

Investigation of Foraminifera from Gourpi Formation, North of Ilam, Iran and Their Paleonecological Significance

Nooshin Habibi Babadi^{1*}, M.Shankara², Behzad Gholami³

Ph.D Student, Department of Studies in Earth Science, Manasagangotri, University of Mysore, Mysore, India^{1,3}

Professor, Department of Studies in Earth Science, Manasagangotri, University of Mysore, India

Mysore, India.²

ABSTRACT: The current study is on Gourpi formation located in north-west of Ilam. This section with about 120 meters of thickness consists of Marl with Mid-layers of Calcareous Marl which also includes stones of clayey Calcareous parts of Imam Hassan based on geology. The lower boundary of this section is covered and is discontinuously situated over the Ilams formation whereas the upper boundary is well visibly continuously situated below the Pabdeh's formation. Through the boundary of cretaceous-Paleocene there exists a lag of sedimentation and reduction in depth due to absence of *Abathomphalus Mayarousis* Species. As per as the studies done on 43 samples taken from the above section, 24 substances and 54 species were identified. As per as the increase in Planktonic foraminifers Index, the age of Gourpi formation in this section have been estimated to be between mid-campanian and late Paleocene. The analysis of the identified Foraminifers with respect to the Environmental zoning [5][6], led to identification of the following nine environmental zones: *Globotruncanaventricosa* Interval zone, *Radotruncanacalcarata* Taxon-Range zone, *Globotruncanellahavanensis* Partial-Range zone, *Globotruncanaegyptiaca* Interval zone, *Gansserinagansseri* Interval zone, *Contusotruncanacontusa* Interval zone, *Pseudoguembelinahariaensis* Interval zone, *Praemuricauncinata* Interval zone and *Morozovellaangulata* Interval zone.

KEYWORDS: Gourpi Formation, Ilam, Imam Hassan, planktonic foraminifera, bio zone.

I. INTRODUCTION

The Gourpi Formation, situated in the folded section of Zagros Zone is of quite important from a research perspective as it contains a Cretaceous-Paleocene boundary (K/Pg) and high potentiality in creating Source rocks. Its patterned partition situated in northern oilfield section of Lali and northern-east section of Masjed Soleiman has a thickness of 320 meters and consists of limestone clays and bluish gray shale. There are a number of national and international researches done on these foraminifers [1, 2, 3, and 4]. The studied section in the northwest of Ilam is located in the northern part of Emamzadeh-Bakhtiyar link road. (**figure1**)

As per as the necessary studies and a Cross-country analysis, about 43 samples were taken from Gourpi formation and the lower section of Pabdeh formation. After preparing thin sections, each and every sample was examined based on their fossil content. Their stratigraphic distribution of microfossils and environmental zoning (Bio zone) were achieved as well.

