echinoides and large foraminifera
		TANJERO	35	32		Calcareous sandstone contain large foraminifera, rudist and echinoides interbedded with very thin beds of limestone
		AQRA	45	31 - 28		Limestone, dolomitic and silty in the top, sandy in the bottom, bluish -light grey, hard contain rudist, large foraminifera and echinoides
			7			Coverd by soil
		AQRA	6	27		Massive dolomitic limestone, with thin lensess of sandstone and shale, rich with rudist, large foraminifera and echinoides

System/Period	Age/Stage	Formation	Thickness (m)	Sample No.	Lithology	Description
LATE CRETACEOUS	EARLY MAASTRICHTIA	TANJERO	28	26		Interbeeded of thick beds of calcareous sandstone with thin bed of shale, contain rudist, large foraminifera and echinoides
		AQRA	9	25		Massive dolomitic limestone, bluish grey, contain large foraminifera, rudist and echinoides
			5			Coverd by soil
		AQRA	2	24		Limestone, hard, light grey, contain large foraminifera and echinoides.
		TANJERO	7	23		Friable shale, dark grey contain echinoides and large foraminifera.
		AQRA	11	22 - 20		Limestone, hard, greenish-bluish grey, with thin lensess of sandstone and shale, rich with rudist, large foraminifera and echinoides
		TANJERO	40	19 - 18		Greenish-dark grey shale interbedded with greenish grey- olive green snadstone, contain echinoides, rudist and large foraminifera.
		AQRA	17	17 - 15		Massive dolomitic limestone, bluish grey, contain large foraminifera, rudist and echinoides
		TANJERO	3	14		Shale interbedded with snadstone, bluish grey, rich with large foraminifera.
		AQRA	20	13 - 12		Dolomitic limestone, hard- very hard, bluish grey, contain rudist, echinoides and large foraminifera.
		TANJERO	2	11		Friable silty sandstone, brown, contain large foraminifera and echinoides
		AQRA	5	10 - 9		Massive dolomitic limestone, yellowish -bluish grey, contain large foraminifera and rudsit
		TANJERO	4	8 - 7		Friable sandstone, yellow-light brown, become calcarous at the top, friable, contain large foraminifera and echinoides
			3	6		Friable shale, dark grey, contain thin beds of sandstone
		AQRA	5	5		Dolomitic limestone, bluish grey, rich with echinoides and large foraminifera
		TANJERO	30	4		Friable marly shale, brown,iterbedded with sandston and calcareous sandstone
			60	3		Calcareous sandstone contain glogonit, rich with large foraminifera, rudist and echinoides interbedded with very thin beds of limestone
		SHIRANISH	240	1 - 2		Marly limestone, bluish grey, interbedded with light grey marl the top, hard

Figure-2: Stratigraphic column of Mukaba section

-Tanjero Formation (Late Campanian- Maastrichtian): It is consists of calcareous sandstone, shale, siltstone and claystone with thickness of 283 m.
- Aqra Formation (Late Maastrichtian): It is dominated by massive dolomitic limestone. The thickness is 201m.
- The Red Beds Group: It consists of pebbly sandstone, siltstone and shale with 14 m thick.

List of Fossil

The following fossils were identified in the studied samples (*Figure: 3*):

Planktonic foraminifera: *Abathomphalus mayaroensis* (BOLLI); *Gansserina gansseri* (BOLLI); *Globotruncana aegyptiaca* NAKKADY; *Glt. arca* (CUSHMAN); *Glt. bulloides* VOGLER; *Glt. elevata* BRTZEN; *Glt. falsocalcarata* KERDANY & ABDEL-SALAM; *Glt. gagnebini* TILEV; *Glt. lapparenti* BRTZEN; *Glt. nothi* BRONNIMANN & BRAWN; *Glt. stuarti* (DE LAPPARENT); *Globotruncana* sp.; *Globotruncanita conica* (WHITE); *Gla. stuartiformis* (DALBIEZ); *Globigerinelloides* sp.; *Hedbergella planispira* (TAPPAN); *Hedbergella* sp.; *Heterohelix globulosa* (EHERENBERG); *H. striata* (EHERENBERG); *Heterohelix* sp.; *Kuglerina rotundata* (BRONNIMANN); *Pseudotextularia elegans* (RZEHAK); *Pseudotextularia* sp.; *Rugoglobigerina rugosa* (PLUMMER) and *Rugoglobigerina* sp.

