

ECHINOID GENUS *EUPATAGUS* IN TERTIARY ROCKS OF KUTCH, INDIA

D. K. SRIVASTAVA¹

GEOLOGY DEPARTMENT, LUCKNOW UNIVERSITY, LUCKNOW-226007

ABSTRACT

Three species, including two new species of the echinoid genus *Eupatagus* Agassiz, 1847, distinguished on the basis of the presence or absence of frontal sinus, are described. The stratigraphical significance of the genus in Kutch is also discussed.

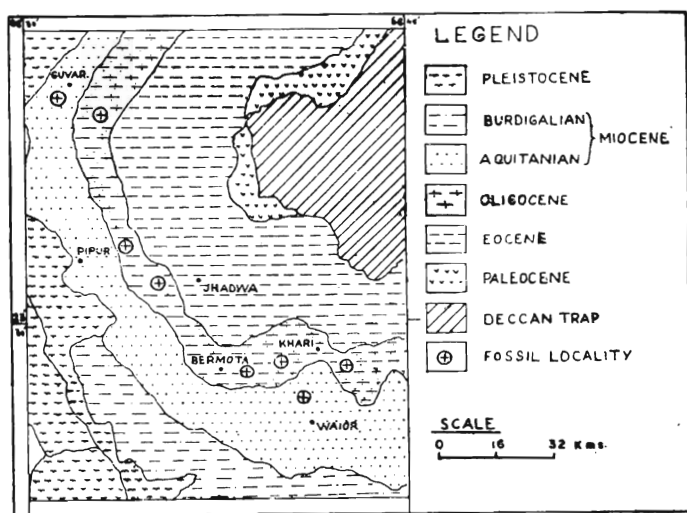
INTRODUCTION

In order to understand the proper stratigraphic distribution of *Eupatagus* in Kutch, a large number of specimens of this genus along with other echinoids were systematically collected during a number of field seasons by Late Dr. K. K. Tandon and the author from the rocks of Oligo-Miocene period exposed around Ber Mota (23°27'45" : 68°38'25"), Pipur (23°31'30" : 68°31'45"), Jhadwa (23°30'30" : 68°36'30"), Guvar (25°38'10" : 68°32'30"), Khari (25°28'05" : 68°41'10") and Waior (23°25'05" : 68°41'45") villages, Kutch (Fig. 1).

(1883) described a few species of this genus from the localities : (i) Eocene rocks exposed about one 'mile' east of Guvar near Narain Sarovar ; (ii) Eocene rocks exposed 3-4 miles northeast of Pipur ; (iii) Oligocene *Orbitoides* beds near Kapfoorassir, north of Kayari ; (iv) 'Nummulitic bed' of Wynne (1872) and (v) Miocene rocks exposed in Waior Stream near Chiropira. Lately, Tandon and Srivastava (1973) recorded its stratigraphic distribution in Kutch. Only a solitary reference of the occurrence of genus *Eupatagus* from the Eocene rocks of Assam is available (Spengler 1923) in the Indian literature.

Wynne (1872), for the first time, classified the Tertiary rocks of Kutch on lithologic basis. Later, a chronostratigraphic classification of the Tertiary rocks of Kutch has been proposed by Biswas (1971). Tandon (1966, 1974) attempted the biozonation of the Oligo-Miocene succession of the southwestern Kutch. The Oligo-Miocene biozonation given by Tandon has been followed in the present paper (Fig. 2). The horizons yielding the genus *Eupatagus* range in age from Lattorfian to Aquitanian and consist of marl and limestone, which at places become sandy.

Oligocene rocks are best exposed in a continuous sequence in the nala cuttings between Jhadwa and Ber Mota villages. This succession unconformably overlies the Middle Eocene rocks and is equivalent to Lower Nari sequence (part) of Sind. The total thickness of the succession is ± 32 m and consists of white, hard and compact limestones, yellow marls and clays. The biostratigraphy of the sequence, as proposed by Tandon (1974) is given in Table 1. The *Spiroclypeus* Zone unconformably lies over the *Eupatagus* (*Eupatagus*) *rostratus* Zone of Chattian age and is assigned to Aquitanian age by Tandon (1974). It is about 5.2 m in thickness and consists of yellow marly and sandy limestone.