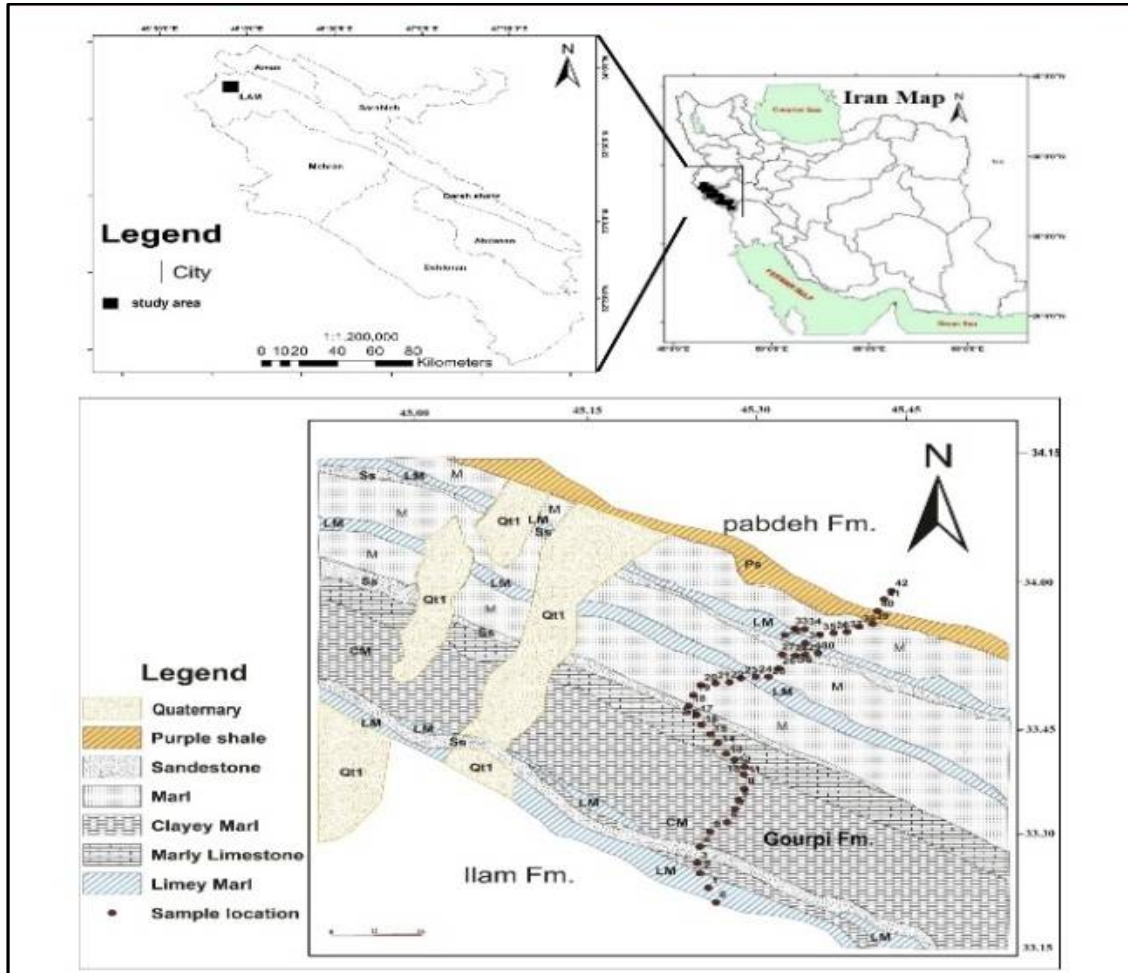


Figure 1: The root to the section under study

II. STRATIGRAPHY

The Gourpi formation has a thickness of about 120 meters. The lower boundary of this section is covered and is discontinuously situated over the Ilams formation whereas the upper boundary is well visibly continuously situated below the Pabdeh's formation. In terms of geology, the cut is divided into four units. The first unit consists of brown and dark shale with mid-layers of limestone and clay containing pyrite particles. The second unit consists of low weathering cream colored limestone clays with mid-layers of colloidal parts and particles of pyrite which assumed to be equivalent with the Imam Hassan section limestone. The third unit contains marl with mid-layers of bluish gray limestone marl. The fourth distinguishable unit consists of Chocolate colored marl with weathered layers of greenish marl and reddish brown marl. It is noteworthy to know that Cretaceous-Paleocene (k / pg) boundary is in 116 meters of thickness from their base. By this boundary a geological change from dark bluish grey marl to soft marls of reddish brown can be observed which implies and end to Cretaceous and its change to Paleocene.

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III. ENVIRONMENTAL STRATIGRAPHY

Once the type and species of Planktonic foraminifera have been identified, to determine the environmental zones of Upper Cretaceous and Lower Paleocene, [5] and [6] are used respectively. As per as this study a total of 24 types and 54 species were identified (Figure 2). Environmental zones in our section of interest are as follows:

1. *Globotruncanaventricosa* Interval zone:

The range of this environmental zone lies within the first appearance of *Globotruncanaventricosa* and the first appearance of *Radotruncanacalcarata*. It ages to Mid-Campanian and some the foraminifera in this zone are as follows: *Contusotruncana fornicate*, *Globotruncanaarca*, *Globotruncanabulloides*, *Globotruncanalinneiana*, *Globotruncanamariei*, *Globotruncanitaelevata*, *Pseudotextularianuttalli*, *Rugoglobigerinarugosa*.

