UPPER CRETACEOUS ECHINOIDS FROM JAMES ROSS BASIN, ANTARCTICA

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ABSTRACT - New palaeontological collections made from Upper Cretaceous strata exposed within the James Ross Basin, Antarctica, include ten echinoid species. Five species are described for the first time from Antarctica, while four others, previously published by Lambert in 1910, are revised according to the new data. The described echinoids comprise two new species, *Huttonechinus antarctica* nov. sp. and *Nordenskjoeldaster* ? *australis* nov. sp., specimens closely related to an European spatangoid, *Micraster* aff. *regularis,* and three taxa that cannot be named at the specific level owing to poor preservation. In total, the fauna comprises three species of regular echinoids, five holasteroids, and two spatangoids. The ten taxa range in age from Santonian to Early Maastrichtian. The richest faunas are those associated with the prolific *Gunnarites antarcticus* ammonite assemblage. Several forms show affinities with Australia, New Zealand, south-east Africa and South America. There are indications that this is an essentially deep shelf echinoid fauna.

KEYWORDS: ECHINOIDS, SENONIAN, JAMES ROSS BASIN, ANTARCTICA.

RÉSUMÉ - De nouvelles missions réalisées sur les terrains sénoniens du bassin de l'archipel de James Ross, en Antarctique, ont permis de récolter de nombreux échinides. A partir de ce matériel inédit, 5 espèces sont recensées en Antarctique pour la première fois et 4 autres, déjà recensées par Lambert en 1910, sont retrouvées et révisées. Les formes inédites en Antarctique comprennent deux nouvelles espèces, *Huttonechinus antarctica* nov. sp. et *Nordenskjoeldaster* ? *australis* nov. sp., des spécimens proches d'un spatangue européen, *Micraster* aff. *regularis,* et deux autres taxons qui n'ont pu être identifiés au rang spécifique en raison de leur mauvaise conservation. Au total, l'échinofaune comprend trois espèces d'échinides réguliers, cinq holastéroïdes et deux spatangoïdes. Les 10 espèces sont réparties entre le Santonien et le Maastrichtien inférieur, les associations les plus riches étant localisées dans les niveaux à *Gunnarites antarcticus*. Plusieurs espèces montrent des affinités avec des échinides d'autres régions australes, trouvés en Australie, en Nouvelle Zélande, en Afrique du sud-est ou en Amérique du Sud. L'association de plusieurs holastéroïdes et de l'hémiastéridé *Bolbaster,* par comparaison aux échinofaunes téthysiennes, caractérise des environnements de plateforme profonde, circalittoraux à épibathyaux.

MOTS-CLÉS: ÉCHINIDES, SÉNONIEN, ARCHIPEL DE JAMES ROSS, ANTARCTIQUE.

INTRODUCTION

Echinoids form a small, but nonetheless important, component of the Mesozoic and Cenozoic marine invertebrate faunas of Antarctica. A short review of all studies prior to 1982 was provided by Hotchkiss (1982), and in this, it is apparent that the richest fauna, in terms of both numbers of species and individuals, is that known from the Upper Cretaceous. The Swedish South Polar Expedition (1901-1903) collected from the Upper Cretaceous of Snow Hill, Seymour and Cockburn Islands material that was published by Lambert (1910). A less well known Lower Cretaceous (Aptian) fauna has been reported from Alexander Island (Taylor 1966), and nearly all other occurrences are from either the Neogene or

Quaternary. These include King George Island (South Shetland Islands), Cockburn Island, the McMurdo Sound region (East Antarctica) and Vestfold Hills (East Antarctica) (for a map of these localities see Hotchkiss 1982, fig. 83.1). Since 1982 new Maastrichtian and Eocene echinoids have been described from Seymour Island (McKinney et al. 1988; Blake & Zinsmeister 1991; Radwanska 1996), Kelly (1993) has provided an Aptian echinoid record from Alexander Island and Jesionek-Szymanska (1987) has added an echinoid Miocene record from King George Island.

In this study, we describe a small collection of additional material which has been collected recently from the Upper Cretaceous (Santonian-Maastrichtian) of the James Ross Island group (Fig. 1). This additional occurrence data and systematic descriptions contribute to a better knowledge of evolutionary, biogeographical and biostratigraphical characteristics of this fossil austral fauna.

STRATIGRAPHICAL FRAMEWORK

With the single exception of specimen D.8228.264 (*Giraliaster* sp. A), which occurs in the topmost