(MODIFIED AFTER BISWAS ET AL., 1970)

Fig. 1

In Indian subcontinent, genus *Eupatagus* Agassiz, 1847 has so far been reported from Tertiaries of Kutch and Assam only. In Kutch, Wynne (1872) recorded the genus from the uppermost part of the 'Nummulitic bed' exposed between Kapfoorassir and the edge of Koree estuary. Later, from Kutch region, Duncan and Sladen

¹Present address : Himalayan Geology Division, Geological Survey of India, B-11, 'H' Road, Mahanagar Extension, Lucknow-226006, India.

Table 1. Biostartigraphy of the Area

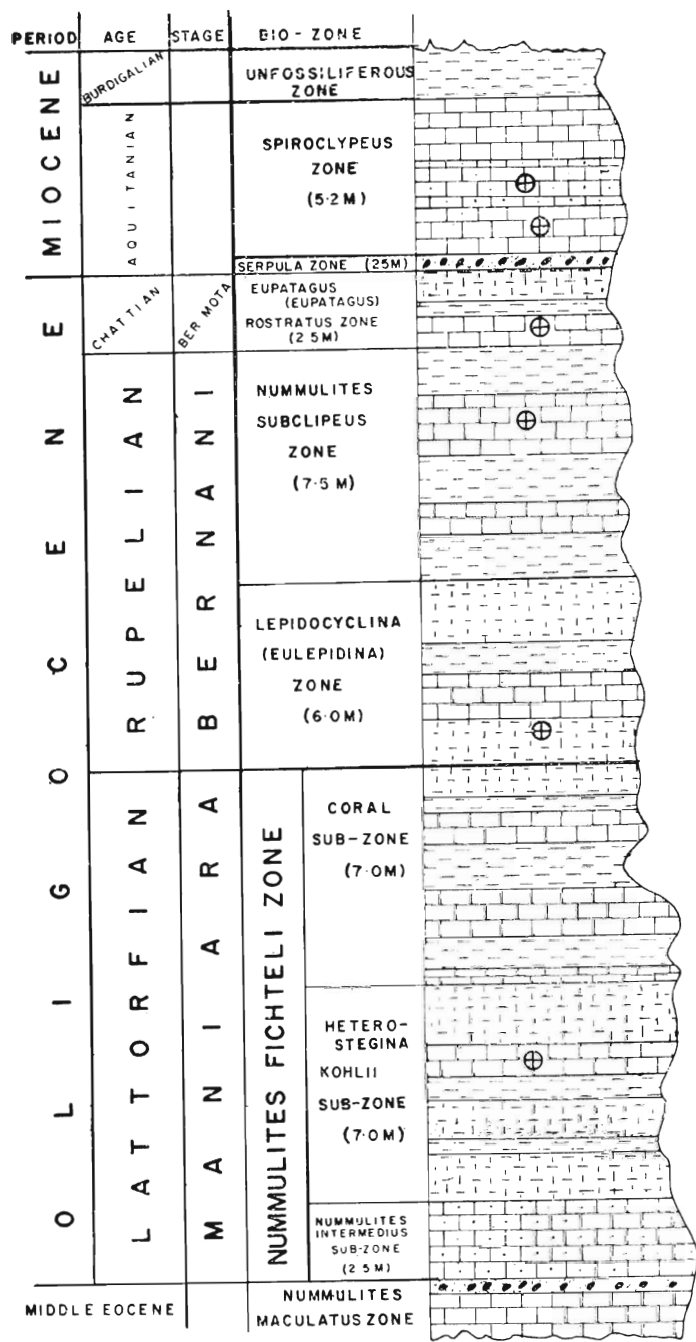


Fig. 2

Period	Age	Stage	Zone
Early Miocene	Aquitanian	..	Spiroclipeus Zone (5.2m)
			Serpula Zone (0.25m)
Unconformity			
MIOCENE	Chattian	Ber Moti	Eupatagus (Eupatagus) rostratus Zone (2.5m)
	Rupelian	Ber Nani	Nummulites subclipeus Zone (7.5m)
OLIGOCENE	Lattorfian	Maniara	Lepidocyclina (Eulepidina) Zone (6.0 m)
			Nummulites fichteli Zone (16.0m)
unconformity			
Middle Eocene			Nummulites maculatus Zone

