

## UNCOILED AMMONITES OF MIDDLE ALBIAN (LOWER CRETACEOUS) AGE FROM HABUR SERIES, JAISALMER, RAJASTHAN

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### ABSTRACT

The paper embodies the first record of any uncoiled ammonites from Jaisalmer, Rajasthan. These uncoiled forms belong to the genus *Hamites* Parkinson and are represented by two species *H. subrotundus* Spath and *H. praegibbosus* Spath; the forms having been obtained from the top of the strata grouped within *Douvilleiceras* Zone (Lower Albian), the youngest of the 3 biostratigraphic zones established earlier by the author (1975b) within Habur Series. This is the first record of the two species from India, their earlier description being from part of the Gault Unit of England, assigned to the well established standard *Hoplites ? dentatus* Zone of W. Europe of early Middle Albian age. Hence the upper age limit of Habur Series earlier revised and extended by the author (1975a) up to Lower Albian may be further extended up to *Hoplites dentatus* Zone i.e. early Middle Albian.

Besides, the description of the above referred uncoiled ammonite forms, important index ammonites *Douvilleiceras mammilatus* (Schloth.), *D. inaequinodum* (Quenstedt), *Cleoniceras cleon* (d'Orbigny), *C. baylei* (Jacob) *Hoplites ? dentatus* (Sowerby) found within *Douvilleiceras* Zone have also been described and illustrated.

### INTRODUCTION

The occurrence of marine Mesozoic strata in Jaisalmer has been known nearly for a century (Blanford, 1877). The strata correspond to two marine incursions in the area during the Mesozoic period; first one sometime in Upper Bathonian in Jurassic and the second one during late Lower Cretaceous at the advent of Aptian. Succession of beds formed during the latter of the two incursions constitutes Habur Series (Singh & Jai Krishna, 1969). It comprises predominantly calcareous rocks of a shallow shelf environment, exposed in the vicinity of village Habur (27°10'N, 70°33'E) about 40 kms NW of Jaisalmer city.

Presence of ammonites in Habur Series has been known since its very record by Blanford in 1877 as is amply clear from his reference of the unit as 'Kuchri Ammonite Zone' but surprisingly for a long time the only fossils known from it were the ammonites *Deshayesites ? aburense* Spath, *D. ? indicum* Spath recorded and illustrated by Spath (1933) from an earlier collection, and *Prodeshayesites bodei* (von Koenen) recorded by Richter-Bernburg *et al.* (1963) and on the basis of these occurrences both Spath and Richter-Bernburg *et al.* assigned Lower Aptian age to Habur Series. Almost all other workers (Swaminath, 1959; Poddar, 1964; Sastry and Mamgain, 1972; Das Gupta, 1975) on Jaisalmer Mesozoics seem to have followed the said age assignment of these rocks.

Singh and Jai Krishna (1969) on the basis of the presence of a single specimen of the Lower Albian index ammonite genus *Cleoniceras* Parona and Bonarelli suspected

the presence of Lower Albian rocks in Habur Series. Later working on a larger horizon by horizon collection of ammonites, Jai Krishna (1975a) further recorded from Habur Series *Epicheloniceras cf. martini*, *Douvilleiceras mammilatus* (Schloth.) and thereby established the definite presence of Upper Aptian and Lower Albian in Habur Series. In another paper on the biostratigraphic zonation of marine Mesozoic units of Jaisalmer Jai Krishna (1975b) also proposed 3 ammonite zones (Table 1) within Habur Series which in ascending order are (1) *Deshayesites* Zone (Lower Aptian), (2) *Epicheloniceras* Zone (Upper Aptian) and (3) *Douvilleiceras* Zone (Lower Albian). These ammonite zones are found quite comparable and correlatable with the standard ammonite zones established in Europe (Wright, 1952) and Indo-African region (Collignon, 1964). Of special significance is the fact that most of the ammonites reported from Habur Series have their first record from India, and also that *Douvilleiceras* Zone represents the lone occurrence of definite Lower Albian marine rocks anywhere in Western India.