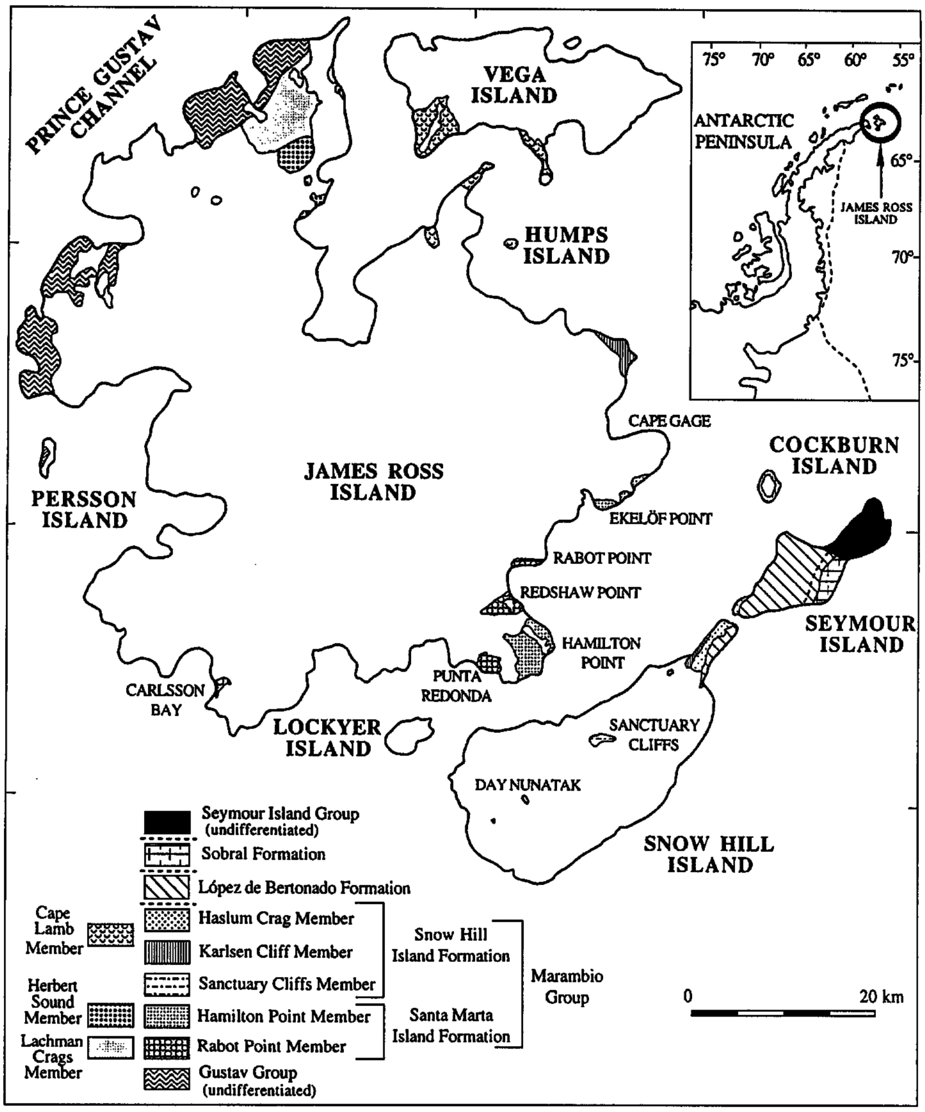


FIGURE 1 - Geographical location and stratigraphical formations of the outcrops under study. *Localisation géographique et attribution stratigraphique des affleurements étudiés.*

levels of the Gustav Group, all the material to be described here is located within the overlying Marambio Group (Figs 1, 2). Collectively, these two groups comprise the entire Cretaceous succession within the James Ross Island group. The lower Gustav Group is approximately 2.3 km thick and is composed of a range of coarse clastic lithologies (Ineson et al. 1986). It grades up into the Marambio Group, which is now known to be at least 3 km thick and to comprise a finer grained succession. Further information on the stratigraphy, sedimentology and palaeoenvironmental setting of the Marambio Group is contained in sources such as Macellari (1988), Pirrie (1989, 1991, 1994), Crame et al. (1991), and Scasso et al. (1991).

The single specimen of *Giraliaster* sp. A (D.8228. 264, Figs 1, 2) was collected from a sequence of olive-green to rusty-brown siltstones and fine sandstones located within the uppermost levels of the Hidden Lake Formation (the uppermost formation within the Gustav Group). It is associated with a sparse ammonite fauna in which a small pachydiscid, provisionally assigned to *Menuites patagonicus* (PAULCKE), predominates (M.R.A. Thomson, pers. comm. 1997). The benthos is dominated by inoceramid bivalves assigned to the '*Mytiloides*' *africanus* HEINZ group, and there are strong Santonian age affinities (Ineson et al. 1986).

Specimens D.8615.55 (*Huttonechinus antarctica*), D.8617.59 and RF 10/12 (*Micraster* aff. *regularis*) were collected from approximately the lowermost 230 m of the Lachman Crags Member, Santa Marta Formation (the lowermost lithostratigraphical unit within the Marambio Group) (Figs 1, 2). The lithologies at this level are typically fine-grained, tuffaceous silty sandstones, together with subordinate mudstones and pebbly sandstones (Pirrie 1989; Scasso et al. 1991). The benthonic fauna is slightly more prolific than in the underlying levels and inoceramids occur together with nuculid, pinnid and trigoniid bivalves, and naticid gastropods. A distinctive ammonite assemblage includes a range of small scaphitids, baculitids, nostoceratids and diplomoceratids. Together with belemnites such as *Dimitolebus (Dimitolebus)* cf. *ongleyi* STEVENS and *D. (Dimitocamax)* cf. *seymouriensis* DOYLE, they indicate a Late Santonian-Early Campanian age-range (Olivero 1988; Doyle 1990).

Structural repetition, by a major NE-SW trending reverse fault (or faults) has led to extensive expo-