2. *Radotruncanacalcarata* Taxon– Range zone of [7]:

This zone consists of the aforementioned taxon and it ages to Late Campanian. Some of the foraminifera in this zone are: *Archaeoglobigerinacretacea*, *Contusotruncana fornicate*, *contusotruncanapatelliformis*, *Globotruncanaarca*, *Globotruncanabulloides*, *Globotruncanalinneiana*, *Globotruncanamariei*, *Globotruncanaventricosa*, *Globotruncanitaelevata*, *Globotruncanitastuarti*.

3. *Globotruncanellahavanensis* Partial – Range zone:

The range of this environmental zone lies with the last presence of *Radotruncanacalcarata* and the rise in *Globotruncanaaegyptiaca*. This zone is equivalent to *G.stuartiformis* environmental zone introduced by [8]. It ages to Late Campanian and some the foraminifera in this zone are as follows: *Archaeoglobigerinacretacea*, *Contusotruncana fornicate*, *contusotruncanapatelliformis*, *Globotruncanaarca*, *Globotruncanabulloides*, *Globotruncanalinneiana*, *Globotruncanamariei*, *Globotruncanaventricosa*, *Globotruncanitaelevata*, *Globotruncanitastuarti*.

4. *Globotruncanaaegyptiaca* Interval- zone of [5]:

The range of this environmental zone lies within the first appearance of *G.aegyptiaca* and the first appearance of *Gansserinagansseri*. It ages to late Campanian. Some of the foraminifera along this environmental zone are: *Archaeoglobigerinacretacea*, *Contusotruncana fornicate*, *Contusotruncanapatelliformis*, *Contusotruncanaplummerae*, *Globotruncanaarca*, *Globotruncanabulloides*, *Globotruncana*.

5. *Gansserinagansseri* Interval zone of [9]:

The range of this environmental zone lies within the first appearance of *G.gansseri* and the first appearance of *Contusotruncanacontusa*. It ages to Former Maastrichtian and contains the following foraminifera: *Archaeoglobigerinacretacea*, *Contusotruncana fornicate*, *Contusotruncanapatelliformis*, *Contusotruncanapalicta*, *Contusotruncanaplummerae*, *Globotruncanaaegyptiaca*.

6. *Contusotruncanacontusa* Interval zone of [9]:

As per as Premoli Silva & Bolli the range of this environmental zone lies within the first appearance of *C.contusa* until the first appearance of *A.mayaroensis*, however the current study shows that the *A.mayaroensis* does not exist and hence the range of this environmental zone is assumed to be within the first appearance of *C.contusa* until the first appearance of Species similar to *A.mayaroensis* species. It ages to Former Maastrichtian. Some of the foraminifera in this zone are: *Contusotruncana fornicate*, *Contusotruncanapatelliformis*, *Contusotruncanaplummerae*, *Gansserinagansseri*, *Globotruncanaarca*, *Globotruncanadupeubeli*, *Globotruncanamariei*, *Globotruncanaventricosa*, *Globotruncanastuarti*.

7. *Pseudoguembelinahariaensis* Interval zone of [10]:

The range of this environmental zone lies within the first begins of *Pseudoguembelinahariaensis* until the end presence of *Gansserinagansseri*. In the late Maastrichtian sedimentary poverty and the biological chaos phenomena caused by it in the border k/Pg end of this ecological zone is yet not well understood. It ages to late Maastrichtian and some foraminifera that live along this zone include: *Contusotruncanacontusa*, *Gansserinagansseri*, *Globotruncanaaegyptiaca*, *Globotruncanaarca*, *Globotruncanamariei*, *Globotruncanellahavanensis*, *Globotruncanitastuartiformis*.

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8. *Praemuricauncinata* Interval zone of [11]:

Within this ecological zones range between premiere *Praemuricauncinata* to premiere *Morozovellaangulate*. It ages to danian and some the foraminifera in this zone are as follows: *Chiloguembelinamidwayensis*, *Chiloguembelinasubtriangularis*, *Praemuricaconstans*, *Subbotinatriangularis*, *Subbotinatriloculinoides*.