Lately Bannerji (1971), and Mathur and Mathur (1972) have described rich microfauna and microflora from the subsurface core samples which are suggestive of the advent of true marine facies towards the close of Neocomian.

### GEOLOGICAL SETTING AND SUCCESSION

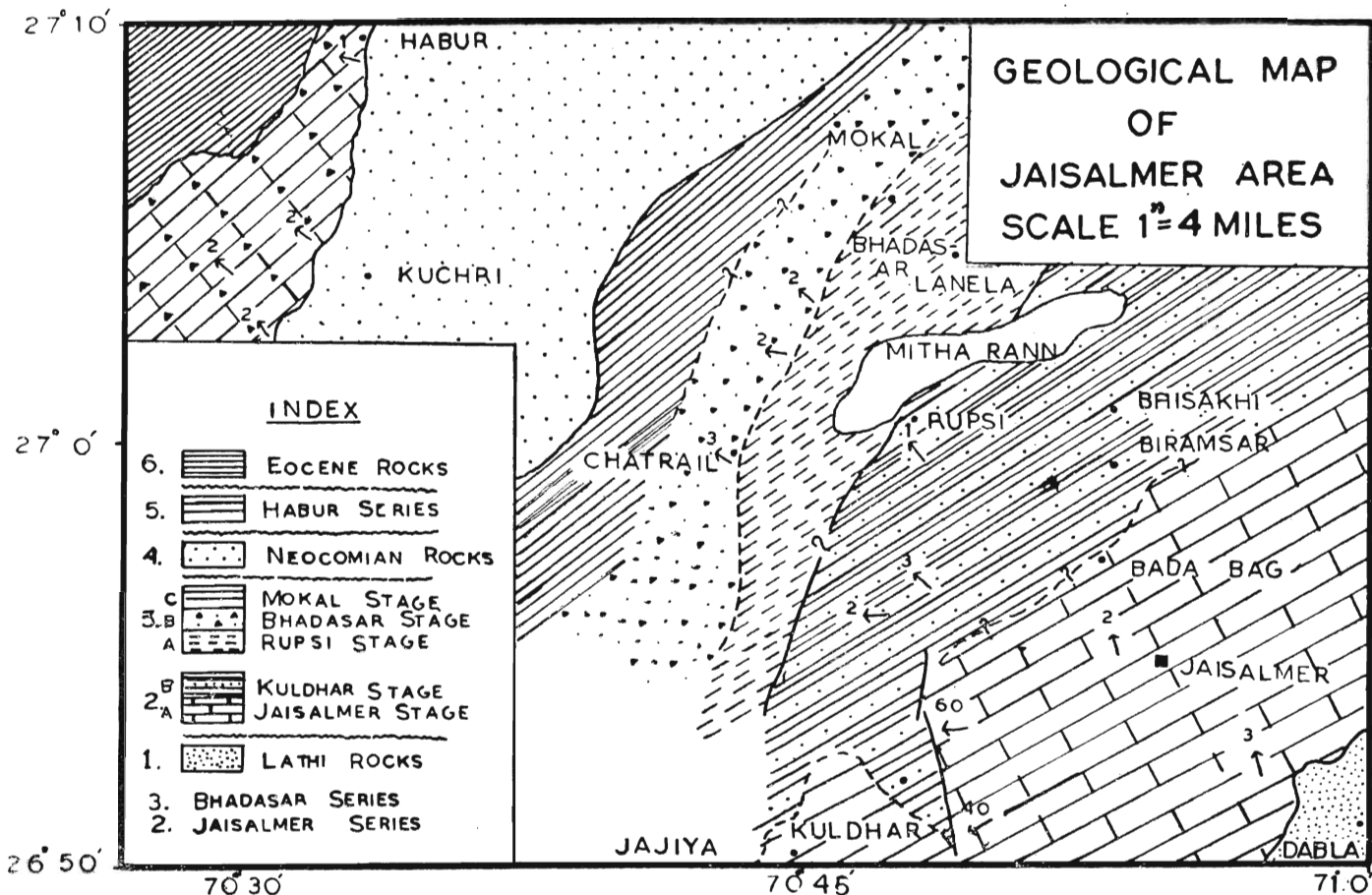
Habur Series is the youngest marine Mesozoic stratigraphic unit in Jaisalmer, and is of late Lower Cretaceous (Lower Aptian—early Middle Albian) age.