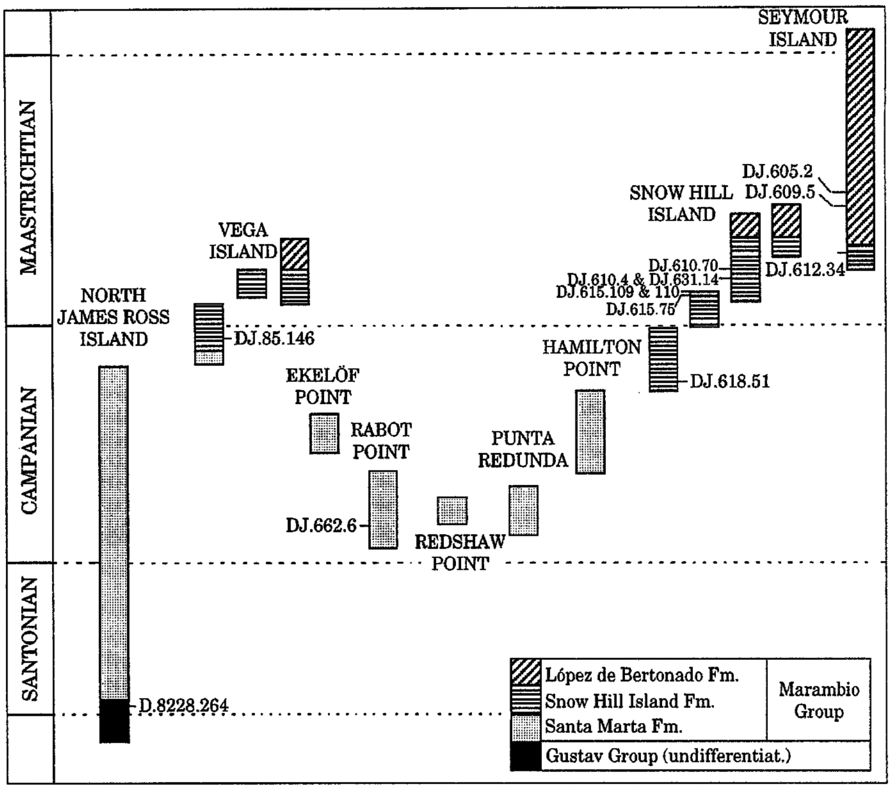


FIGURE 2 - Schematic stratigraphical sections of the localities under study. The succession from the left to the right of the figure corresponds to the succession of the sections from the west to the east of the Antarctic peninsula. *Coupes stratigraphiques schématiques des sites étudiés. La succession des coupes de gauche à droite sur la figure correspond à la succession d'Ouest en Est de ces coupes sur la péninsule antarctique.*

sure of the Santa Marta Formation on southeastern James Ross Island (Figs 1, 2). At Rabot Point, specimen DJ.662.6 (*Nordenskjoeldaster* ? *australis* sp. nov.) was collected from the lower levels of the informal 'Unit b', Rabot Point Member (Pirrie et al. 1991, 1997). The dominant lithologies here are intensely bioturbated muddy siltstones and fine sandstones, and associated macrobenthos is restricted to just a few infaunal bivalves, together with brachiopods and gastropods (Buatois et al. 1993). A combination of ammonite and dinoflagellate cyst age determinations suggests an Early to mid-Campanian range for the lower levels of Unit b (Pirrie et al. 1991, 1997). The single specimen recorded from Sanctuary Cliffs, Snow Hill Island, is an *Hemiaster (Bolbaster) vomer* (DJ.618.51; Figs 1, 2) and was collected from the lowermost beds of the Sanctuary Cliffs Member, Snow Hill Island Formation. It is part of a prolific marine invertebrate assemblage preserved within dark, kidney-red calcareous concretions. The kossmaticeratid ammonite *Neograhamites* is particularly common (P. Bengtson, pers. comm. 1996), as is the serpulid worm tube *Rotularia fallax* Wilckens; there are also bivalves, solitary corals, crabs and a single cirripede stem. Dinoflagellate cysts indicate a Late Campanian age (Pirrie et al. 1991, 1997).

No fewer than seven of the new specimens were obtained from the Haslum Crag Member, the highest unit within the Snow Hill Island Formation (two *Hemiaster (B.) vomer*, four *Giraliaster lorioli*; one incertae sedis holasteroid, Figs 1, 2). This member is characterized by a distinctive alternation of grey-green, bioturbated muddy sandstones with yellow-weathering, clay-rich, graded tuffaceous beds. Calcareous, early diagenetic concretions are abundant throughout the unit, and in the topmost 90 m they are intensely fossiliferous. The benthonic component of the regional *Gunnarites antarcticus* fauna also contains bivalve taxa such as *Solemya, Nordenskjoeldia, Modiolus, Pinna, Trigonia, Lahillia, Panopea* and *Gonomya,* gastropods such as *Perissoptera, 'Amberleya'* and *'Cassidaria'*, decapod crustaceans (especially *Hoploparia*), solitary corals and *Rotularia.* A consensus of palaeontological evidence has indicated that the *Gunnarites antarcticus* fauna is most likely Early Maastrichtian in age (Pirrie et al. 1991, 1997). Nevertheless, more recent palynological investigations have suggested that part of the Haslum Crag Member may range into the mid- or even Late Maastrichtian (Pirrie et al. 1991, 1997). A specimen of *Cyathocidaris* sp. (DJ.85.146), from the Cape Lamb Member of Vega Island (Figs 1, 2), is also associated with the *G. antarcticus* fauna.

Three spines of cidaroid echinoids, two of *C. nordenskjoldi* (DJ.605.2a, DJ.609.5) and one of *C. patera* (DJ.605.2b) from the lowermost López de Bertodano Formation on Seymour Island, (Figs 1, 2), occurred within poorly lithified, sparsely fossiliferous mudstones. Only *Rotularia fallax* is at all common in the benthos in this interval (Macellari 1988).

All the specimens described in this study are housed in the collections of the British Antarctic Survey, Cambridge, UK. Complementary cidarid material from the outcrops on Seymour Island is in the collection of the Earth Sciences Department of the University of California, Riverside, U.S.A.. This material was collected by Marilyn Kooser as part of another study.

SYSTEMATIC PALAEONTOLOGY

Order CIDAROIDA Claus, 1880
Family CIDARIDAE Gray, 1825

Genus ***Cyathocidaris*** LAMBERT, 1910

Cyathocidaris nordenskjoldi LAMBERT, 1910

Fig. 3.1-4

1910 *Cyathocidaris nordenskjoldi* - Lambert, pp. 5-6, pl. 1, figs 2-18.

Material and occurrence - 2 spines (DJ.605.2a and DJ.609.5) from the López de Bertodano Formation, Marambio Group, Seymour Island; Lower Maastrichtian.

Size and shape - The spine DJ.609.5 is complete and measures 54.5 mm in length (SL) and 5.5 mm in collar diameter (CD). The collar is short and smooth, the length between the base of the spine and the distal part of the collar being about 5.5 mm (10% of total length). The proximal part of the spine is cylindrical but the section becomes more and more flattened from the collar to the end. Moreover the sides of the distal mid-part of the spine are turned up and give a 'U'-shaped or 'V'-shaped section. The ten most distal millimeters of the spine look to be indented with about twelve points. The shaft surface is corroded but seems to be finely ribbed. The base is perforated and smooth or eroded. The spine DJ.605.2 is very similar to the previous one, but shorter (SL=38mm; CD=4.9 mm), more cupule-shaped distally and conspicuously ribbed.

