

## *Cyclaster platornatus* Kutscher, 1978: an addition to the echinoid fauna from the late Maastrichtian of NE Belgium

John W.M. Jagt<sup>1</sup> and Ger P.H. Michels<sup>2</sup>

<sup>1</sup> Maasbreesestraat 55, 5921 EJ Venlo, The Netherlands; <sup>2</sup> Da Costastraat 14, 5922 TB Venlo, The Netherlands

Received 12 January 1987; accepted 29 January 1987

### Abstract

Two fairly well preserved specimens of the brissid echinoid *Cyclaster platornatus* Kutscher, 1978 are described from the late Maastrichtian Vijlen Member (Gulpen Formation) as exposed in the SA Ciments Portland Liégeois (CPL) quarry at Haccourt, municipality of Oupeye, province of Liège, Belgium

Kutscher (1978) introduced this taxon for a small population of brissid echinoids from the early Maastrichtian white chalk of Rügen (GDR). Despite slight morphological differences the Belgian specimens are considered to be conspecific with the Rügen type population. The occurrence in the late Maastrichtian of NE Belgium constitutes the first record of this species beyond the North European white chalk facies of Rügen. The Belgian specimens are herein compared and contrasted with morphologically similar (*Hemiaster aquisgranensis* Schlüter, 1899 and *Diplodetus* species) from the Vijlen Member. Some remarks on other late Cretaceous spatangoids are added.

### Introduction

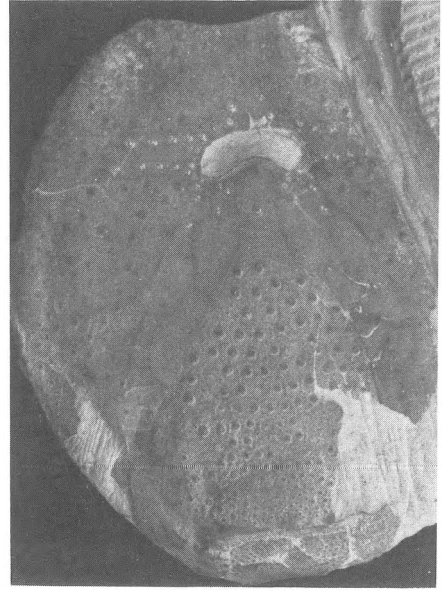
Recently we found a spatangoid echinoid in the northeastern corner of the CPL quarry at Haccourt (Liège), which was provisionally identified as an aberrant species of *Diplodetus*. It was not until Raymond van der Ham, after having examined this specimen, drew our attention to Kutscher's 1978 paper on spatangoids from the early Maastrichtian of Rügen, that the true nature of this echinoid could be determined.

Unfortunately the fairly well preserved test was not found *in situ*. However, on the basis of the macrofossil content (especially the serpulid *Pentaditrupe subtorquata*) of the chalk block from which it was collected, we were able to determine that it must have originated from the lowermost two metres of the Vijlen Member (Froidmont Horizon + 0 to 2 m; lithostratigraphic terminology of Felder, 1975).

A second, smaller, incomplete test was recently collected by Ewald van Ham from the same part of the quarry and the same lithostratigraphic unit.

The lower part of the Vijlen Member in the CPL quarry yields an interesting echinoid fauna (vide Meijer, 1965) among which the holasterids *Echinocorys* gr. *limburgica/duponti* (vide Lambert, 1903) and *Cardiaster granulosus* (Goldfuss, 1829; vide Jagt & Michels, 1986) clearly dominate, whereas the spatangoids *Hemiaster aquisgranensis* Schlüter, 1899 (vide Van der Ham, 1985) and *Diplodetus* species are rather rare, as are phymosomatoids (*Gauthieria radiata broeckii* Lambert, 1898 (sensu Geys, 1980), *G. pseudoradiata* Schlüter, 1883 (sensu Geys, 1980), *Phymosoma* sp.) and cidaroids.