9. *Morozovellaangulata* Interval zone:

The range of this environmental zone lies within the first appearance of *Morozovella angulate* and the first appearance of *Globanomalina pseudomenardii*. It ages to selandian stage and contains the following foraminifera: *Chiloguembelinamidwayensis*, *Chiloguembelinasubtriangularis*, *Praemuricaconstans*, *Praemuricauncinata*, *Subbotinatriangularis*, *Subbotinatriloculinoides*.

IV. CONCLUSION

This study on Gourpi formation of the section of interest resulted in identification of 9 Environmental Zones, 24 types and 54 species. The age of Gourpi formation in this section are estimated to be between Mid-Campanian to Late Paleocene. The lower boundary of this section is covered and is discontinuously situated over the Ilams formation whereas the upper boundary is well visibly continuously situated below the Pabdeh's formation. This section with about 120 meters of thickness consists of Marl with Mid-layers of Calcareous Marl which also includes stones of clayey Calcareous parts of Emam Hassan based on geology. Over the Cretaceous-Paleocene border the Sedimentary poverty phenomenon is observed where the absence of *A. mayaroensis* species signs point to reduction in depth and sedimentary poverty.

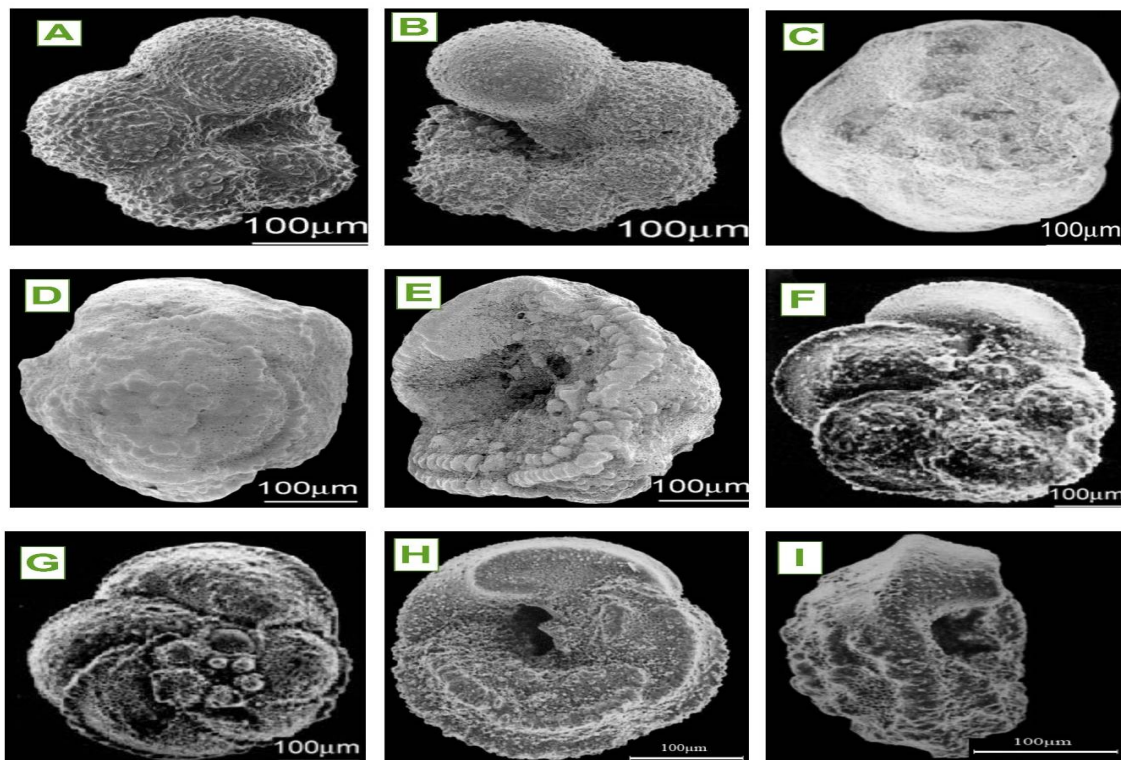


Plate 1. A- *Archaeoglobigerina* Cretacea; B- *Archaeoglobigerina* Cretacea; c- *Contusotruncana* Contusa; D- *Contusotruncana* Contusa; E- *Contusotruncana* Contusa; F- *Contusotruncana* Fornicate; G- *Contusotruncana* Fornicate; H- *Contusotruncana* Fornicate; I- *Contusotruncana* Fornicate.