Remarks - By their shape and ornamentation, the isolated spines are similar to those previously found in Seymour Island and published by Lambert (1910). This author gave only drawings of his material and photographs of the spines are given for the first time here. However, a wide range of spine morphologies were included in the species *C. nordenskjoldi* by Lambert (1910). Cup-shaped spines, not illustrated here, could be confused with *C. patera*. Relying on the hundreds of spines of both species collected by M. Kooser from Seymour Island as part of another study we can offer the following observations for distinguishing between the two. *C. nordenskjoldi* is most readily distinguished from *C. patera* by the greater robustness of the spines. The shaft tends to be longer in relation to the size of the cup, with coarser ribbing. The edge of the cup may be spinose. Although the terminal cup on *C. nordenskjoldi* spines may be asymmetrical, it does not develop into the delicate, widely flared, asymmetrical, and often tilted cup morphology of *C. patera*. Although both species may have some infilling of the center of the cup, this is more common, thicker, and often rugose in *C. nordenskjoldi*. The shaft of *C. nordenskjoldi* is more likely to be flattened on one side, below the shortest side of the terminal cup. In more common terms, *C. nordenskjoldi* resembles a golf tee, whereas *C. patera* is more like a thumb tack. The spines of

C. nordenskjoldi are also similar to those of *Cyathocidaris ortmanni* from the Upper Cretaceous of Patagonia (De Loriol 1902), but are longer, more flattened distally and have smaller ribs.

Cyathocidaris patera Lambert, 1910
Fig. 3.5-6

1910 *Cyathocidaris patera* - Lambert, pp. 6-7, pl. 1, figs. 19-22.

Material and occurrence - 1 spine (DJ.605.2b) from the López de Bertodano Formation, Marambio Group, Seymour Island; Lower Maastrichtian.

Size and shape - This spine is almost complete and measures about 16 mm in length and 4 mm in collar diameter. The proximal part of the spine is cylindrical; thereafter, the shaft is very short. The base is eroded but conspicuously perforated. The distal part, partly broken, corresponds to a large but thin and faintly concave cup, with a diameter of about 30 mm.

Remarks - By its shape, this spine is similar to those previously found in both Snow Hill and Seymour Islands (Lambert 1910). Lambert gave only drawings of his material and photographs of the spines are given for the first time here. On Seymour Island both *C. patera* and *C. nordenskjoldi* are long ranging through the Lopez de Bertodano Formation, showing no significant differences in stratigraphic range. They occur occasionally in the sparsely fossiliferous *Rotularia* units of Macellari (1988) and are both abundant in the Molluscan units 7-9, disappearing at the Cretaceous/Tertiary boundary. However, according to J.A. Crame collections, only *C. nordenskjoldi* is present in the younger level of the Marambio Group corresponding to the Snow Hill Island Formation. In the extensive collections from Seymour Island at the University of California, Riverside, there is just one specimen of *C. patera* that includes portions of the test and it is too poorly preserved to invite comparison with *C. nordenskjoldi* tests. However, of the several specimens that include both test and spines of *C. nordenskjoldi*, there are never any *C. patera*-like spines present. Therefore, it seems reasonable to conclude that these are separate species.

Cyathocidaris sp.
Fig. 3.7-8

Material and occurrence - 1 test (DJ.85.146) from the Cape Lamb Member, Snow Hill Island Formation, Marambio Group, Vega Island; Lower Maastrichtian.

Size and shape - The test is 33 mm in diameter (D) and 15 mm in height (45%D).

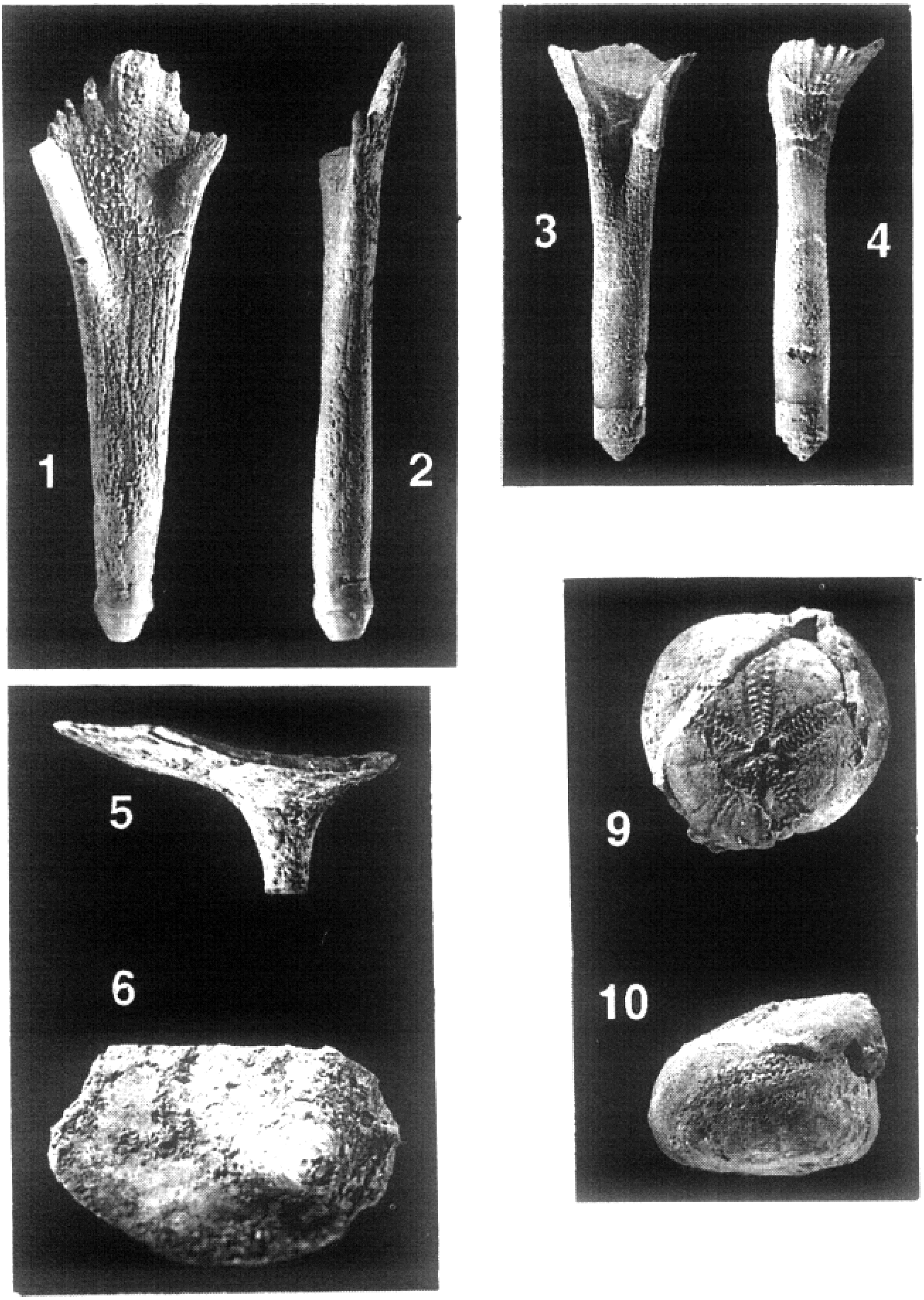
Apical system - The apical system is fossilized with the test but is covered by hard sediment.