Large benthonic foraminifera: *Dictyoconella* sp.; *Lepidorbitoides (Asterorbis)* sp. (*Figure: 4-1*); *Lepidorbitoides socialis* (LEYMERIE) (*Figure: 4-2*); *Lepidorbitoides* sp.; *Loftusia baykali* MERIÇ (*Figure: 4-3*); *L. coxi* HENSN (*Figure: 4-4*); *L. elongata* COX (*Figure: 4-5*); *L. harrisoni* COX; *L. minor* COX.(*Figure: 4-6*); *L. morgani* DOUVILLE (*Figure: 5-1*); *Loftusia* sp.; *Nummofallotia* sp. (*Figure: 5-6*); *Omphalocyclus macroporus* (LAMARCK) (*Figure: 5-2*); *Om. (Torreina) torrei* PALMER (*Figure: 5-3*); *Orbitoides apiculatus* SCHLUMBERGER (*Figure: 5-4*); *O. gensacicus* (LEYMERIE); *O. medius* D'ARCHIAC (*Figure: 5-5*); *O. palmeri* GRAVELL; *O. tissoti* SCHLUMBERGER; *Orbitoides* sp.; *Pseudorbitolina marthae* DOUVILLE (*Figure: 6*); *Rhapydionina* sp.; *Siderolites calcitrapoides* LAMARCK (*Figure: 7-2*); *Siderolites* sp.; *Sulcoperculina globosa* DE CIZANCOURT (*Figure: 7-3*) and *Sulcoperculina* sp.

Small benthonic foraminifera: *Bolivina incrassata* REUSS; *Bolivina* sp.; *Cibicides* sp.; *Eggerellina gibbosa* MARIE; *Eggerellina* sp.; *Elphidium* sp.; *Fissoelphidium* sp.; *Lagena* sp.; *Marginulinopsis anstinana* (CUSHMAN); *Marginulinopsis* sp.; *Nodosaria* sp.; *Pseudochrysalidina* sp.; *Pyrgo* sp.; *Quinqueloculina* sp.; *Rotalia skourensis* PFENDER (*Figure:7-1*); *Rotalia* sp.; *Siproloculina* sp. and *Textularia* sp.

Discussian

The Aqra Formation contain abondant foraminifera species specially large foraminifera species of Cretaceous age, like : *Lepidorbitoides (Asterorbis)* sp.; *Lepidorbitoides socialis* (LEYMERIE); *Loftusia* spp.; *Nummofallotia* sp.; *Omphalocyclus macroporus* (LAMARCK); *Om. (Torreina) torrei* PALMER; *Orbitoides* spp.; *Rhapydionina* sp.; *Siderolites calcitrapoides* LAMARCK; *Sulcoperculina globosa* DE CIZANCOURT. These fauna are documented from Late Maastrichtian age, of Swazland by ***[8]***; from Iran by ***[9]***, ***[10]***) and ***[11]***; from Algeria by ***[12]***; from Cuba by ***[13]***; from Venezuela by ***[14]***; from Pakistan by ***[15]***; from Turkey by Meriç, 1958 in ***[6]***; ***[17]***, ***[18]***, ***[19]*** and ***[20]***)1985 ; ***[21]***), ***[22]***; ***[23]*** and ***[24]***; from Middle East by ***[25]*** and from Greece by ***[26]***. The most important species marks its first appearance in Iraq is *Pseudorbitolina marthae* DOUVILLE indicating the Late Maastrichtian age (Late Cretaceous age) within the Aqra Formation recognized by ***[27]*** and ***[28]*** from Qatar and by ***[29]*** from United Arab Emirates and Oman.