Table 1—Ammonite Zonation of Habur Series

Period and Stage	Strat. Unit	Ammonite Zones	Thick. in Mets.	Lithology	
LATE LOWER CRETACEOUS	HABUR SERIES	Lower and early middle albian	<i>Douvilleiceras</i> Zone	5 7	Shell limestones with bivalves. Shell limestones with gastropods, ammonites.
		Upper Aptian	<i>Epicheloniceras</i> Zone	5	Shell limestones with <i>Trigonia</i> etc. and occasional ammonites.
				10	Hard shell limestones with ammonites.
		Lower Aptian	<i>Deshayesites</i> Zone	8	Hard shell limestones with broken shell fragments and subordinate clays.

Stratigraphic units underlying and overlying Habur Series are of fresh water origin, and with both of them it has unconformable contacts. Habur Series is exposed W and NW of Habur (27°10'N, 70°33'E) and Kuchri (27°3'N, 70°34'E) villages in a roughly 10 × 5 kms. belt. The strata have a dip of 2° to 3° due W and NW, and with a total thickness of about 35 meters reveal general thickening of the sequence towards SW. Lithologically the unit comprises arenaceous limestones, hard shell

limestones, clays and sandy marls of yellowish red to brown colour which are intercalated with coquina beds made up of ammonites, bivalves or gastropods. The base is made up of calcareous sandstones and clays and the unit is capped by a conglomerate composed of lumps of bivalve coquinas, shell limestones etc. The prominent fossil elements in the unit are ammonites, bivalves and gastropods which are generally found in hard limestone and marl bands; foraminiferal presence is also evident



in thin sections. *Douvilleiceras* Zone, from which have been obtained the ammonites recorded and illustrated here, comprises hard limestones studded with beautifully ornamented as well as smooth turreted gastropods, intervening marls and bivalve coquina beds. The ammonites are generally confined to hard shell limestones and marls.

## SYSTEMATIC DESCRIPTION

Family Hamitidae HYATT, 1900  
Genus *Hamites* PARKINSON, 1911  
Type Species *Hamites attenuatus* SOWERBY 1814

*Hamites subrotundus* SPATH

(Pl. I—1, 3)

1941 *Hamites subrotundus* Spath, pl. 68, fig. 69, text figs 2219-f p. 626.

*Remarks*: The present specimens resemble much with the description and illustrations of *H. subrotundus* Spath described from Lower Gault of England of early Middle Albian age, though suture line is not preserved in the present specimens. The species has been collected from towards the top of *Douvilleiceras* Zone in association with *Hoplites* ? *dentatus* Sowerby. Though other species of Genus *Hamites* Parkinson have been recorded from Upper Albian and later horizons of South Indian Cretaceous, *H. subrotundus* Spath is being reported for the first time from India.

*Hamites praegibbosus* SPATH

(Pl. I—5)

1942 *Hamites praegibbosus* Spath, pl. 70, figs. 13-15, text figs. 227a-f, p. 626.

*Remarks*: The species is represented by only one specimen, but like the previous species has its first record from India. It occurs in the same stratigraphic horizon and association as *H. subrotundus* Spath.

Family Douvilleiceratidae PARONA and BONARELLI, 1857

Subfamily Douvilleiceratinae PARONA and BONARELLI, 1857

Genus *Douvilleiceras* GROSSOUVRE, 1854.

Type species *Douvilleiceras mammilatus* (SCHLOTH.).

*Douvilleiceras mammilatus* (SCHLOTH.)