(After Tandon, 1974)

SYSTEMATIC DESCRIPTION

(After Fischer, 1966)

- Super Order Atelostomata ZITTEL, 1879
- Order Spatangoida CLAUSS, 1876
- Family Brissidae GRAY, 1855
- Genus Eupatagus L. AGASSIZ, 1847
- Subgenus Eupatagus

Eupatagus (Eupatagus) rostratus (d' Archiac)
(Plate I—1-4)

Euspatangus rostratus d' Archiac 1853, *Proc. Res. Geol. Mono. Nummulites*, p. 218, pl. 15, Fig. 3.

Euspatangus rostratus d'Archiac, Duncan and Sladen, 1883. *Pal. Ind.*, ser. 14, vol. 1, pt. 4, pp. 47-48, pl. 7, Figs. 1-8.

Remarks : The species has already been reported by Duncan and Sladen (1883) from the rocks of Eocene and Oligocene age exposed near Pipur and Kapurasir respectively. The species is now being reported from the rocks of Oligocene age exposed at Ber Mota, Guvar, Jhadwa Khari and Miocenes of Guvar.

Eupatagus (Eupatagus) singhi sp. nov.
(Plate I—5-8)

Material and Preservation : 14 well preserved specimens. Holotype No. KTE 1021 ; Paratype Nos. KTE 1022 and KTE 1023.

Etymology : The species has been named after Prof. S. N. Singh, Head of the Geology Department, Lucknow University, Lucknow-226 007.

Diagnosis : Test large, oval, moderately keeled ; lacks frontal sinus ; apical system excentric anteriorly ; paired

ambulacra petaloid ; periproct longitudinally oval ; peristome excentric anteriorly ; peripetalous and subanal fascioles present.

Description : Test large, oval in outline, margin tumid and well rounded, longer than width and wider than height, greatest width posterior to the apical system, truncated posteriorly and moderately keeled aborally towards the posterior side, oral surface concave and a little thickened towards the posterior margin of the test. It lacks the frontal sinus.

Apical system excentric towards the anterior side, small, compact, ethmolytic and consists of four rounded genital pores, two anterior genitals closer than the two posterior ones. Paired ambulacra petaloid and flush with the test with the exception of the poriferous zones which are slightly depressed and consist of oval inner pores and slit like outer pores, ambulacra II and IV less flexuous and shorter than the ambulacra V and I, ambulacra III flush with the test.

Periproct longitudinally oval, lies on vertical posterior truncation and not visible from aboral side. Peristome on oral surface in a slight depression, excentric towards the anterior side and kidney shaped. Both peripetalous and large kidney shaped subanal fascioles present. The test is ornamented with nonperforated and noncrenulated tubercles which are sunken in small circular scorbicules. These occur within area circumscribed by the peripetalous fasciole, aborally tubercles scarce and large while orally these are small and dense.

Measurements in mm :

Specimens no. No.	Length of test	Breadth of test	Height of test	B/L	H/L
1. KTE 1021 (Holotype)	35.0	27.5	15.0	0.78	0.428
2. KTE 1022 (Paratypes)	36.0	29.0	13.8	0.80	0.383
3. KTE 1023	25.0	21.0	9.6	0.84	0.384

Remarks : The species under description differs from *Eupatagus (Eupatagus) rostratus* (d' Archiac) described by Duncan and Sladen (1883) from Eocene rocks of Kutch and *Eupatagus (Gymnopatagus) tandoni* sp. nov. in lacking the frontal sinus and having less flexuous ambulacra II and IV.