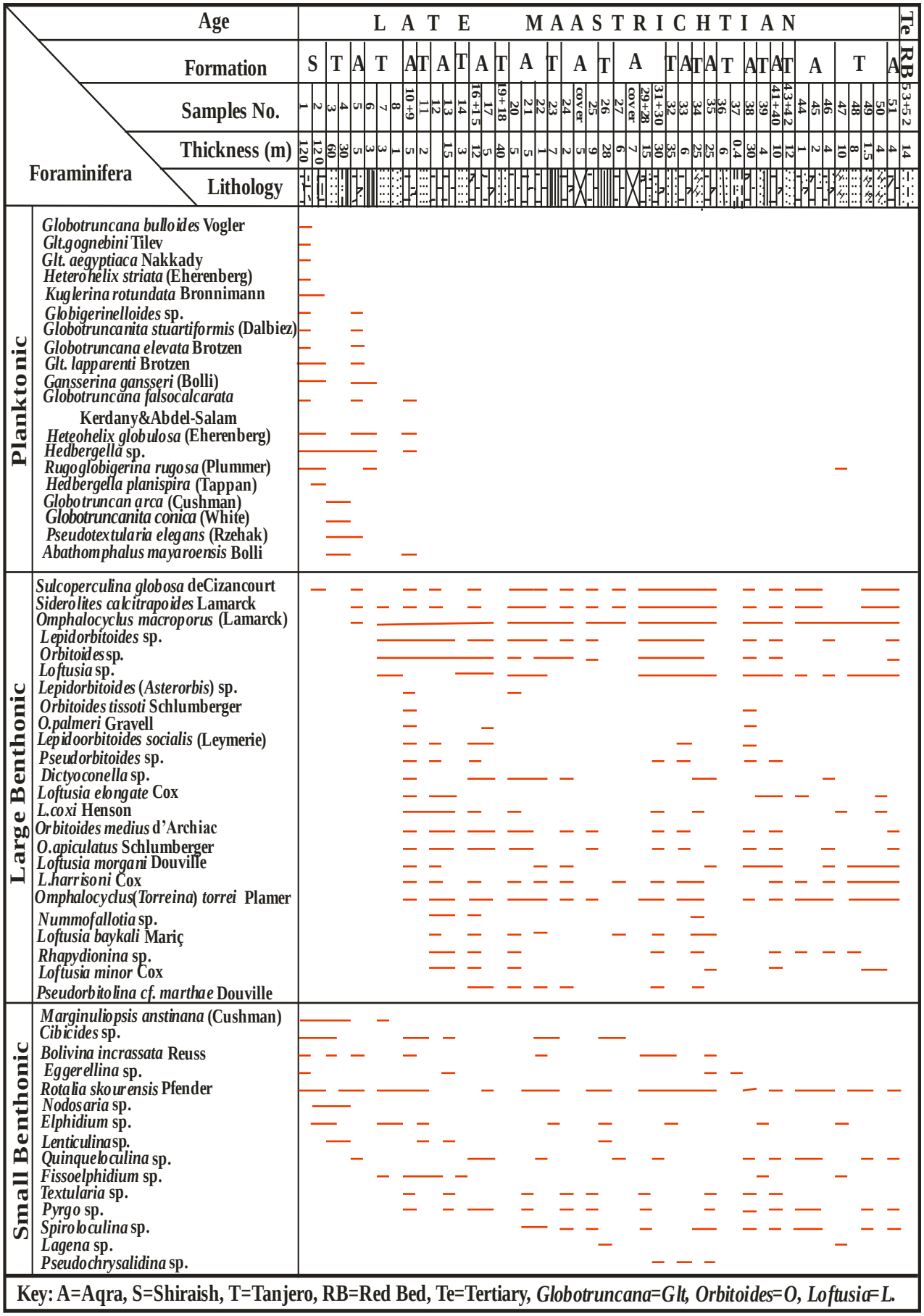

Figure-3: Distribution chart of the foraminifera in the studied section (Mukaba section)