(Pl. I—2, 6 and 7)

1923 *Douvilleiceras mammilatus* (Schloth.), Spath, pl. 4, figs. 3a, b; pl. 5, figs. 1-4, p. 68.

<sup>1</sup>Measurements:

Sp. No.	I	II	III	IV
JK/193/76	4.406	1.841	1.900	2.591
JK/194/76	7.123	2.582	2.622	4.012

\*Measurements are in cms.; columns I to IV stand for length of the shell, width of the umbilicus, height of the whorl section and width of the whorl section respectively.

*Remarks*: It is the well known, universally occurring index ammonite species of the late Lower Albian ammonite zone named after the species itself (*D. mammilatus* Zone). Being the most common among all the ammonites of the zone, it has prompted nomenclature of the zone as *Douvilleiceras* Zone in Jaisalmer as well. Present record is also the first record of the genus as well as the species from India, and it has been primarily responsible for decisively establishing the presence of Lower Albian rocks in Jaisalmer.

*Douvilleiceras inaequinodum* QUENSTEDT

(Pl. II—2 and 4)

1923 *Douvilleiceras inaequinodum* (Quenstedt), Spath, pl. 4, fig. 5; pl. 5, figs. 6, 15, p. 70.

## Measurements:

Sp. No.	I	II	III	IV
JK/192/76	6.152	2.281	2.583	3.024

*Remarks*: It is the first record of the species from India. *D. inaequinodum* (Quenstedt) along with *D. mammilatus* (Schloth.) make up the most ornamented ammonite forms among all the zones of Habur Series.

Family Hoplitidae DOUVILÉ, 1890

Subfamily Cleoniceratinae WHITEHOUSE, 1926

Genus *Cleoniceras* PARONA and BONARELLI, 1896

Type species *Cleoniceras cleon* (D'ORBIGNY) 1850

*Cleoniceras cleon* (D'ORBIGNY)

(Pl. II—1 and 3)

1923 *Cleoniceras cleon* (d'Orbigny), Spath, pl. 5, fig. 8, text fig. 19, p. 91.

## Measurements:

Sp. No.	I	II	III	IV
JK/195/76	11.221	2.200	5.792	3.130

*Remarks*: The specimens from Jaisalmer, closely match in morphology, costation and suture pattern with the description and illustrations of *Cleoniceras cleon* (d'Orbigny) recorded from different parts of the world. It is the first occurrence of the species from India. Stratigraphically, it seems to appear a little earlier than the first appearance of *D. mammilatus* (Schloth.) which is very much in agreement with its stratigraphic position in other parts of the world.

*Cleoniceras baylei* (JACOB)

(Pl. II—6 and 7)

1925 *Cleoniceras baylei* (Jacob), Spath pl. 4, figs. 6a, b, text fig. 20, p. 93.

## Measurements:

Sp. No.	I	II	III	IV
JK/198/76	5.261	1.000	2.634	1.653

*Remarks* : The specimen under description from Jaisalmer has greater number of ribs than normally found in *Cleoniceras cleon* (d'Orbigny) but it still compares well with that species in the overall ribbing pattern ; its less acute venter has prompted its inclusion under *Cleoniceras baylei* (Jacob). It is also the first record of the species from India

*Genus* *Hoplites* NEUMAYR, 1875  
*Type species* *Hoplites dentatus* (SOWERBY), 1821

*Hoplites ? dentatus* (OWERBY)  
(Pl. II—5)

*Remarks* : One fragment of whorl side in the present collection displays the characteristic ornamentation of the well known species *H. dentatus* (Sowerby). Its ornamentation comprises prorsiradiate ribs bifurcating with a significant node at the point of bifurcation along with occasional intercalated ribs. Its suture line also seem to depict the typical bifid massive external saddle. The above resemblance as well as its association with *Hamites subrotundus* Spath and *H. praegibbosus* Spath has prompted its tentative identification as *Hoplites ? dentatus* (Sowerby).