Type locality : Near Ber Mota village, Kutch.

Type horizon : *Lepidocyclina (Eulepidina)* Zone, Middle Oligocene.

Subgenus *Gymnopatagus* DODERLEIN, 1901

Eupatagus (Gymnopatagus) tandoni sp. nov.

(Plate I—9-11)

Material and Preservation : 9 well preserved specimens. Holotype No. KTE 1030, Paratype Nos. KTE 1031, KTE 1032, KTE 1033 and KTE 1034.

Etymology : The species has been named in honour of Late Dr. K. K. Tandon, Reader in Geology Department, Lucknow University, Lucknow-226 007.

Diagnosis : Test large with deep frontal sinus ; apical system ethmolytic, excentric anteriorly ; paired ambulacra petaloid ; periproct circular to longitudinally oval ; peristome semicircular in shape ; excentric anteriorly.

Description : Test large, oval in outline with a deep frontal sinus ; margin tumid and well rounded, longer than width and wider than height, maximum width just posterior to the apical system, truncated posteriorly and strongly keeled aborally on the posterior side ; oral surface more or less flat, but a little thickened posteriorly.

Apical system excentric towards the anterior side, small, compact, ethmolytic and consists of four rounded genital pores, two anterior genital pores closer than the two posterior ones.

Paired ambulacra petaloid and flush with the test with the exception of the poriferous zones which are slightly depressed and consist of circular to oval inner pores and outer slit like pores, ambulacra II and IV strongly flexuous and shorter than the ambulacra V and I, ambulacra III flush with the test near the apical system but slightly depressed crossing the ambitus.

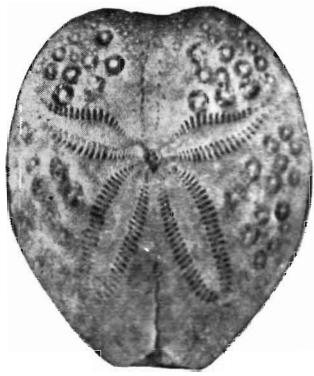
Periproct circular to longitudinally oval, lies on vertical posterior truncation and not seen from aboral side. Peristome on oral surface, excentric towards the anterior side and semi circular in outline. Both peripetalous and kidney shaped subanal fascioles present.

The test is ornamented with nonperforated and noncrenulated tubercles which are sunken in small circular scorbicules. These occur within area circumscribed by the peripetalous fasciole ; aborally tubercles scarce and large while orally these are small and dense.

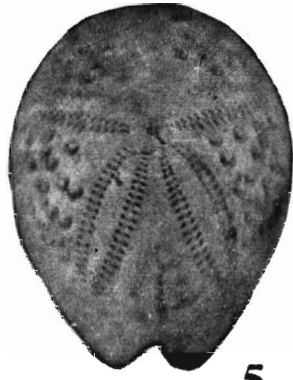
Measurements in mm :

Specimen No.	Length of test	Breadth of test	Height of test	B/L	H/S
1. KTE 1030 (Holotype)	48.0	38.3	21.7	0.79	0.45
2. KTE 1031 (Paratypes)	38.0	31.4	17.4	0.82	0.46
3. KTE 2032	37.2	31.0	17.2	0.83	0.47
4. KTE 1033	44.7	33.9	20.8	0.76	0.49
5. KTE 1034	46.4	36.2	21.0	0.78	0.45