Judging from the joint occurrence of *Belemnitella* ex gr. *junior* Nowak, 1914, *Hoploscaphites tenuistriatus* Kner, 1850 and *H. constrictus* J. Sowerby, 1817 (vide Jagt, 1985, 1986a, b; Van der



Figs. 1 and 2. *Cyclaster platornatus* Kutscher, 1978. Adapical and adoral view of specimen 1 (coll. Michels, no. 713, leg. Jagt). Vijlen Member (Gulpen Formation), CPL quarry, Haccourt (Liège),  $\times 2,0$ .

Tuuk in Robaszynski et al., 1985) the Vijlen Member in the CPL quarry is probably correlatable with (part of) the *tegulatus/junior* zone of Schulz & Schmid (1983) and Schulz et al., 1984). However, the index inoceramid *Spyridoceramus tegulatus* Von Hagenow, 1842 has not yet been found in this member so that, for the time being, this correlation will have to remain tentative (vide Jagt, in prep.).

Some other macrofossils originating from this member are listed in Jagt & Michels (1986) and illustrated in Dhondt & Jagt (in press).

### Systematic palaeontology

The classification of spatangoid echinoids proposed by Fischer (*in* Moore, 1966) is followed here.

- Order Spatangoida Claus, 1876
- Suborder Micrasterina Fischer *in* Moore, 1966
- Family Brissidae Gray, 1855 (incl. Cyclasteridae Poslavskaia, 1965)
- Genus *Cyclaster* Cotteau *in* Leymerie & Cotteau, 1856 (p. 345)
- Type species *C. declivus* Cotteau *in* Leymerie & Cotteau, 1856 (p. 345)

### *Cyclaster platornatus* Kutscher, 1978

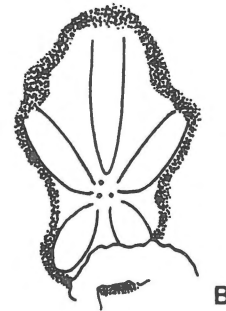
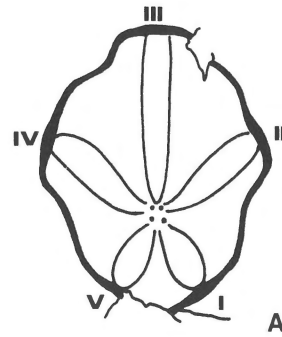
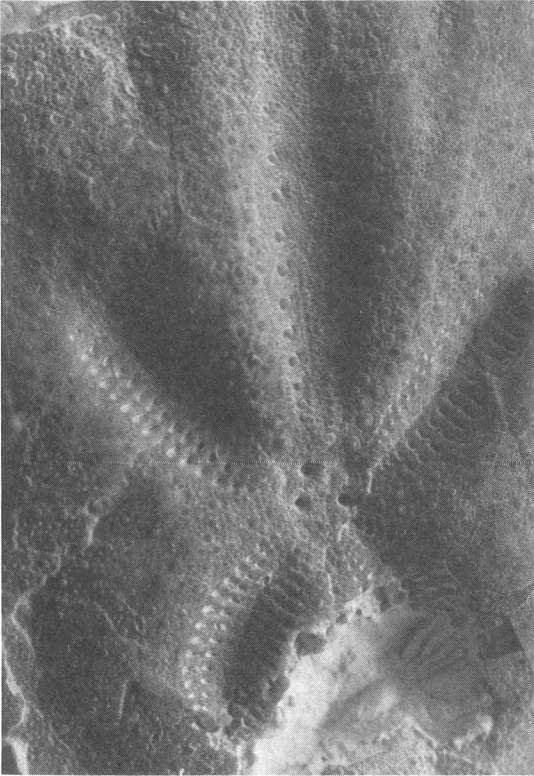
1978 *Cyclaster platornatus* Kutscher, p. 1028, pl. III, fig. 1–5; 1979 *Cyclaster platornatus* Kutscher – Kutscher, p. 98, pl. 5, fig. 13

#### Diagnosis

‘Ein mittelgrosser Spatangid mit peripetaler und subanaler Fasziolen, kurzen, schwach eingesenkten Petalodien, ethmophractem Apikalschild mit nur drei Genitalporen und auffälligem Plastronbau’ (Kutscher, 1978, p. 1029).