#### ENVIRONMENTAL MAKEUP

Giving credence to the habitat and bathymetric distribution of different broadly classified groups of Cretaceous ammonites of Texas worked out by Scott (1940), the ammonite assemblage of *Douvilleiceras* Zone of Habur Series is suggestive of their nectobenthonic habitat in a largely epineritic to infranertic environment. *Cleoniceras cleon* (d'Orbigny) and *C. baylei* (Jacob) which were perhaps the first to appear in the stratigraphic succession represent a group of tenuous, involute, smooth shelled forms with extremely thin, elongated and acute whorl sections flourishing best in an epineritic environment with the depth of the water ranging between 5 to 20 fathoms. This is followed up in the sequence by the

appearance of *Douvilleiceras mammilatus* (Schloth.) and *D. inaequinodum* (Quenstedt) which constitute the group of strongly sculptured ammonites with tuberculated, strong, coarse and widely spaced ribs reflecting an infranertic environment with depth range of water between 20 to 80 fathoms. This in turn is succeeded by the group of less ornamented *Hoplites ? dentatus* (Sowerby) and the uncoiled *Hamites subrotundus* Spath, *H. praegibbosus* Spath which like the previous group also reflect infranertic environment.

On the other hand presence of intercalated coquina bands made up of bivalves, gastropods suggests that towards the close of *Douvilleiceras* Zone (Habur Series) the sea was having frequent fluctuation in its level, though there was a general deepening up of the sea from a shallow epineritic depth of 5 to 20 fathoms to a maximum of 80 fathoms or so up to early Middle Albian period after which the sea withdrew from the area, though subsurface geology of areas further west indicate a continuous marine sedimentation well into Upper Cretaceous.

#### CONCLUSION

The present record of index ammonite forms, *Cleoniceras cleon* (d'Orbigny), *C. baylei* (Jacob), *Douvilleiceras mammilatus* (Schloth.), *D. inaequinodum* (Quenstedt), *Hamites subrotundus* Spath, *H. praegibbosus* Spath and *Hoplites ? dentatus* Sowerby of Lower Albian and early Middle Albian age from *Douvilleiceras* Zone of Habur Series, is quite significant on many counts. 1. Stratigraphically, it decisively establishes the presence of marine Lower Albian and early Middle Albian rocks within Habur Series in Jaisalmer, representing the lone occurrence of definite marine Lower Albian rocks anywhere in Western India. The only other Indian stratigraphic unit equivalent to *Douvilleiceras* Zone of Habur Series, possibly is Dalmiapuram Formation (Bhatia and Jain, 1969), underlying Uttatur Formation at Dalmiapuram, South India though Dalmiapuram Formation has not yielded

Table 2—Correlation of Lower and Early Middle Albian Ammonite Zones

Age	JAISALMER (INDIA) Jai Krishna (1978)	MADAGASCAR Collignon (1964)	W. EUROPE Wright (1952)	CANADA Jeletzky (1964)
LOWER AND EARLY MIDDLE ALBIAN	<i>Hoplites dentatus</i>	<i>Lyellicerias lyelli</i>	<i>Hoplites dentatus</i>	<i>Archhoplites macconelli</i>
	<i>Hamites subrotundus</i>			
	<i>Lemuroceras aburense</i>	<i>Lemuroceras spathi</i>		<i>Archhoplites irenense</i>
	<i>Douvilleiceras mammilatus</i>		<i>Douvilleiceras mammilatus</i>	<i>Lemuroceras cf. indicum</i>
	<i>Cleoniceras cleon</i>	<i>Cleoniceras besairei</i>		<i>Cleoniceras aff. subbaylei</i>
	<i>Pseudosonnertia ?</i>	<i>Pseudosonnertia sakalava</i>	<i>Leymeriella tardifurcata</i>	<i>Sonnertia</i> sp. A
	sp.			