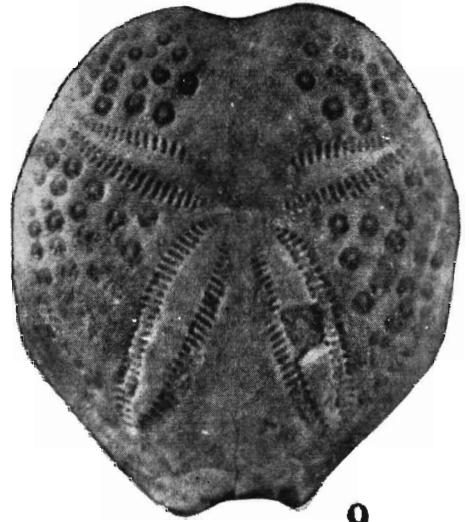
Remarks : The new species resembles somewhat with the British Somaliland species, *Eupatagus cairensis* P. de Loriol, described by Kier (1957) from Karkar Series (Middle Eocene) but it differs from latter in not having the deep frontal sinus and in the opinion of author, the Somalilandian species should be kept within the genus *Eupatagus (Eupatagus)* in which the frontal sinus is lacking or poorly develop.



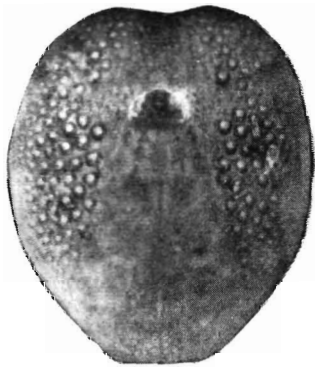
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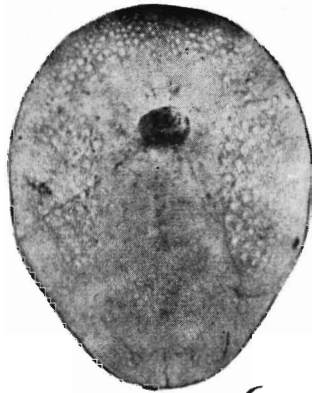
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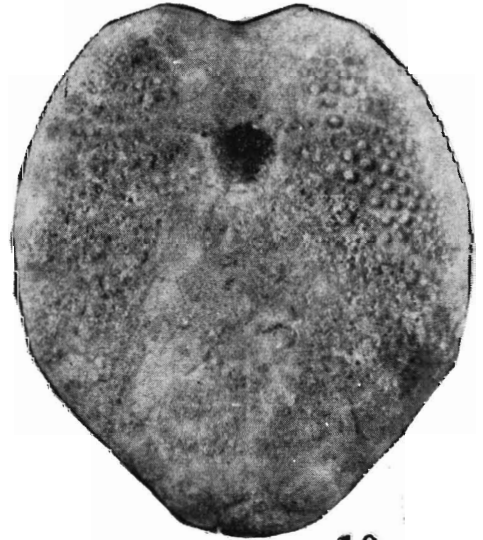
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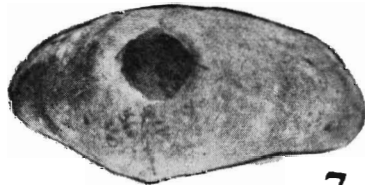
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The species under description differs from *Eupatagus* (*Eupatagus*) *affinis*, (Duncan and Sladen), described by Duncan and Sladen (1883) from Eocene rocks of Kutch in the shape of paired ambulacra. *Eupatagus* (*Gymnopatagus*) *tandoni* sp. nov. differs from *Eupatagus* (*Eupatagus*) *rostratus* (d' Archiac) described by Duncan and Sladen (1883) from Eocene rocks of Kutch, in having deeper frontal sinus and the fascioles. Further, the shape of ambulacra also vary in the species under description.

Type Locality : Near Ber Mota village, Kutch.

Type Horizon : *Eupatagus* (*Eupatagus*) *rostratus* Zone, Late Oligocene.

Repository : All the specimens described herein are deposited in the Museum, Geology Department, Lucknow University, Lucknow-226 007.