Tuberculation and spines - The tubercles are perforate and their platforms, generally covered by short spines, seem to be smooth, non crenulate. The sutures are conspicuous. Six or seven major tubercles (plates) are present in each interambulacral column. The areoles are no confluent. Three kinds of spine fragments are preserved on the test: (1) the base and sometimes the annulus of the major spines is preserved attached to a lot of primary tubercles; (2) the secondary spines surrounding the base of major spines cover most of the primary tubercles; (3) fragments of the small smooth primary spines surrounding the peristome are preserved, inclined towards the centre of the peristomial area.

Ambulacra - Only the adoral part of two ambulacra is rather well preserved and shows two columns of large granules. Ambulacral pores, very corroded, seem to be small isopores.

Peristome - The peristome is circular and approximately 15 mm in test diameter (about 45%D).

Remarks - By its small number of perforate and noncrenulate tubercles, its large miliary zones, and its sinuous and narrow ambulacra, this cidaroid corresponds well with the diagnosis of the genus *Cyathocidaris* revised by Lambert (1910). This test and the *C. nordenskjoldi* spines have the same stratigraphical range, but they cannot be attributed with certainty to the same species. M. Kooser has found a couple of test or test pieces with *C. nordenskjoldi* spines and she has noticed on it that ambulacral pores are nonconjugate and interambulacral areols are nonconfluent, as on this specimen. Moreover, the other Maastrichtian Antarctic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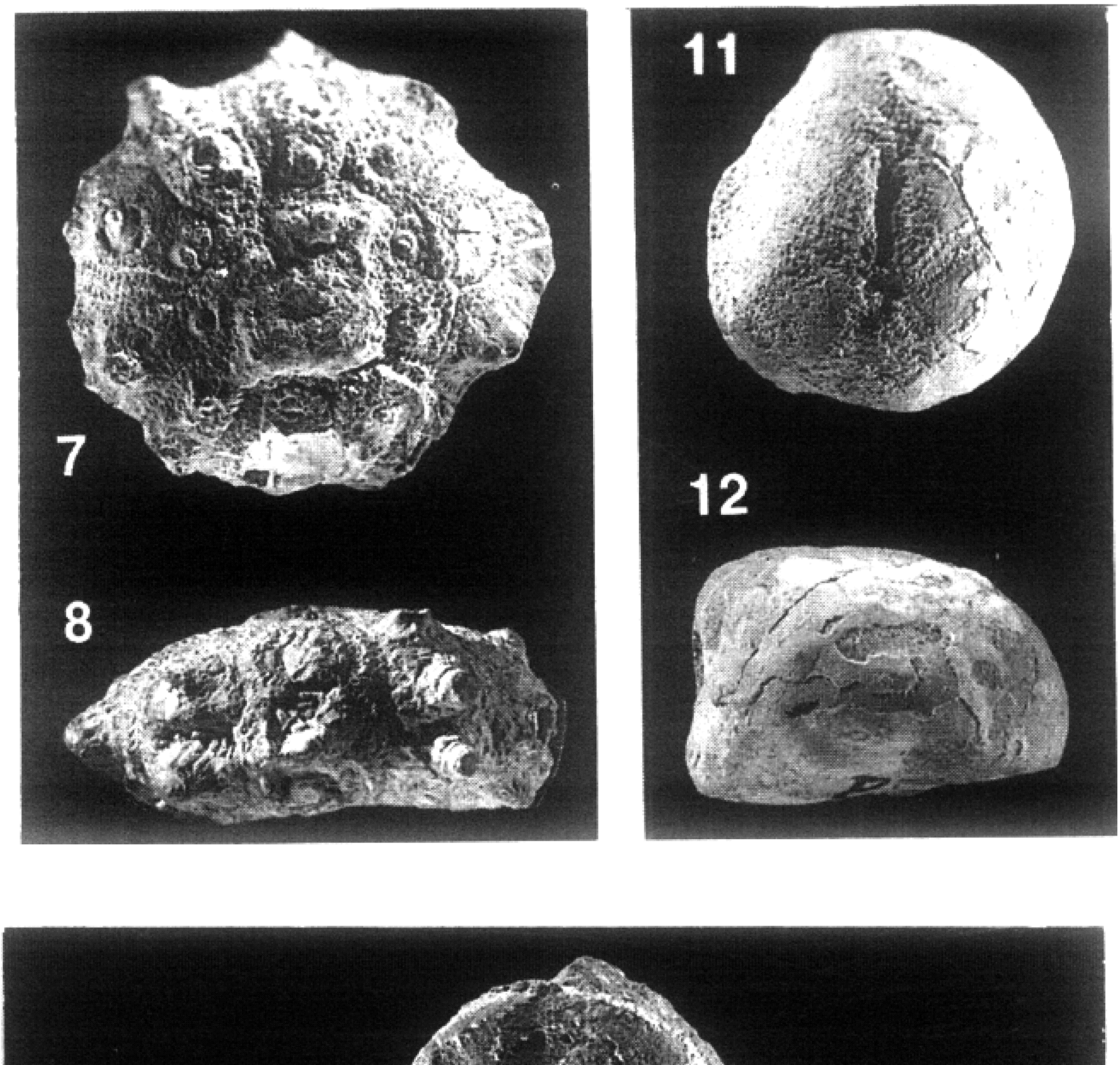
