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SHORT COMMUNICATION

A NOTE ON *'STEREOCIDARIS' KEERTII* SMITH, 2010 *VIS-À-VIS* *'STEREOCIDARIS' NAMADICA* (DUNCAN, 1887) FROM THE BAGH FORMATION, M.P., INDIA

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ABSTRACT

'Stereocidaris' keertii Smith, 2010 is the second cidaroid echinoid being reported 123 years after the first one, i.e. *'S.' namadica* (Duncan, 1887), on the strength of a single specimen, picked loose, from an abandoned quarry at Karondia, assigning both of them a Turonian age. While *keertii*, at the first glance, looks very similar to *'S.' namadica*, the former has been deemed differentiable from the latter for its wider perradial ambulacral zone filled with smaller, somewhat elongate granules, and the degree of coarseness of the extrascrobicular granulation of their interambulacral plates.

In this note it has been argued (with an explanation on the likely reasons for the observed differences between *namadica* and *keertii*) that Smith's new taxon (the latter obne) is merely an ecophynotypic variant of *namadica* !

Keywords: *'Stereocidaris' keertii*, Smith, 2010; *'S.' namadica* (Duncan, 1887); Bagh Formation; Turonian; Madhya Pradesh, India; Ecophynotypic variant

INTRODUCTION

The Late Cretaceous shallow-water marine rocks of the Bagh Formation (formerly called the Bagh Beds) are well known for various kinds of invertebrate fossils, more than 75% of which are echinoids (dominated by the irregular ones). These echinoids have attracted the attention of palaeontologists since the late 19th century when Duncan (1887) examined few echinoids from these sediments. The only cidaroid studied by him, in considerable detail, was named *Cidaris namadicus* Duncan, 1887. Fourtau (1919), later, restudied Duncan's material and the species was instead transferred to the genus *Dorocidaris* A. Agassiz, 1869. In order to match the genders of the trivial and the generic names, Fourtau amended the name as *Dorocidaris namadica* Duncan, 1887 (*sic*., Fourtau, 1919, p. 35).

More than five decades later, Chiplonkar and Badve (1972) recorded this taxon again, preferring Duncan's original naming, i.e. *Cidaris namadicus* (since *Dorocidaris* A. Agassiz,1869 was subsequently adjudged synonymous with *Cidaris* Leske, 1778), ignoring Fourtau's grammatical pronouncement for the discrepancy in the respective genders of the binomial names coined by Duncan! Later, Dassarma and Sinha (1975) reported this species again, and following Fourtau, reinstated its name as *D. namadica*, ignoring in turn the dictum prescribed by Fell (1966, p. U331). The latest report of this cidaroid is by Smith (2010) who transferred *namadica* provisionally to *'Stereocidaris' s.l.* Pomel, 1883.

It is worth noting that among all the examples of cidaroid echinoids collected, reported and described from the Bagh Formation rocks so far (123 yrs), the only known taxon was Duncan's *namadica*, but for the second one, recently discussed by Smith (2010, p. 372) as *'Stereocidaris' keertii* sp. nov., on the strength of a single specimen, picked loose, from an abandoned quarry at Karondia (south of Zeerabad), Dhar district, Madhya Pradesh (M.P.), India (Fig.1).

Smith (2010, p. 372), has meticulously arrived at a conclusion that "...the bulk of the Bagh Formation was deposited during the Turonian". However, it may be worth reminding that Chiplonkar and Borkar (1973, p. 3) had envisaged much earlier that the age of the Bagh Formation (their Bagh Beds) "...is Cenomanian and Turonian, the latter being perhaps relatively the more conspicuous"! Likewise, Sharma (1976, p. 242), and Rajshekhar (1995, p. 417) too had opined that the Bagh Formation sediments are largely of Turonian age.

The material, this note is based upon, is solely on the basis of the examples of *namadica* and *keertii* used by Smith (2010), reposited in the Natural History, Museum (NHM), London.