CONCLUSION

Out of the three species included in this paper, only *Eupatagus* (*Eupatagus*) *rostratus* (d'Archiac) was reported earlier. The stratigraphic distribution of the three species of *Eupatagus* in Kutch region is shown in Table 2. From this Table, it is clear that as far as this genus is concerned,

Table 2

STRATIGRAPHICAL RANGES OF EUPATAGID SUBGENERA IN KUTCH

PERIOD	AGE	ZONE	SPECIES	EUPATAGUS	EUPATAGUS	EUPATAGUS
				(EUPATAGUS) ROSTRATUS (D'ARCHIAC)	(EUPATAGUS) SINGHI SP. NOV.	(GYMNOPATAGUS) TANDONI SP. NOV.
TERTIARY	AQUITANIAN	SPIROCLYPEUS ZONE				
		SERPULA ZONE				
		UNCONFORMITY				
OLIGOCENE	CHATTIAN	EUPATAGUS (EUPATAGUS) ROSTRATUS ZONE				
	RUPELIAN	NUMMULITES SUBCLYPEUS ZONE				
Eocene		LEPIDOCYCLINA (EULEPIDINA) ZONE				
	LATTORFIAN	NUMMULITES FICHELTI ZONE				

it has no representative in Eocene of Kutch and appeared for the first time in Kutch region in Lattorfian and continued up to Early Aquitanian. On the basis of the occurrence of *Eupatagus* (*Eupatagus*) *rostratus* (d'Archiac) in the *Spiroclypeus* Zone, it is suggested that the age of this species can be extended from Oligocene (Duncan and Sladen, 1883) to Aquitanian, at least. Further, *Eupatagus* (*Eupatagus*) *rostratus* (d'Archiac) and *Eupatagus*

(*Eupatagus*) *singhi* sp. nov. are markedly absent in the Serpula Zone underlying the *Spiroclypeus* Zone. The absence of these two species can be attributed to the reason that the dominant serpulas might have provided an unsuitable environment for eupatagids. It was also observed that the eupatagids increased in number and occur very commonly in the Early Rupelian and Chattian beds but after Chattian the number decreases sharply. Thus the early Rupelian-Chattian period saw the maximum development of the eupatagids.

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EXPLANATION OF PLATE

PLATE I

- Eupatagus* (*Eupatagus*) *rostratus* (d' Archiac), *Nummulites fichteli* Zone, Loc. Guvar, aboral view, ×1.75 approx.
- Eupatagus* (*Eupatagus*) *rostratus* (d' Archiac), *Nummulites fichteli* Zone, Loc. Guvar, oral view, ×1.75 approx.
- Eupatagus* (*Eupatagus*) *rostratus* (d' Archiac), *Nummulites fichteli* Zone, Loc. Guvar, postero-lateral view, ×1.75 approx.
- Eupatagus* (*Eupatagus*) *rostratus* (d' Archiac), *Nummulites fichteli* Zone, Loc. Guvar, lateral view, ×1.75 approx.
- Eupatagus* (*Eupatagus*) *singhi* sp. nov., *Nummulites subclipeus* Zone, Loc. Ber Mota, aboral view, ×1.25 approx.
- Eupatagus* (*Eupatagus*) *singhi* sp. nov., *Nummulites subclipeus* Zone, Loc. Ber Mota, oral view ×1.25 approx.
- Eupatagus* (*Eupatagus*) *singhi* sp. nov., *Nummulites subclipeus* Zone, Loc. Ber Mota, postero-lateral view, ×1.25 approx.
- Eupatagus* (*Eupatagus*) *singhi* sp. nov., *Nummulites subclipeus* Zone, Loc. Ber Mota, lateral view ×1.35 approx.
- Eupatagus* (*Gymnopatagus*) *tandoni* sp. nov., *Eupatagus* (*Eupatagus*) *rostratus* Zone, Loc. Guvar, aboral view, ×1.50 approx.
- Eupatagus* (*Gymnopatagus*) *tandoni* sp. nov., *Eupatagus* (*Eupatagus*) *rostratus* Zone, Loc. Guvar, oral view, ×1.50 approx.
- Eupatagus* (*Gymnopatagus*) *tandoni* sp. nov., *Eupatagus* (*Eupatagus*) *rostratus* Zone, Loc. Guvar, lateral view, ×1.6 approx.