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Designation of the type species of the Cretaceous echinoid genus *Epiaster* D'ORBIGNY, 1855: a case study of confusion

By Robert B. STOKES¹

(With 2 tables)

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Abstract

The Cretaceous echinoid genus *Epiaster* was established by D'ORBIGNY in 1855 without designation of a type species. As SMITH (2008: p. 628) pointed out, the type species for this genus has been the subject of much confusion over the years. This note reviews the history of differing designations of a type species and gives the valid reason for *Epiaster acutus* (DESHAYES, 1831), [currently considered as subjective junior synonym of *Epiaster crassissimus* (DEFRANCE, 1827)], to be the type species by subsequent designation of LAMBERT (1895).

Keywords: Echinoidea, Cretaceous, *Epiaster*, type species.

Zusammenfassung

Der Kreidezeit Seeigel Gattung *Epiaster* wurde von D'ORBIGNY 1855 ohne Designation einer Typusart etabliert. Wie SMITH (2008: p. 628) berichtet war die Typusart dieser Gattung Anlass für viel Verwirrung über die Jahre. Der vorliegende Artikel untersucht die Geschichte der unterschiedlichen Typusdesignationen und nennt den gültigen Grund warum *Epiaster acutus* (DESHAYES, 1831), [derzeit als subjektives jüngeres Synonym von *Epiaster crassissimus* (DEFRANCE, 1827) betrachtet], die Typusart durch die nachträgliche Designation von LAMBERT im Jahr 1895 ist.

Schlüsselwörter: Echinoidea, Kreidezeit, *Epiaster*, Typusart.

Establishment of *Epiaster*

The name *Epiaster* was proposed by D'ORBIGNY in *Paléontologie française* (1855) for a group of Cretaceous spatangoids which lack any fasciole but in other respects resemble *Micraster*, to which several species had previously been referred. D'ORBIGNY treated

¹ Geoscience Programm, Mahidol University, Sai Yok Campus, Kanchanaburi, 71150 Thailand;
e-mail: surbitongs@gmail.com

this genus in a section of pages (186 to 201) which consisted of all or part of 3 different signatures (feuilles): pages 186 to 192 form part of signature 12; pages 193 to 200 form signature 13; and page 201 is the first page of signature 14.

In his introduction on the history of the genus, D'ORBIGNY (1855: p. 187) clearly stated that [my translation] "*Micraster polygonus, trigonalis, acutus, distinctus and aquitanicus totally lack any fasciole and the preceding species and several others can no longer remain in the genus Micraster I find myself forced to separate from Micraster all species which lack a fasciole, and to unite them here under the generic name Epiaster.*" In the following paragraph he stated that eight species were known: one in the Aptian, one in the Albian, five in the Cenomanian, and one in the Senonian. He drew attention to the very remarkable *maximum* [his emphasis] development of the genus in the Cenomanian.

The eight species to which D'ORBIGNY referred are listed in Table 1. Although the nominal species *M. acutus* was cited as one of the constituent species on page 187, it was not recognised as a taxonomic species in the subsequent signature where D'ORBIGNY (1855: p. 194) sank it in the synonymy of *E. crassissimus*, recognising that *Spatangus acutus* DESHAYES, 1831 is a junior synonym of *Spatangus crassissimus* DEFRANCE, 1827.

The current status of some species (*koechlinanus*, *tumidus* and *varusensis*) requires clarification. DESOR (1858: p. 360) did not agree that the absence of a sub-anal fasciole was sufficient to establish a new genus without additional characters, and placed seven of D'ORBIGNY's species in *Micraster* and regarded *Epiaster varusensis* as a synonym of *M. distinctus*. The eighth species, *aquitanicus*, he made the type of his new genus *Isaster* (DESOR 1858: p. 359). As SMITH in SMITH & KROH (2014) noted, the assignment of many other species to *Epiaster* needs to be checked. SMITH & WRIGHT (2008: p. 631) recorded *E. distinctus* from the Albian in addition to established Cenomanian occurrences. Likewise, REY-JOUVIN (1993) recorded *E. cf. tumidus* from the Albian.

Table 1. The eight species which D'ORBIGNY included in *Epiaster* giving, from left to right: stratigraphical age; D'ORBIGNY's names with original authors; original generic attribution; current generic attribution; later authority for current attribution.