Plate 2. A- *Contusotruncana* Fornicate; B- *Contusotruncana* Patelliformis; C- *Contusotruncana* Patelliformis; D- *Contusotruncana* Patelliformis; E- *Contusotruncana* Patelliformis; F- *Contusotruncana* Plummerae; G- *Contusotruncana* Plummerae; H- *Gansserina* Gansseri; I- *Gansserina* Gansseri.

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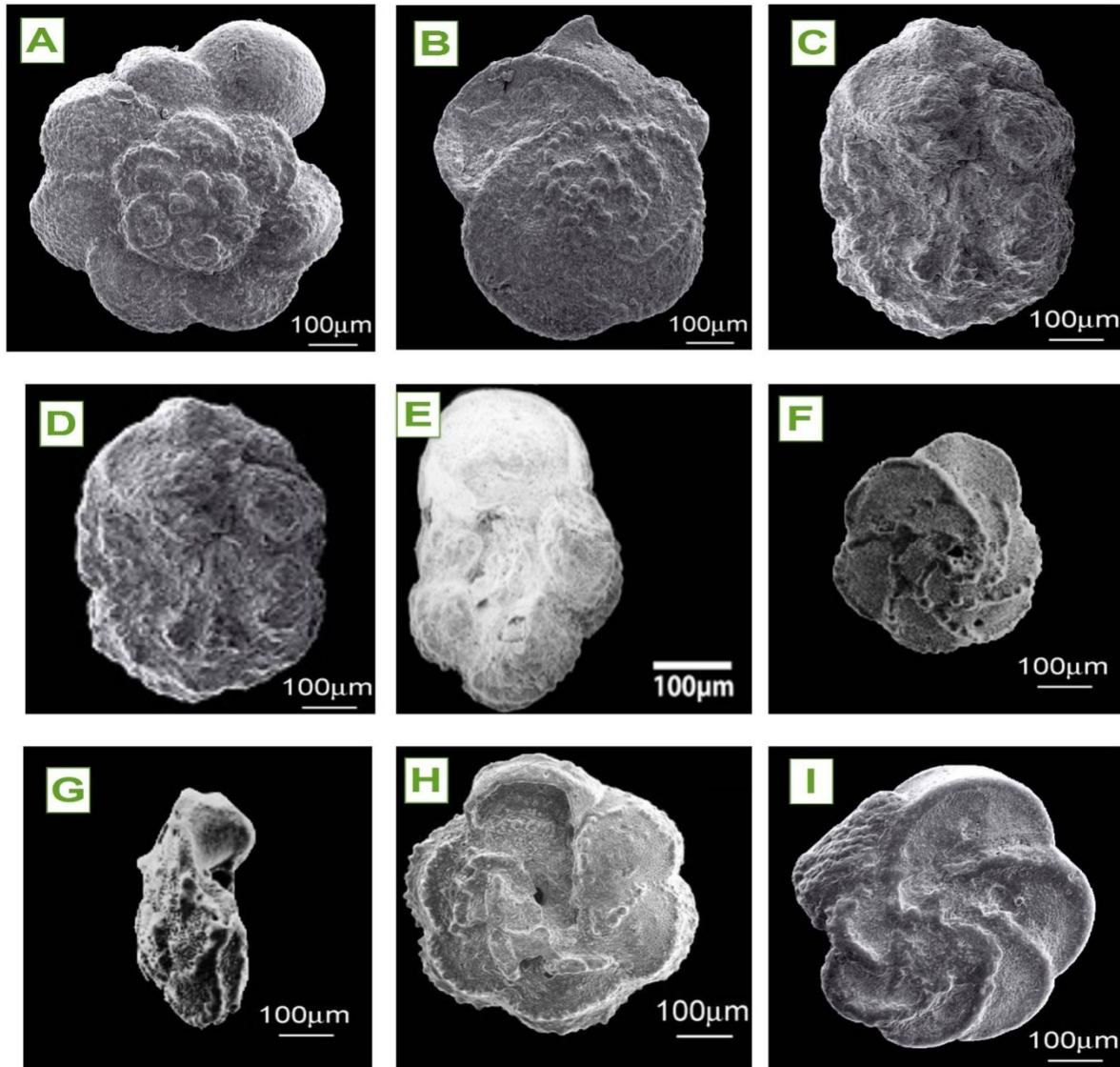