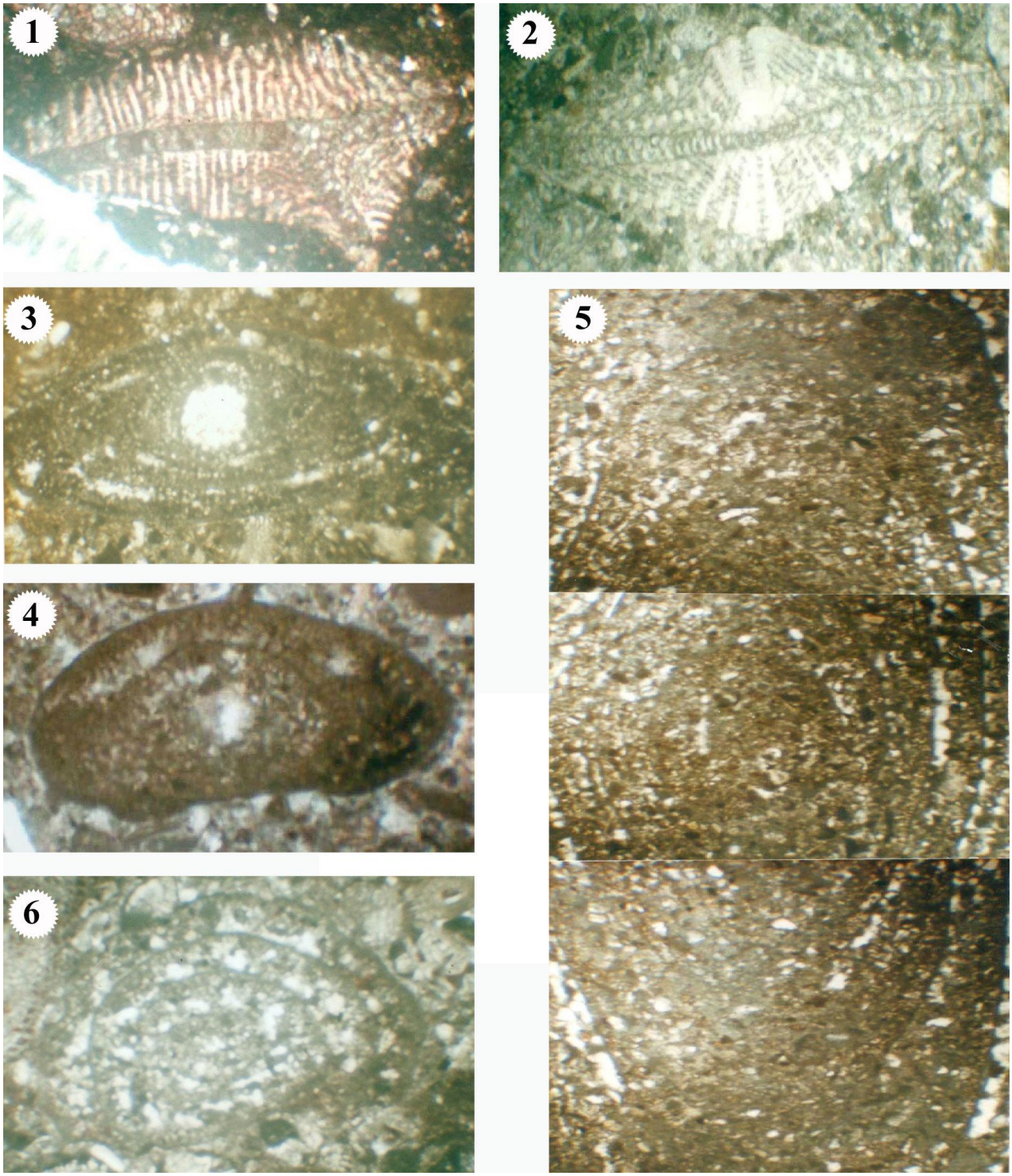

Figure-4: Studded foraminifera
1-*Lepidorbitoides* (*Asterorbis*) sp., X 22.S.No. 20
2-*Lepidorbitoides socialis* (LEYMERIE), X 22, S. No. 17
3-*Loftusia baykali* MERIÇ, X 22, S. No. 20
4-*Loftusia coxi* HENSON, X 22, S. No. 45
5-*Loftusia elongata* COX, X 22, S. No. 50
6-*Loftusia minor* COX, X 22, S. No. 39