'S.' NAMADICA vs. 'S.' KEERTII

Smith has elaborately described his *namadica* and *keertii* (Figs. 2A and 2B respectively), distinguishing the two: "...by their very different ambulacral tuberculation. The former has a narrower perradial ambulacral zone with only a double column of rounded granules, while the latter has a broader zone filled with smaller, somewhat elongate granules. The two also differ in the coarseness of the extrascrobicular granulation of their interambulacral plates...". Smith admits (2010, p. 372) that the two, "...at first glance..." look "...very similar"! The purpose of this note is to evaluate the validity of this **'new'** specific status of *'S.' keertii* in spite of its perceivable similarity to *'S.' namadica* in its overall appearance. It would be useful to reexamine, item-wise, the features of advocated differences while justifying the individuality between the two taxa (Smith, 2010, p. 372), in order to arrive at a tangible consequence regarding the ***new*** status of *'S.' keertii*.

(i) Width of the Ambulacral Zone

The ambulacral tuberculation in *namadica* (Smith, 2010), about four abreast (of which two are marginal and two internal, along with a few tiny rounded granules), occupy the interporiferous zone (c. 1.9 mm in NHM EE 13841) having mostly (not all) rounded tubercles (Fig. 3A); whereas in *keertii*, the interporiferous zone (c. 2.4 mm in NHM EE 13844) harbours

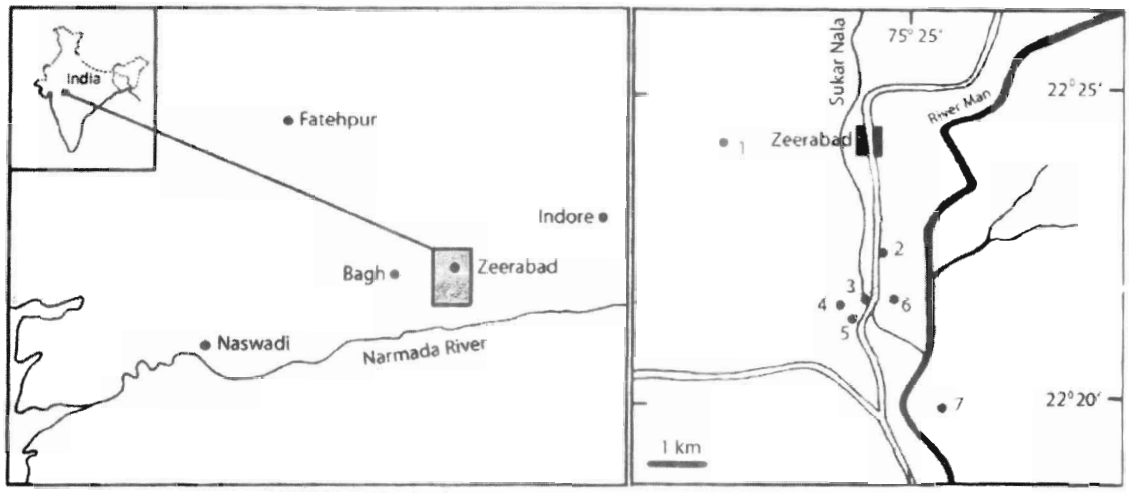

Fig. 1. The location map of the Zeerabad region, along with important Bagh Fm exposures: 1-Rati Talai Quarry; 2-Karaundia Quarry; 3-Badia river-cliff section; 4-Chakrud Quarry; 5-Chakrud road-section and pond; 6-Badia Village; and 7-Sitapuri Village (After Smith, 2010).

four or more tubercles abreast (rather irregularly), of which most are elliptical or ovoidal, but some are rounded indeed (Fig. 3A and 3B respectively). The deemed 'narrowness' of the perradial ambulacral zone in *namadica*, as seen in the two matching examples (NHM EE 13841 and NHM EE 13844 of about 55 mm ambital diameter each of *namadica* and *keertii* respectively) amounts only about a trivial 0.5 mm; what catches the sight is not the relative width of the perradial ambulacral zones but the intrinsic designs therein. Emphasizing on the factor of narrowness of this zone does not seem to merit an instant differentiation!