Plate 3. A- *Globotruncana Bulloides*; B- *Globotruncana aegyptiaca* Nakkady; C- *Globotruncana aegyptiaca* Nakkady; D- *Globotruncana aegyptiaca* Nakkady; E- *Globotruncana aegyptica*; F- *Globotruncana arca*; G- *Globotruncana arca*; H- *Globotruncana arca*; I- *Globotruncana Linneiana*

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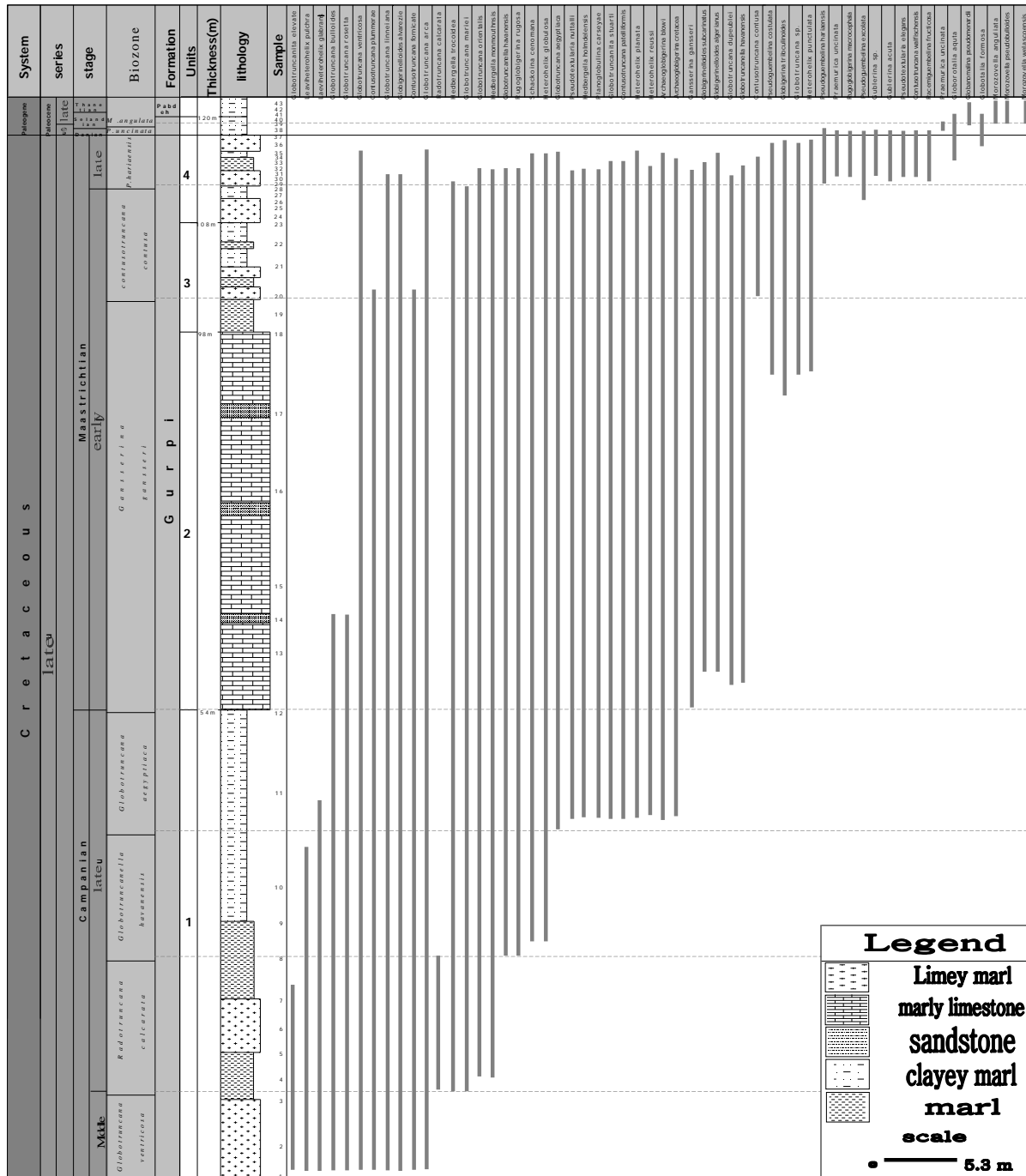


Figure 2: Gourpi planktonic foraminifera range extends in the studied section.