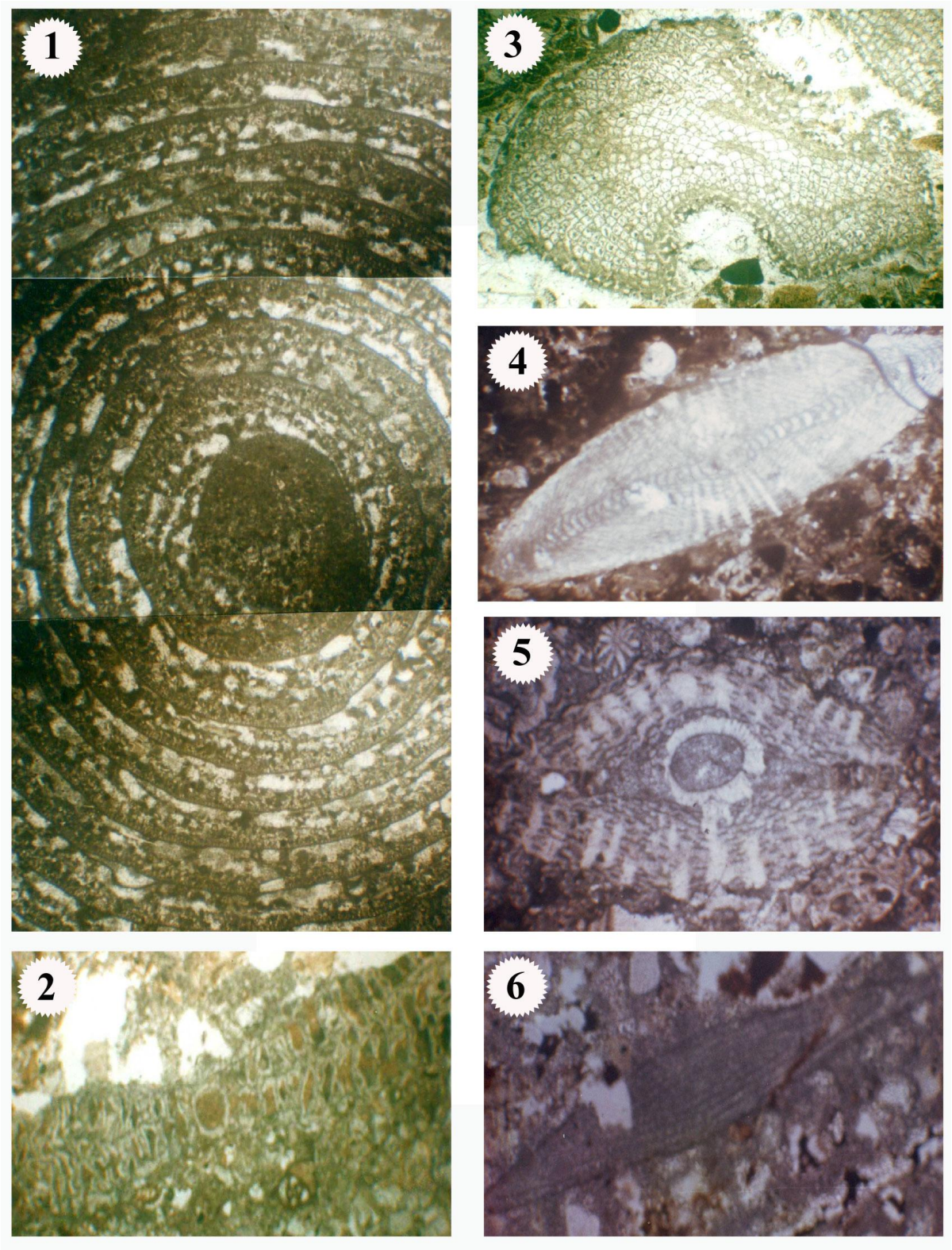

Figure-5: Studded foraminifera
1-*Loftusia morgani* DOUVILLEl, X 22, S. No. 13
2-*Omphalocyclus macroporus (*LAMARCK), X 35, S. No.12
3-*Omphalocyclus (Torreina) torrei* PALMER, X 22, S. No. 33
4- *Orbitoides apiculatus* SCHLUMBERGER, X 22, S. No.32
5- *Orbitoides medius* D'ARCHIAC, X 22, S. No.18
6-*Nummofallotia* sp22X, S. No.9