Age	Included species of D'ORBIGNY 1855	Generic attribution		Authority
		Original	Current	
Aptian	<i>E. polygonus</i> (AGASSIZ in AGASSIZ & DESOR, 1847: p. 24)	<i>Micraster</i>	<i>Macraster</i>	SMITH 2007
Aptian	<i>E. trigonalis</i> (DESOR in AGASSIZ & DESOR, 1847: p. 24)	<i>Micraster</i>	<i>Heteraster</i>	SMITH 1988
Cenomanian	<i>E. koechlinanus</i> D'ORBIGNY, 1855: p. 191	<i>Epiaster</i>		
Cenomanian	<i>E. tumidus</i> D'ORBIGNY, 1855: p. 191	<i>Epiaster</i>		
Cenomanian	<i>E. acutus</i> (DESHAYES, 1831: p. 255)	<i>Spatangus</i>	<i>Epiaster</i>	SMITH 2007
Cenomanian	<i>E. distinctus</i> (AGASSIZ, 1840: p. 2)	<i>Micraster</i>	<i>Epiaster</i>	SMITH 2007
Cenomanian	<i>E. varusensis</i> D'ORBIGNY, 1855: p. 198	<i>Epiaster</i>		
Senonian	<i>E. aquitanicus</i> (GRATELOUP, 1835: p. 74)	<i>Spatangus</i>	<i>Isaster</i>	DESOR 1858

Early Designation of a Type Species

D'ORBIGNY did not designate a type species for his genus *Epiaster*. POMEL (1883: p. 43) gave *E. trigonalis*, *E. tumidus* and *E. acutus* as “types”. Where POMEL gave only one species as “type”, as in the case of *Micraster coranguinum* in the genus *Micraster*, this is taken as indicating the type species, but where more than one species was indicated, the word “types” is taken to mean “examples”. MORTENSEN (1950: p. 345), referring to POMEL's list, stated that “*the first of these must be the genotype*” following LAMBERT & THIÉRY (1924: p. 477). However, when dealing with fossil taxa, the procedure of taking the first named species as the type for a subsequent designation can lead to problems where the original author treated the constituent species in stratigraphical order. D'ORBIGNY was rigorous in treating his species in the stratigraphical order of his stages, so the first described species are early forms which are not necessarily as characteristic of the genus as later species, and are often much rarer than the more typical forms. This is amply demonstrated by SMITH (1988: p. 173) who concluded that *E. trigonalis* should be placed in the genus *Heteraster*.

Works of Lambert

LAMBERT (1895: p. 156) stated that the type of *Epiaster* D'ORBIGNY is *Epiaster crassissimus* DEFRANCE (sub. *Spatangus*). This designation is fortuitous because it typifies the genus with a very characteristic and abundant Cenomanian species.

Later, LAMBERT & THIÉRY (1924: p. 477) gave *E. trigonalis* (DESOR) as the type, arguing that LAMBERT (1895) was wrong to propose *Spatangus crassissimus* DEFRANCE as the type because this species was not included in the issue (*livraison*) of *Paléontologie française* in which the genus had been established.

I (STOKES 1977: p. 806), like COOKE (1955: p. 108), regarded the subsequent designation of LAMBERT (1895) as valid because there was no published evidence regarding the alleged differing dates of the publication of the relevant signatures of *Paléontologie française*, and to me, more especially, because it typified precisely my interpretation of the genus.

The legitimacy of LAMBERT's (1895) designation of *E. crassissimus* as the type species comes from Article 69 of the *International Code of Zoological Nomenclature* (Paragraph 69.2.2. of 1999 Edition, earlier editions had identical wording e.g. Article 69 (a) (iv) of the 1964 Code). I here quote this paragraph, inserting within brackets the data which apply to the genus *Epiaster*:

“If an author [LAMBERT 1895: p. 156] designates (or accepts another's designation) as type species a nominal species that was not originally included [*Epiaster crassissimus* (DEFRANCE)] and if, but only if, at the same time he or she places that nominal species in synonymy with one and only one of the originally included species [LAMBERT 1895: p. 192 footnote synonymising *E. crassissimus* with *E. acutus*], that act constitutes fixation of the latter species as type species of the nominal genus or subgenus.”

Thus the type species is *Spatangus acutus* DESHAYES, 1831, p. 255 [currently considered as subjective junior synonym of *Epiaster crassissimus* (DEFrance, 1827)], by subsequent designation of LAMBERT (1895: p. 156).

Works of Smith

SMITH (1988: p. 173), following LAMBERT & THIÉRY (1924) and their assertion that *E. crassissimus* was not an included species originally, regarded *E. trigonalis* as the type species and stated that I (STOKES 1977) was wrong to resurrect the earlier designation of *E. crassissimus* by LAMBERT (1895). In accepting the argument of LAMBERT & THIÉRY, SMITH went on to state that *E. trigonalis* is undoubtedly a species of *Heteraster* D'ORBIGNY (1855: p. 175) and would thus make *Epiaster* a junior synonym of *Heteraster*. Fortunately, he failed to implement this rectification in nomenclature.