(ii) Broadening of the Interporiferous Zone

In the so-called "broader zone" in *keertii*, the inner tubercles (comprising several rounded and few transversely elongate ones) are separated by a band of randomly set granules, mostly elongate (and some rounded too) as illustrated by Smith (2010, here reproduced in Fig. 3). The ultimate 'broadening' of the said zone is obviously due to acquisition of a greater number of randomly distributed elongate grains (though individually smaller than the bordering inner tubercles). However, this feature does not appear to be good enough to warrant erection of a new taxon since smaller grains, though fewer, have indeed developed in the interporiferous zone of *namadica* too. Instead, this phenomenon seems to be an exercise to slightly increase the spacing between the pore-zones in order to gain a wider space for respiration; and the finer extrascrobiculation in *keertii* may be a result of energy budgeting as a compensatory maneuver, compromising for the increased number of tuberculation in its interporiferous zone!

Obviously, the individual required a better oxygenation (due to poorer niche conditions?), prompting for the 'modifications' : a need-based physical maneuver suggesting ecological reason's role in the phenomenon

(iii) Tuberculation in the Interporiferous Zone

The marginal tubercles of both *namadica* (Fig. 3A,C) and *keertii* (Fig. 3B,D) are rounded. The inner tubercles of *namadica* are mostly rounded (but a few are not), and associated with tiny rounded tubercles too. Those for *keertii* comprise more than four columns of irregularly disposed comparatively smaller tubercles, mostly elongated, but some are rounded too. The pattern seems to be an exaggeration (associated with reduction in size) and distortion of inner tuberculation in *keertii* in comparison to that in *namadica*;

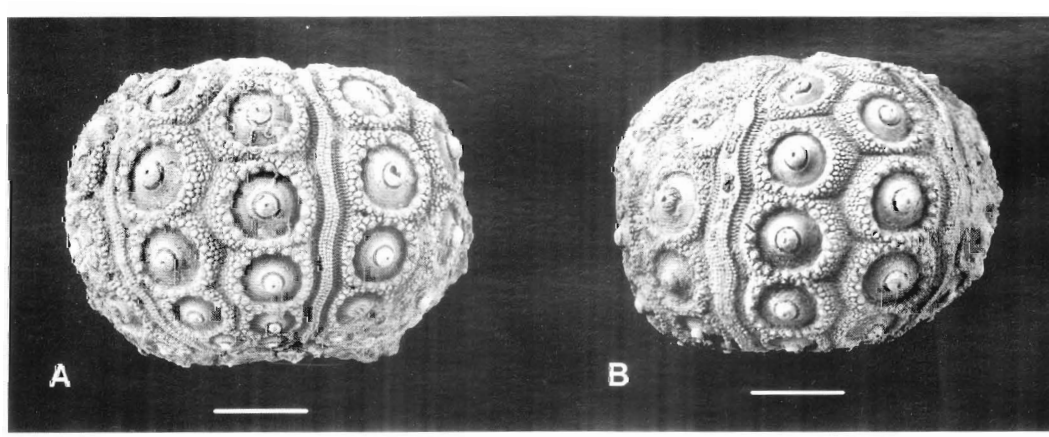

Fig. 2 : A- *'Stereocidaris' namadica* (Duncan, 1887) (Sp. No.: NHM EE 13841), and B- *'S.' keertii* sp. nov., Smith, 2010 (Sp. No.: NHM EE 13844) showing ambital views. Bar scale = 10 mm (approx) (Modified after Smith, 2010).