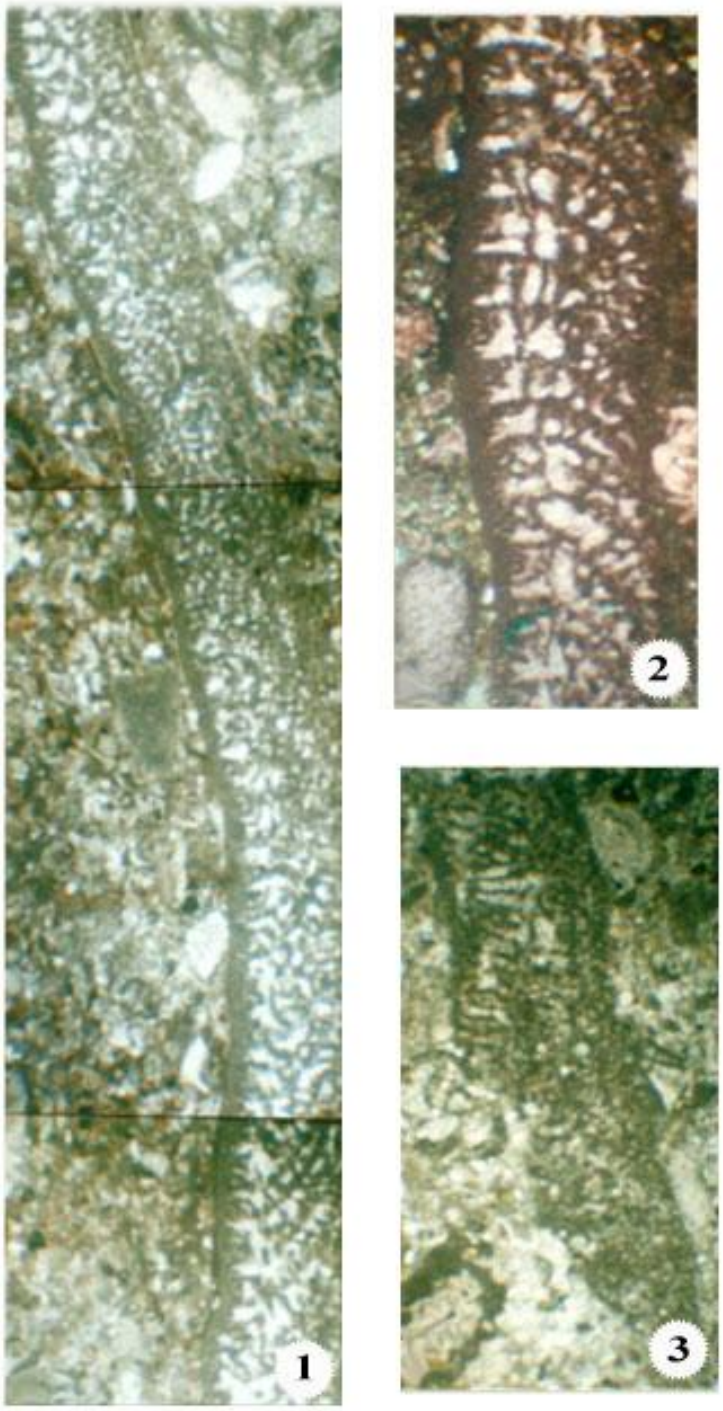

Figure-6: Studded foraminifera
1+2-*Pseudorbitolina marthae* DOUVILLE, X 22, S. No. 16
3-*Pseudorbitolina marthae* DOUVILLE, X 22, S. No. 17

Conclusion

The presence of *Pseudorbitolina marthae* DOUVILLE within the Aqra Formation in addition to the previous-mentioned species indicates and marks