any common ammonite element owing to its different environmental framework of largely reefal make up (Gundu Rao, 1970). From interregional correlation (Table 2) point of view the ammonite assemblage of *Douvilleiceras* Zone compares well with ammonite zones established for Lower Albian and early Middle Albian in Madagascar, Europe, Canada, etc., though the species everywhere are not common. (2) From palaeontologic point of view the present record is important as the forms present are not known from anywhere else in India, though known far and wide the world over. 3. Biogeographically, the ammonite assemblage recorded here along with that of other subdivisions of Habur Series provides strong marine faunal evidence of the remarkable change in ammonite assemblage from an strictly restricted regional composition (India, Africa, Madagascar, etc.) during Callovian-Tithonian period (Jai Krishna, 1968) to a cosmopolitan character during Aptian-Albian period in support of ultimate severing and drifting apart of East Africa and Indo-Australian land masses, which were possibly united or at least connected through land bridges sometime during Neocomian period to permit and encourage more free mixing and migration of faunal elements of the different zoogeographical provinces as also advocated by Verma (1968) and Govindan (1976), respectively basing their studies on the similarity of shark fauna from Bagh Beds and S. Indian Cretaceous rocks, and prevalence of Tethyan elements in the Upper Cretaceous benthonic foraminifera from Cauvery Basin.

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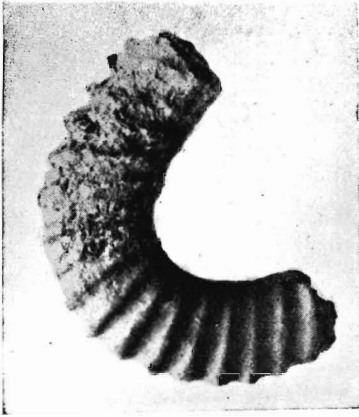
## EXPLANATION OF PLATES

## PLATE I

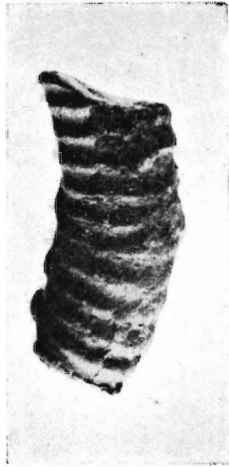
- 1 and 3. *Hamites subrotundus* Spath  $\times 1.3$ , And.  $\times 1.2$
2. Ventral view of *Douvilleiceras mammilatus* (Schloth.)  $\times 1$
4. Lateral view of *Pseudosonnertia* ? sp.  $\times 1.2$
5. *Hamites praegibbosus* Spath  $\times 1.2$
6. Lateral view of *Douvilleiceras mammilatus* (Schloth.)  $\times 1.2$
7. Lateral view of *Douvilleiceras mammilatus*. (Schloth.)  $\times 1$

## PLATE II

1. Lateral view of *Cleonicerias cleon* (d' Orbigny)  $\times 1.8$
2. Ventral view of *Dowilleicerias inaequinodum* (Quenstedt)  $\times 1$
3. Ventral view of *Cleonicerias cleon* (d' Orbigny)  $\times 1.8$
4. Lateral view of *Dowilleicerias inaequinodum* (Quenstedt)  $\times 1$
5. Lateral view of *Hoplites? dentatus* (Sowerby)  $\times 1$
6. Lateral view of *Cleonicerias baylei* (Jacob)  $\times 1$
7. Lateral view of *Cleonicerias baylei* (Jacob)  $\times 1$



1



3



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2



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6



7



1



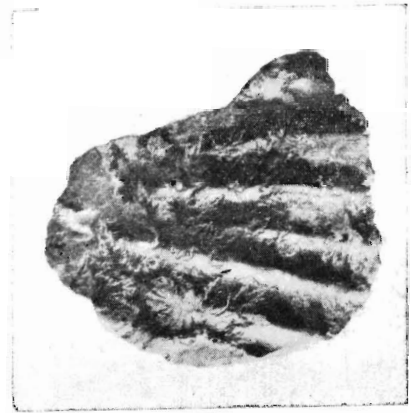
2



3



4



5