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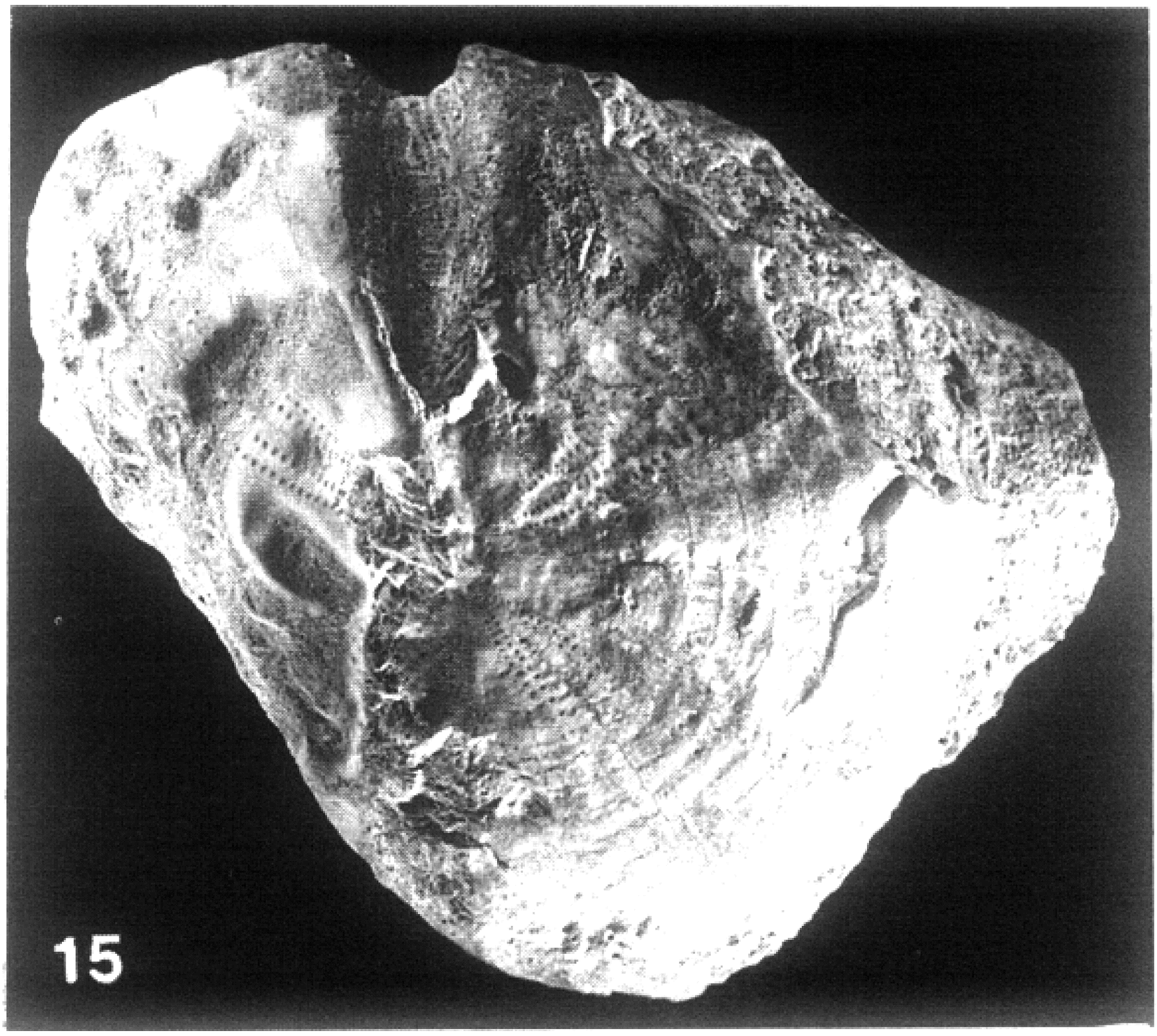
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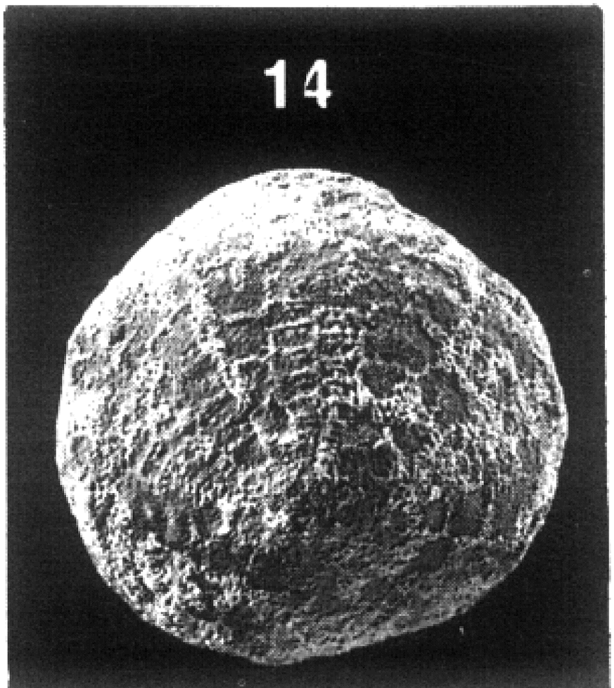
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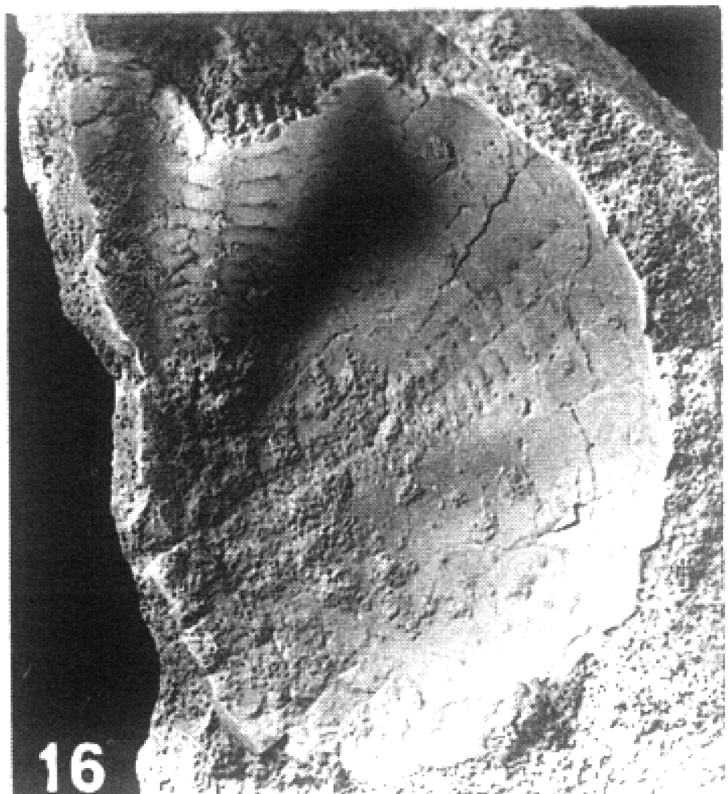
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FIGURE 3 - **1,2,3,4.** *Cyathocidaris nordenskjoldi* LAMBERT, 1910. 1. General view. 2. Side view. López de Bertodano Formation, Marambio Group, Lower Maastrichtian, Seymour Island. DJ.609.5 [x 1]. 3. General view. 4. Side view. López de Bertodano Formation, Marambio Group, Lower Maastrichtian, Seymour Island. DJ.605.2a [x 1]. **5,6.** *Cyathocidaris patera* LAMBERT, 1910. 5. General view. 6. Side view. López de Bertodano Formation, Marambio Group, Lower Maastrichtian, Seymour Island. DJ.605.2b [x 1]. **7,8.** *Cyathocidaris* sp. Lambert, 1910. 7. Apical view. 8. Side view. Cape Lamb Member, Snow Hill Island Formation, Marambio Group, Lower Maastrichtian, Vega Island. DJ.85.146 [x 1]. **9,10.** *Hemiaster (Bolbaster) vomer* LAMBERT, 1910; Sanctuary Cliffs Member, Snow Hill Island Formation, Marambio Group, Upper Campanian, Snow Hill Island. 9. Apical view. 10. Left side view. DJ.618.51 [x 1]. **11,12,13.** *Hemiaster (Bolbaster) vomer* LAMBERT, 1910; Haslum Crag Member, Snow Hill Island Formation, Marambio Group, Lower Maastrichtian, Snow Hill Island. 11. Apical view. 12. Right side view. DJ.610.4 [x 1]. 13. Apical view. DJ.615.75 [x 1]. **14.** *Incertae sedis* holasteroid; Haslum Crag Member, Snow Hill Island Formation, Marambio Group, Lower Maastrichtian, Seymour Island. Apical view. DJ.612.34 [x 1]. **15,16.** *Giraliaster lorioli* (LAMBERT, 1910); Haslum Crag Member, Snow-Hill Island Formation, Marambio Group, Lower Maastrichtian, Snow Hill Island. 