the upper part of Cretaceous(Late Maastrichtian).

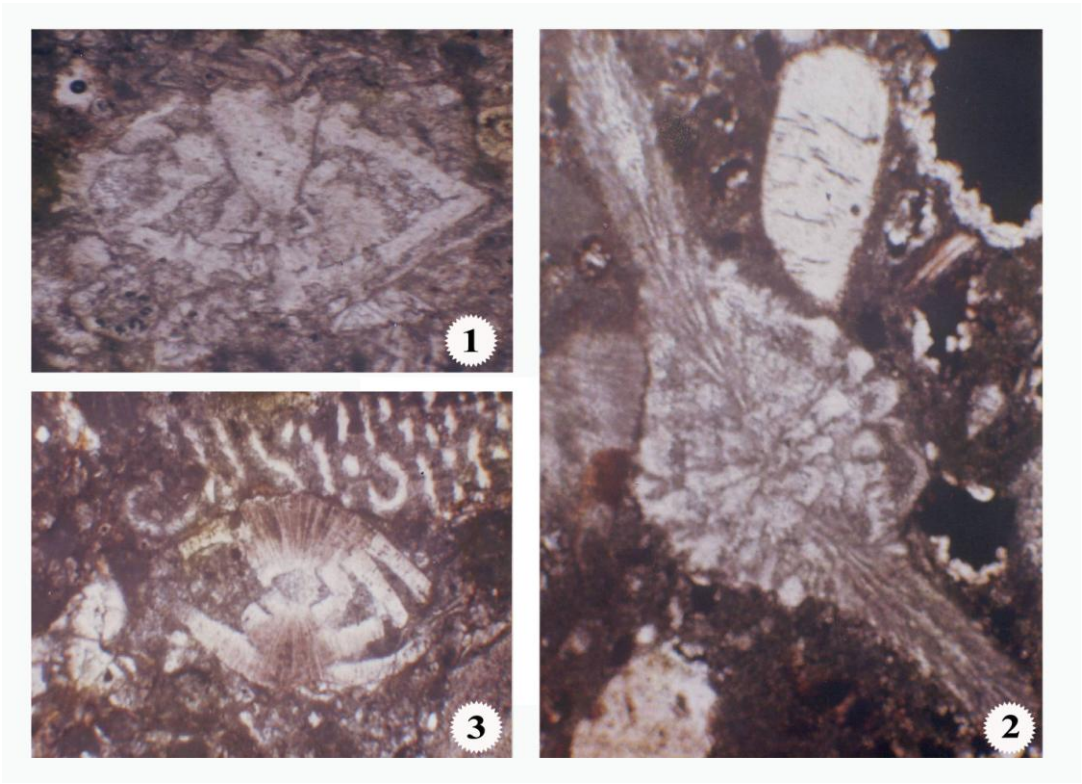

Figure-7: Studded foraminifera
1-*Rotalia skourensis* PFENDER, X 22, S. No.9
2-*Siderolites calcitrapoides* LAMARCK X 22, S. No.9
3-*Sulcoperculina globosa* DE CIZANCOURT, X 22, S. No.12

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