#### Description

Specimen 1 (Figs. 1, 2, 3, 4b). Test elongate, without frontal notch. Ambulacrum III only slightly sunken and becoming flush with test long before reaching the ambitus, displaying small, inconspicuous pore pairs which are positioned obliquely. The round to weakly elongate pores (the outer one being the larger one) are separated by a prominent granule. The interporiferous area is covered with widely spaced granules. Paired petals slightly sunken and petaloid. Petals II and IV longer than I and V. the number of pore pairs being almost equal



Figs. 3 and 4. *Cyclaster platornatus* Kutscher, 1978. Detail of apical system, petals and peripetalous fasciole,  $\times 5,25$ . Same specimen as in figs. 1 and 2. Figs. 4a–b. Schematic drawings of peripetalous fasciole of *Hemiaster aquisgranensis* (based on specimen GM 897 in the Michels collection) and *Cyclaster platornatus* (based on specimen GM 713). Roman numerals refer to petals.

though (Table 1). The nearly straight front row of pores in the anterior petals is made up of small, circular pores, which are separated by a granule and which are positioned obliquely. The back row of pores is slightly curved and shows elongate pores, of which the outer pore in each pair is somewhat larger than the inner one. The interporiferous area is coated with few granules. These granules are also present in between the pore pairs. The pore rows of the posterior petals are more curved. The pairs consist of relatively large, elongate pores; the inner pore being slightly smaller than the outer one. Granules are present on the interporiferous area and in between the pore pairs. Apical system ethmophract, with three genital pores, which are encircled by rings of granules. Madreporite lacks genital pore; however, the perforations extend to part of genital plate 4. Peripetalous fasciole well developed, following the

petals and curving inwards between petals I-II and IV-V (Fig. 4b), broadest at the tips of petals II and IV. It is not sharply delimited and incorporates many (primary) tubercles, especially on the anterior part of the test. Tuberculation uniform, consisting of small, closely spaced (primary) tubercles. Larger tubercles are to be found on the anterior part of the test, around the apical system and in the direction of the ambitus. Adorally: peristome relatively large with prominent rim, making up ca. 20% of the total width of the test. Labrum bottle-shaped and broad at the junction with the plastronal plates. It shows only one larger tubercle and very small 'pustules' with some scattered granules in between. Periplastronal plates display a similar ornamentation. These therefore strongly contrast with the plastron which is covered by large, crenulate-perforate tubercles, not arranged in rows but separated by rings of granules. Towards the anal

region the tubercles become smaller and more closely spaced. Tubercles comparable to the plas-tronal tubercles in dimension and structure are found on IA 2 and 3, but they become smaller towards the ambitus. Phyllodes prominent. Posterior part of test shows the densely tuberculate anal field encircled by a well developed subanal fasciole. Periproct not preserved.

#### *Specimen 2* (Figs. 5–6)

This second, smaller specimen unfortunately lacks the apical system and the posterior part of the test with the anal region. However, it does show the same course and structure of the peripetalous fasciole, and a comparable pore morphology. Moreover the ratios of the petals (Table 1) are nearly equal to those of specimen 1 described above. Differences exist in the fact that this smaller test shows more prominent tubercles in the anterior part of the test and fewer granules between the plas-tronal tubercles. These differences are possibly due to the younger age of this individual.