15. Apical view. DJ.631.14 [x 1]. 16. Apical view on an external mould. DJ.610.70 [x 1]. ***1,2,3,4.*** Cyathocidaris nordenskjoldi *LAMBERT, 1910.Vue générale. 2. Vue latérale. López de Bertodano Formation, Marambio Group, Maastrichtien inférieur, Seymour Island. DJ.609.5 [x 1]. 3. Vue générale. 4. Vue latérale. López de Bertodano Formation, Marambio Group, Maastrichtien inférieur, Seymour Island. DJ.605.2a [x 1].* ***5,6.*** Cyathocidaris patera *LAMBERT, 1910. 5. Vue générale. 6. Vue latérale. López de Bertodano Formation, Marambio Group, Maastrichtien inférieur, Seymour Island. DJ.605.2b. [x 1].* ***7,8.*** Cyathocidaris *sp. LAMBERT, 1910. 7. Vue apicale. 8. Vue latérale. Cape Lamb Member, Snow Hill Island Formation, Marambio Group, Maastrichtien inférieur, Vega Island. DJ.85.146 [x 1].* ***9,10.*** Hemiaster (Bolbaster) vomer *LAMBERT, 1910. Sanctuary Cliffs Member, Snow Hill Island Formation, Marambio Group, Campanien supérieur, Snow Hill Island. 9. Vue apicale. 10. Vue latérale gauche. DJ.618.51 [x 1].* ***11,12,13.*** Hemiaster (Bolbaster) vomer *LAMBERT, 1910. Haslum Crag Member, Snow Hill Island Formation, Marambio Group, Maastrichtien inférieur, Snow Hill Island. 11. Vue apicale. 12. Vue latérale droite. DJ.610.4. [x 1]. 13. Vue apicale. DJ.615.75 [x 1].* ***14.*** Incertae sedis *holasteroid. Haslum Crag Member, Snow Hill Island Formation, Marambio Group, Maastrichtien inférieur, Seymour Island. Vue apicale. DJ.612.34 [x 1].* ***15,16.*** Giraliaster lorioli *(LAMBERT, 1910). Haslum Crag Member, Snow-Hill Island Formation, Marambio Group, Maastrichtien inférieur, Snow Hill Island. 15. Vue apicale. DJ.631.14 [x 1]. 16. Vue apicale sur un moule externe. DJ.610.70 [x 1].*