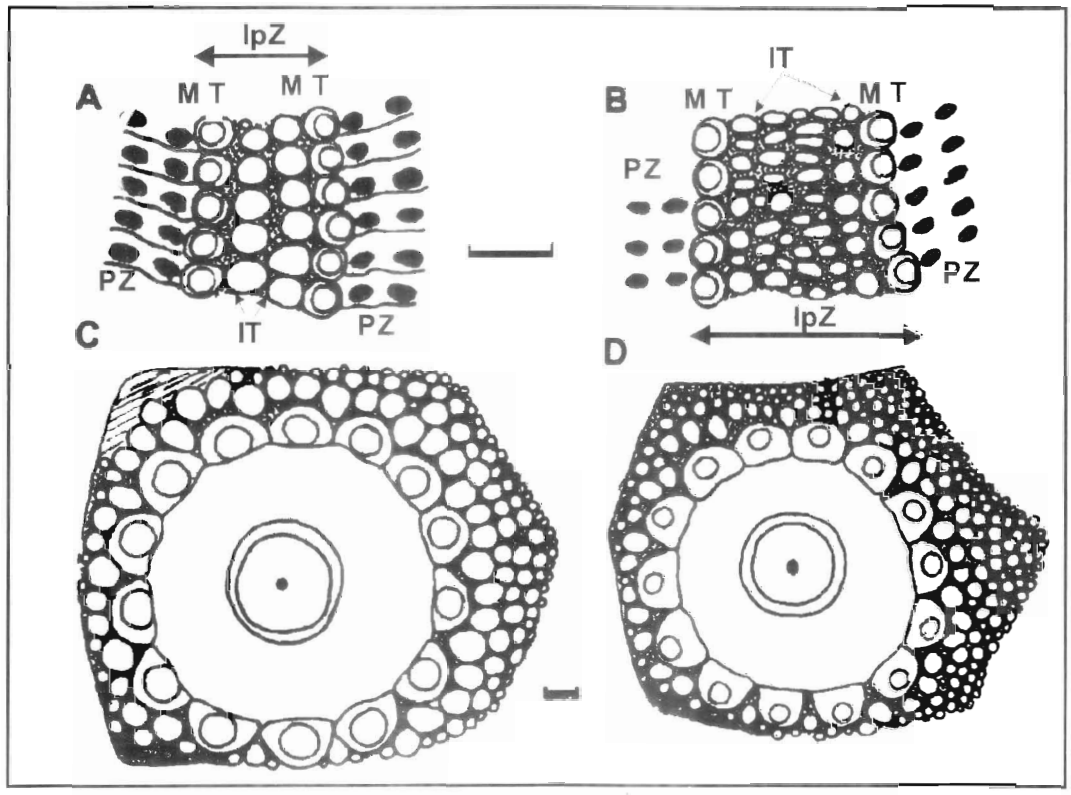

Fig. 3. Sketches of an ambulacra and an ambulacral plate of-'*Stereocidaris*' *namadica* (Duncan, 1887) A, C , and '*S.*' *keertii* sp. nov., Smith, 2010 B, D. Abbreviations used. IT- inner tubercles; lpZ- interporiferous zone; PZ- pore zone; and MT- marginal tubercles. Bar Scale = 1mm (approx) (Modified after Smith, 2010).

the aberration may be visualized as a compromise between the niche-stress (due to low oxygenation) and the genetic trends guiding the overall set pattern of ornamentation.

(iv) Extrascrobiculation Patterns

Likewise the extrascrobiculation in the two forms (Fig. 3C, and 3D respectively) also display a similar trend as that exhibited by the inner tuberculation, discussed above. Visually, it seems that the total mineral mass of granulations in both (i.e. the inner tuberculation zone and the extrascrobiculation) are materially not different enough (being smaller but more in number in *keertii*) from a set pattern (vis-à-vis *namadica*), and thus suggesting merely a readjustment of the textural elements (in the ambulacral and surrounding regions in *keertii*), having expended a matching metabolic energy in their creations.

The *apparent* 'distinctions' are merely a fallout of ecophynotypic requirements in case of *keertii* and, therefore, do not warrant its separation into another distinct species!

INFERENCE

The diameter/height ratio of both *namadica* and *keertii* as seen in the material (NHM EE 13841 and NHM EE 13844 respectively; repository: NHM, London) used by Smith (2010), suggest that these were dwelling over a rather hard substrate, not necessarily rocky, but may be over a thin veneer of sandy mud. The water was probably turbid in the habitat occupied by *keertii* so much so that the net amount of available oxygen might have been rather insufficient in its dwelling, prompting it to 'widen' its ambulacra by a bit, creating and sufficing enough spacing in the pore zones in order to successfully extract the required amount of oxygen for its healthy subsistence. The observed deviation in its granulation pattern is apparently an *effort* to strike balance between the genetic code governing ornamentation (grain size/distribution pattern) and the ecological stress.

Smith (2010), having only the lone example of *keertii* at his disposal from his 'Unit E', coming from a horizon much younger than that of *namadica*, could not emphasize about the range of morphological variation in *keertii* in time and/or space. Under the circumstances, '*S.*' *keertii*, otherwise closer indeed to '*S.*' *namadica* in overall morphological characters, appears to be merely an ecophynotypic variant of the latter, and therefore should not be promoted as a **new** species.

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