Because of the fact that the diagnostically important features of the subanal fasciole and the apical system are missing, this second specimen is referred to *Cyclaster platornatus* with some reser-

vation. This test is particularly interesting since it seems to indicate that a small, but fertile population (which probably lived in direct competition with the other spatangoids mentioned below) was present in the environs of Haccourt during the deposition of the Vijlen Member.

#### Discussion

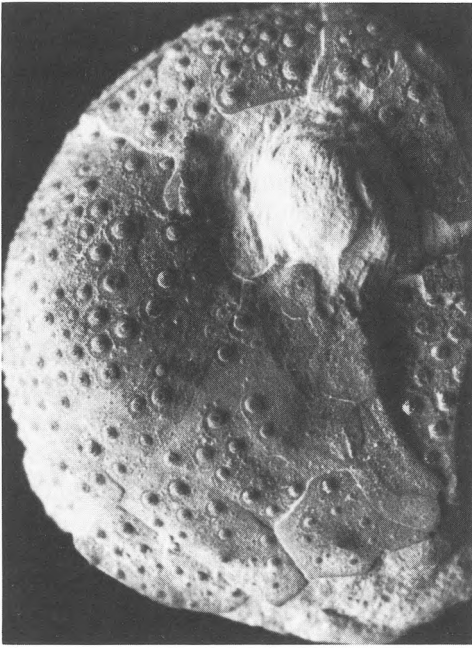
On the basis of photographs and a description of the larger Belgian specimen Mr M. Kutscher (Sassnitz, Rügen, GDR) confirmed (pers. comm. Aug. 1985) the identification as *C. platornatus*. Several ratios (length/height, length/width and width/height) were checked (Table 1). In the original description Kutscher (1978) stated that the number of pore pairs in the posterior petals was 8 to 9. However, his figure 5 on plate III shows more than 10 pairs here.

As becomes clear from the table, there are only slight morphological differences between the holotype of *C. platornatus* and the two Belgian specimens that are here referred to this species. These differences are probably due to the larger dimensions of our specimen 1. It must be stressed that the

Table 1. Measurements of the holotype of *C. platornatus* Kutscher 1978 (pl. III, figs. 1–3) and the two Belgian specimens (GM 713 and EH 149) referred to this species. \* = reconstructed, \*\* = damaged.

Test	Dimensions (in mm.)			Ratios		
	length (L)	width (W)	height (H)	L/W	L/H	W/H
holotype	c.30	c.26	c.16	1.15	1.88	1.62
GM 713	c.43	c.40	c.22*	1.08	1.95	1.82
EH 149	c.24	c.22	c.12*	1.09	2.00	1.92

Petals	Dimensions (in mm.)		Number of pore pairs				Ratio
	length anterior petals	length posterior petals	I	II	IV	V	I/II or IV/V
holotype	c.4,5	c.2,5	9	11	11	9	1.2
GM 713	7,0	5,8	>12**	18	18	16	1.1
EH 149	4,2	2,8	10	11	–	–	1.1



Figs. 5 and 6. *Cyclaster platornatus* Kutscher, 1978. Adoral and adapical view of specimen 2 (coll. Van Ham, no. 149). Vijlen Member (Gulpen Formation), CPL quarry, Haccourt (Liège),  $\times 2,8$ .

range of variation of the Belgian 'population' cannot be satisfyingly determined on the basis of the two specimens that are before us. Moreover, there is a difference in stratigraphic age that should be considered: the Rügen type population is referable to the younger part of the early Maastrichtian, whereas the Belgian tests are of a late Maastrichtian age.

Summarising, we consider the differences between the Belgian specimens and the Rügen type population not taxonomically important and we therefore regard them as conspecific.

The species has apparently not yet been found in the standard section (Schulz et al., 1984) of the NW German white chalk facies (pers. comm. Dr M.-G. Schulz, 1986).