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TSCreator		B i o z o n										
Standard Chronostratigraphy		Berggren et al., 1995			Berggren and Pearsons, 2005			This study				
Paleogene	Paleocene	Thanetian	P5	M.velascoensis		P5	M.velascoensis		M.subbotinae			
			P4c	Ac.soldadoensis-Gl. pseudomenardii		P4c	Ac.soldadoensis-Gl. pseudomenardii		Gl. pseudomenardii			
		P4b	Ac.soldadoensis-Ac. subsphaerica		P4b	Ac. subsphaerica						
		P4a	Gl. pseudomenardii-Ac. subsphaerica		P4a	Gl. pseudomenardii-P. variolaria						
		Selandian	P3b	I. albeari-Gl. pseudomenardii		P3b	I. albeari		M. angulata			
			P3a	M. angulata-I. albeari		P3a	I. albeari		X			
		P2	M. angulata-P. uncinata		P2	P. uncinata						
		P1c	M. angulata-P. uncinata		P1c	M. angulata-P. uncinata						
		P1b	S. triloculinoides-Gl. compressa		P1b	S. triloculinoides						
		P1a	P. eugubina-S. triloculinoides		P1a	P. pseudobulloides						
		Pa	P. eugubina		Pa	P. eugubina						
		P0	G. cretacea		P0	G. cretacea						
		Cretaceous	Late	Campanian	Caron, 1985	Nederbraght, 1991	Robaszynski & Caron, 1995	Hardenbol et al., 1998		Li & Keller, 1998 and Li et al., 1999	Petrizzo, 2003	Permoli silva & Sliter, 1995 and Permoli silva & Verga, 2004
					Abathomphalus mayaroensis	Racemiguembelina fructifera	Abathomphalus mayaroensis	Abathomphalus mayaroensis	Pseudogubina hariaensis	Pse. hantken. (CF1)	Pse. palpebra. (CF2)	Abathomphalus mayaroensis
Racemiguembelina fructifera	Racemiguembelina fructifera (CF4)											
Gansserina gansseri					Gansserina gansseri	Gansserina gansseri	Racemiguembelina fructifera	Pseudotextularia intermedia (CF5)	Gansserina gansseri	Contusotruncana contusa (CF6)	Contusotruncana contusa and Racemiguembelina fructifera	Contusotruncana contusa
	Planoglobulina acervulinoides					Gansserina gansseri (CF7)						
Globotruncana aegyptiaca	Globotruncanella havaensis				Globotruncana aegyptiaca	Pseudogubina excolata	Globotruncana aegyptiaca	Rugoglobigerina hexacamerata (CF8b)	Globotruncana aegyptiaca	Globotruncana aegyptiaca	Globotruncana aegyptiaca	Globotruncana aegyptiaca
					Globotruncanella havaensis							
Radotruncana calcarata	Radotruncana calcarata				Radotruncana calcarata	Pseudogubina costulata	Radotruncana calcarata	Radotruncana calcarata (CF10)	Radotruncana calcarata	Radotruncana calcarata	Radotruncana calcarata	Radotruncana calcarata
Globotruncana ventricosa	Globotruncana ventricosa				Globotruncana ventricosa		Globotruncana ventricosa	Globotruncana ventricosa	Globotruncana ventricosa	Globotruncana ventricosa	Globotruncana ventricosa	Globotruncana ventricosa

Figure 3: A Comparison of planktonic foraminifers' environmental zones in the current study with environmental standards and ecological zones of Tethys basin during the Upper Cretaceous [5] and Paleocene [6].

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