SMITH stated that, in the signature in which *Epiaster* was established, D'ORBIGNY described 3 species: *E. polygonus*, *E. trigonalis*, and *E. tumidus*. Implicit in this statement is the assumption that the type species must be chosen from one of these species. However, paragraph 67.2.1. of the Code (1999: p. 67) allows all originally included nominal species to be eligible for fixation as the type species. In the case of *Epiaster* these species are those clearly named by D'ORBIGNY in his introductory paragraph on the history of the genus (i.e., *E. polygonus*, *E. trigonalis*, *E. tumidus*, *E. acutus*, *E. distinctus* and *E. aquitanicus*) plus *E. koechlinianus* which, although it was not listed in the historical introduction, was erected and fully described and figured in the same feuille.

By 2007, SMITH (in SMITH & KROH 2014) had accepted that *Epiaster crassissimus* is the type species but attributed this designation to SAVIN (1905: p. 120) arguing that because D'ORBIGNY recorded *acutus* as a junior synonym of *crassissimus* it then became available for selection of type species by SAVIN. The problems with this argument are (1) if it were available to SAVIN in 1905, it was equally available to LAMBERT in 1895 and (2) the fact that D'ORBIGNY recorded *acutus* as a junior synonym of *crassissimus*, whilst clearly supportive, is not relevant because the Code is clear in demanding that the reviser must assert the synonymy. SAVIN (1905: p. 120) did not assert this synonymy, indeed he does not mention *acutus* in his work, not even in his synonymy list for *crassissimus*. He clearly relied on LAMBERT (who he acknowledged as helping in his revision) for details of nomenclature.

SMITH (2007) implied that, because LAMBERT (in LAMBERT & THIÉRY 1924: p. 447) had changed the type species to *E. trigonalis*, his designation of *E. crassissimus* in 1895 was somehow nullified and must be ignored. The possibility that valid designations could be set-aside if an author changed his or her mind three decades later would cause havoc with nomenclatural stability. The Code (1999: p. 63 in Article 61.1.3) states that the type of any taxon, once fixed in conformity with the provisions of the Code, is not subject to change except by use of the plenary power of the Commission.

SMITH & WRIGHT (2008: p. 628) accepted as valid LAMBERT's (1895) designation of *Epiaster crassissimus* as the type species, but again wrongly stated that it is the fact that D'ORBIGNY regarded *acutus* as a junior synonym of *crassissimus* that made this species available for selection as type, failing to recognise that it is the reviser who must demonstrate the synonymy.

Dates of Publication

As SHERBORN (1899: p. 223) pointed out, the early volumes of *Paléontologie française* “were issued without exact dates of publication, and consequently have caused much confusion in nomenclature.” In French palaeontological works of this period which were issued irregularly to subscribers, the dates attributed to taxa in the published text were often those given by the author in manuscript, which may have been written some significant time before publication. This could have been the reason why in 2007 SMITH wrongly gave the date of publication of *Epiaster* as 1853, although it is more certainly a typographical error. The precise dates of publication of the three signatures containing D'ORBIGNY's text on *Epiaster* have never been published. SHERBORN (1899: p. 224) gave the only reliable dates of publication for D'ORBIGNY's Cretaceous echinoid volume, indicating that pages 129–256 were published in two issues (239 and 240) in 1855. It is impossible from this published data to state on which precise dates the different feuilles (12 to 14) were issued.

LAMBERT & THIÉRY (1924: p. 477) and SMITH (1988: p. 173) all claimed to know that signatures 12 and 13 were published at different times. Since this was critical to their arguments, the evidence for these claims ought to have been published. During the review of an early version of this paper, Andrew SMITH sent dates from a printed list bound into a copy of D'ORBIGNY's volume in the Natural History Museum, London. These dates are given in Table 2, but those for the issues of 1856 are modified to conform to the pagination given by SHERBORN (1899: p. 224). This confirms that signatures 12 (pages 186 to 192) and 13 (pages 193 to 200) were issued on different dates. However, this does not affect the validity of LAMBERT's (1895) designation.

Table 2. Dates of publication for D'ORBIGNY's Echinodermes (*Paléontologie française*, Terrains Crétacés, 6) taken from a printed list bound into a copy in the Natural History Museum, London, but with the pagination of the 1856 issues amended to conform to those of SHERBORN (1899).

Pages	Date	Pages	Date
1–32	July 1854	225–272	Nov. 1855
33–64	Oct. 1854	273–328	Oct. 1856
65–96	Nov. 1854	329–352	Oct. 1856
97–128	Jan. 1855	353–384	1857
129–192	Mar. 1855	385–400	1858
193–208	May 1855	401–432	1858
209–224	Aug. 1855	433–596	1860

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