#### Other spatangoids from the Vijlen Member

The two tests of *C. platornatus* described above are here compared and contrasted with accompanying spatangoids from the Vijlen Member, viz. *Diplodetus* sp. 1, *D. sp. 2* and *Hemiaster aquisgranensis* Schlüter, 1899. A satisfactory identification of the *Diplodetus* species is not possible at the moment; we therefore choose to mention them in open nomenclature. The brief description of *Diplodetus* sp. 1 is based on two fragmentary tests from the Vijlen Member in the CPL quarry (coll. Jagt, nos. 2245 and 2463). Of *Diplodetus* sp. 2 only one slightly deformed test from Loën (Visé) in the Max Meijer collection (no. 130, housed in the Natural History Museum Maastricht), is available. This species has so far not been found in the Vijlen Member in the CPL quarry. Of *Hemiaster aquisgranensis* one nearly complete test (coll. Michels, no. GM 897; illustrated by Van der Ham, 1985, fig. 2a–b) and several fragmentary specimens (coll. Jagt) are before us. In the descriptions of these spatangoids only those characteristics that differentiate them readily from *C. platornatus* are mentioned.

*Diplodetus* sp. 1 differs from *C. platornatus* in having:

- larger dimensions (length of test up to c. 60 mm),

- much longer paired petals which are also more deeply sunken,
- a greater number of pore pairs: in anterior petals 32, in posterior petals 27 pairs,
- a very diffuse peripetalous fasciole which is only visible as isolated patches at the tip of petals I and V,
- a more densely granulate test adapically,
- a broader labrum which is covered with more tubercles,
- more densely tuberculate plastronal plates,
- a different pore morphology (the pores are much more elongate, the interporiferous area is much wider).

*Diplodetus* sp. 2 differs from *C. platornatus* in having:

- a different pore morphology, comparable to that of *D.* sp. 1,
- more deeply sunken petals,
- a diffuse peripetalous fasciole, only visible as isolated patches at the tip of petals I and V,
- four genital pores,
- a much smaller peristome (making up 11% of total width of test),
- more densely tuberculate and granulate peri- and plastronal plates.

*Hemiaster aquisgranensis* differs from *C. platornatus* in having:

- no subanal fasciole,
- a different pore morphology (vide Van der Ham, 1985),
- four genital pores,
- a very sharply delimited peripetalous fasciole, which is completely developed and which shows a different course and structure from that of *C. platornatus* (Fig. 4a), and it does not incorporate any primary tubercles,
- much longer anterior than posterior petals: ratio of number of pore pairs in the anterior and posterior petals being 1.5 and 1.7 in two specimens,
- much higher ambulacral and interambulacral plates, especially well visible above the ambitus (vide Van der Ham, 1985, fig. 2a).

## Remarks

*Cyclaster platornatus* is the only species of *Cyclaster* that has so far been reported from late Cretaceous deposits in NW Europe. The genus is particularly well represented in sediments of early Palaeocene age in southern Scandinavia, Schlüter (1897) described two species from the Danian of Denmark and southern Sweden, which he placed in the genus *Brissopneustes* Cotteau, 1887, viz. *B. danicus* and *B. suecicus*. Ravn (1927) added a third species, *Cyclaster bruennichi* (vide also Jessen & Ødum, 1923). Asgaard (1976) paid particular attention to the skeletal morphology of '*Brissopneustes*' *danicus* Schlüter, 1897 and rightly referred this species to the genus *Cyclaster* on account of its peripetalous fasciole. *B. suecicus* Schlüter, 1897 is now also referred to this genus (Asgaard, 1979).

Kutscher (1978, p. 1030) has already pointed out the differences between his *C. platornatus* and the above mentioned Palaeocene species. In addition he has extensively compared his taxon with other European brissids traditionally referred to *Cyclaster* and *Isopneustes*. Consequently there is no need to go into this matter again here. There is, however, one point in Kutscher's paper that needs rectification. In his description of *Brissopneustes ruegensis* he compared this species with *Micraster (Brissopneustes) maestrichtensis*, a taxon introduced by Lambert in 1902. This species has a well developed subanal fasciole, three genital pores and it lacks a peripetalous fasciole. Kutscher also mentioned a paper by Smiser (1935), who is said to have figured Lambert's species. This is not true, however, since what Smiser (pl. 8, fig. 2a–d) illustrated sub nomen *Brissopneustes maestrichtensis* is in fact *Hemiaster (Leymeriaster) maestrichtensis* Schlüter, 1897, a hemiasterid that has nothing to do with the alleged micrasterid '*Micraster*' *maestrichtensis* of Lambert (1902). It should be stressed that, as far as we know, Lambert's species has never again been mentioned from the Maastricht type area, from which it is claimed to originate. However, spatangoid echinoids superficially resembling it are fairly common in the late Maastrichtian Lanaye Member (Gulpen Formation) of this area, but these always possess four genital pores and are referable to the genus *Diplodetus* Schlüter, 1900.

## Acknowledgements

We like to express our sincere thanks to Mr M. Kutscher (Sassnitz, GDR), who sent us photographs of the type lot of *Cyclaster platornatus*, provided some additional data on the holotype and critically read the manuscript. Mr. R.W.J.M. van der Ham (Delft, The Netherlands) suggested the conspecificity of the Belgian specimens with the Rügen species and commented on an earlier draft of this paper. Finally we would like to thank Ewald van Ham (Echt, The Netherlands) for allowing us to examine the test from his collection.

## References

- Asgaard, U. 1976. *Cyclaster danicus*, a shallow burrowing non-marsupiate echinoid – *Lethaia* 9 (4): 363–375
- Asgaard, U. 1979. The irregular echinoids and the boundary in Denmark. In: Birkelund, T. & R.G. Bromley (eds): Cretaceous-Tertiary boundary events symposium. I. The Maastrichtian and Danian of Denmark – Copenhagen (University Press): 74–77
- Dhondt, A.V. & J.W.M. Jagt (in press). Bivalvia uit de Kalksteen van Vijlen in Hallembaye (België) – *Grondboor en Hamer*
- Felder, W.M. 1975. Lithostratigrafie van het Boven-Krijt en het Dano-Montien in Zuid-Limburg en het aangrenzende gebied. In: Zagwijn, W.H. & C.J. van Staalduin (eds): Toelichting bij geologische overzichtskaarten van Nederland – Rijks Geologische Dienst (Haarlem): 63–75
- Fischer, A.G. 1966. Spatangoids. In: Moore, R.C. (ed): Treatise on invertebrate paleontology, part U, Echinodermata 3, Asterozoa-Echinozoa, 2 – Lawrence (Univ. Kansas Press): U 543–U 628
- Geys, J.F. 1980. Phymosomatoid echinoids from the Campanian and the Maastrichtian of Belgium and the Netherlands – *Paläont. Z.* 54 (3/4) 199–224
- Jagt, J.W.M. 1985. Litho-, Biostratigraphie und Fauna des Lüttich-Limburger Campan und Maastricht (Belgien, Niederlande): eine Kurz-übersicht. 2. Teil: Das Untermaastricht – *Arb. Krs. Paläont. Hannover* 13 (6): 151–156
- Jagt, J.W.M. 1986a. *Sphenodiscus binckhorsti* J. BÖHM 1898 (Ammonoidea) in de Kalksteen van Nekum en de biostratigrafie van de Formatie van Maastricht – *Grondboor en Hamer* 40 (1): 1–17
- Jagt, J.W.M. 1986b. Litho-, Biostratigraphie und Fauna des Lüttich-Limburger Campan und Maastricht (Belgien, Niederlande): eine Kurz-übersicht, 3. Teil: Das Obermaastricht – *Arb. Krs. Paläont. Hannover* 14 (3): 37–54
- Jagt, J.W.M. & G.P.H. Michels. 1986. *Cardiotaxis heberti* (Cotteau, 1860) en *Cardiaster granulatus* (Goldfuss, 1829) uit het onderste deel van de Formatie van Gulpen (Boven-Krijt; prov. Luik): paleobiologie, voorkomen en systematiek – *Grondboor en Hamer* 40 (6): 185–205
- Jessen, A. & H. Ødum. 1923. Senon og Danien ved Voxlev – *Danm. Geol. Unders.* (2) 39: 1–73
- Kutscher, M. 1978. Neue Echiniden aus dem Unter-Maastricht der Insel Rügen. II. Spatangoida CLAUS, 1876 – *Z. geol. Wiss.* 6 (8): 1025–1037
- Kutscher, M. 1979. Gastropoden, Crustaceen und irreguläre Echiniden in der Rügener Schreibkreide und ihre Beziehungen zum Sediment – *Der Geschiebesammler* 13 (2): 95–111
- Lambert, J. 1902. Sur un Micraster nouveau de la craie de Maastricht – *Bull. Soc. belge Géol., Paléont., Hydrol.* 16: 121–128
- Lambert, J. 1903. Description des Echinides crétacés de la Belgique, principalement de ceux conservés au Musée royal de Bruxelles. I. Etude monographique sur le Genre Echinocorys – *Mém. Mus. r. Hist. nat. Belg.* 2: 1–151
- Leymerie, A. & G.H. Cotteau. 1856. Catalogue des Echinides fossiles des Pyrénées – *Bull. Soc. géol. Fr.* (2) 13: 319–355
- Meijer, M. 1965. The stratigraphical distribution of Echinoids in the Chalk and Tuffaceous Chalk in the neighbourhood of Maastricht (Netherlands) – *Meded. Geol. Sticht., n.s.* 17: 21–25
- Moore, R.C. (ed) 1966. Treatise on invertebrate paleontology, part 4, Echinodermata 3, Asterozoa-Echinozoa, 2-Lawrence (Univ. Kansas Press)
- Ravn, J.P.J. 1927. De irregulære Echinider i Danmarks Kridtaflejringer – *Kgl. Dan. Vid. Selsk. Skr., naturvid.-math. Afd.* 8 (11): 307–355
- Robaszynski, F., M.J.M. Bless, P.J. Felder, J.-C. Foucher, O. Legoux, H. Manivit, J.P.M.Th. Meessen & L.A. van der Tuuk. 1985. The Campanian-Maastrichtian boundary in the chalky facies close to the type-Maastrichtian area – *Bull. Centres Rech. Explor.-Prod. Elf-Aquitaine* 9(1): 1–113
- Schlüter, C. 1897. Ueber einige exocyclische Echiniden der baltischen Kreide und deren Bett – *Z. dt. geol. Ges.* 44 (1): 18–50
- Schulz, M.-G. & F. Schmid. 1983. Das Ober-Maastricht von Hemmoor (N-Deutschland): Faunen-zonen-Gliederung und Korrelation mit dem Ober-Maastricht von Dänemark und Limburg – *Newsl. Stratigr.* 13 (1): 21–39
- Schulz, M.-G., G. Ernst, H. Ernst & F. Schmid. 1984. Coniacian to Maastrichtian stage boundaries in the standard section for the Upper Cretaceous white chalk of NW Germany (Lägerdorf – Krons Moor – Hemmoor): Definitions and proposals – *Bull. geol. Soc. Denmark* 33: 203–215
- Smiser, J.S. 1935. A monograph of the Belgian Cretaceous Echinoids – *Mém. Mus. r. Hist. nat. Belg.* 68: 1–98
- Van der Ham, R.W.J.M. 1985. De zeeëgel *Hemiaster aquigranensis* Schlüter, 1899 in het Campanien en het Maastrichtien van Zuid-Limburg en aangrenzende delen van België en Duitsland – *Natuurhist. Maandbl.* 74 (9): 147–156