Cyathocidaris, C. patera, has straight ambulacra whereas this specimen has conspicuously sinuous ambulacra. At present, there is no test material from the other described Maastrichtian Antarctic *Cyathocidaris, C. erubus* LAMBERT, 1910, with which to compare this specimen. However, on Seymour Island, *C. erubus* only occurs in the uppermost Maastrichtian of Macellari's unit 9 (Macellari 1988) of the Lopez de Bertodano Formation. Finally, the present Maastrichtian cidaroid differs from the Maastrichtian species *Almucidaris durhami* from Seymour Island (Blake & Zinsmeister 1991) in having a more flattened test, being non marsupiate, and having narrower poriferous zones with only two series of granules and more conspicuous plate sutures. The test under study has several similarities with *C. nordenskjoldi.* However, it is covered by small fragments of spines, or eroded and we prefer to keep it as *Cyathocidaris* sp.

Order HOLASTEROIDA Durham & Melville, 1957
Family HOLASTERIDAE Pictet, 1857

Genus *Giraliaster* FOSTER & PHILIP, 1978

Giraliaster lorioli (LAMBERT, 1910)
Figs 3.15-16, 4.5

1910 *Holaster lorioli* - Lambert, pp. 8-9, pl. 1, fig. 38.

Material and occurrence - 1 specimen (DJ.631.14) with the test preserved and three moulds (DJ.610.70, DJ.615.109, DJ.615. 110) from the Haslum Crag Member, Snow-Hill Island Formation, Marambio Group, Snow Hill Island; Lower Maastrichtian.

Size and shape - The different specimens are approximately as broad as long, with a deep anterior sulcus. Although the left posterior part of the test is lacking, the length (L) and the width of the specimen with test can be estimated to be about 70 mm (the mould lengths are about 53 mm, 45 mm and 38 mm). The test height is more difficult to measure, but it is estimated to be about 27-30 mm (39-43%L). The anterior part is marked by a deep groove and the frontal notch depth corresponds to approximately 7-8% of the test length. The plastron is sligthly keeled.

Apical system - The apical system is subcentral or slightly anterior. On the specimen with test preserved it is situated at 43% of the test length from the anterior margin. Although the apical system is partly broken, three genital pores can be observed clearly, and a fourth is less conspicuous.

Pair ambulacra - The pair ambulacra are narrow, flushed with the test, subpetaloid and faintly curved, with extremities not constricted. Anterior petals distinctly longer than posterior ones. Their lengths correspond to 26-29% and 14-17% of test length, respectively. Posterior pore series of each petal with elongate pores while anterior series have smaller round pores.

Tubercles - The test is eroded and there is no trace of a fasciole. However, some coarse tubercles can be observed on the right aboral keel of the frontal groove.

Peristome and periproct - The periproct is placed vertically on the posterior truncation. The peristome is covered by hard sediment and cannot be observed.

Remarks - Although they are incomplete, the present specimens show several similarities with the *Holaster lorioli* from

Snow Hill Island (Lambert 1910). Field observations show that Lambert's Cenomanian age is in error and his material, like the present specimens under study, comes from Maastrichtian levels. Lambert puts the species in the genus *Holaster* when his large as broad as long test, his broad petals, his transversely elongate outer pores of posterior series and his deeply sunken ambulacrum III corresponds in fact to the austral *Giraliaster* (Foster & Philip, 1978). The general shape of *Giraliaster* is closely similar to those of *Cardiaster* and *Pseudholaster*, but *Giraliaster* differs from *Cardiaster* by its lack of marginal fasciole and from *Pseudholaster* by its sub-anal fasciole. A synthetic approach to fascioles of spatangoids has recently shown the variability of the fasciolar structures in a single taxa (Néraudeau et al. 1998): in a single genus, even in a single species, a category of fasciole (e.g. peripetalous) can vary according the specimen from complete conspicuous band to incomplete or inconspicuous band, and even no band. Moreover, in the same lineage, there is an evolutionary trend from no fasciole to inconspicuous and finally conspicuous fasciole. Preliminary observations show the same results for holasteroid echinoids (so, Mid-Cretaceous *Pseudholaster*, without fasciole, can be the primitive ancestor of the Late Cretaceous *Cardiaster* and *Giraliaster*). Consequently, although no fasciole can be observed on our Late Cretaceous specimens, according to their bad preservation, we base the systematic attribution of the present specimens to *Giraliaster* on shape criteria only and not on tuberculation characteristics. These specimens differ from the Australian species (Foster & Philip 1978), *G. jubileensis* (Maastrichtian-Paleocene), *G. tertiarius* (Eocene), *G. sulcatus* (Oligocene) and *G. bellisae* (Oligocene) almost only by the test profile. *G. jubileensis* and *G. tertiarius* are conspicuously more inflated than *G. lorioli*. *G. sulcatus* and *G. bellisae* have the same relative height than of *G. lorioli* but their posterior truncation is slightly sloped whereas it is vertical for *G. lorioli* (Fig. 5.5).

Giraliaster sp. A

Fig. 4.6

Material and occurrence - 1 mould (D.8228.264) from the Hidden Lake Formation, Gustav Group, northern James Ross Island; Santonian.

Size and shape - The dimensions of the test, deduced from the mould, are about 44-45 mm in length (L), 38-42 mm in width and 22-25 mm in height. The frontal groove and the anterior notch are deep. The test is subvertically truncate posteriorly and has a keel.

Apical system - The apical system is subcentral. No trace of genital pores can be observed on the mould.

The paired ambulacra - The ambulacra are rather narrow and nonpetaloid, the posterior pair being shorter than the anterior pair.

Periproct and peristome - The periproct is supramarginal and located on the truncate posterior. The peristome cannot be observed.

Remarks - By the shape of the test, this *Giraliaster* is closely related to the previous *G. lorioli*. However, it is too crushed to make a species determination.

Genus *Nordenskjoeldaster* LAMBERT, 1910

Nordenskjoeldaster ? *australis* nov. sp.

Fig. 4.7-8

Systematic position - Due to the presence of double pores in the upper part of paired ambulacra, the present specimen cannot be attributed to the families Urechinidae, Calymnidae and Pourtalesiidae, which are characterized adapically by single pores. Conversely, the lack of a frontal groove and notch, and the shape of the paired ambulacra, flu-

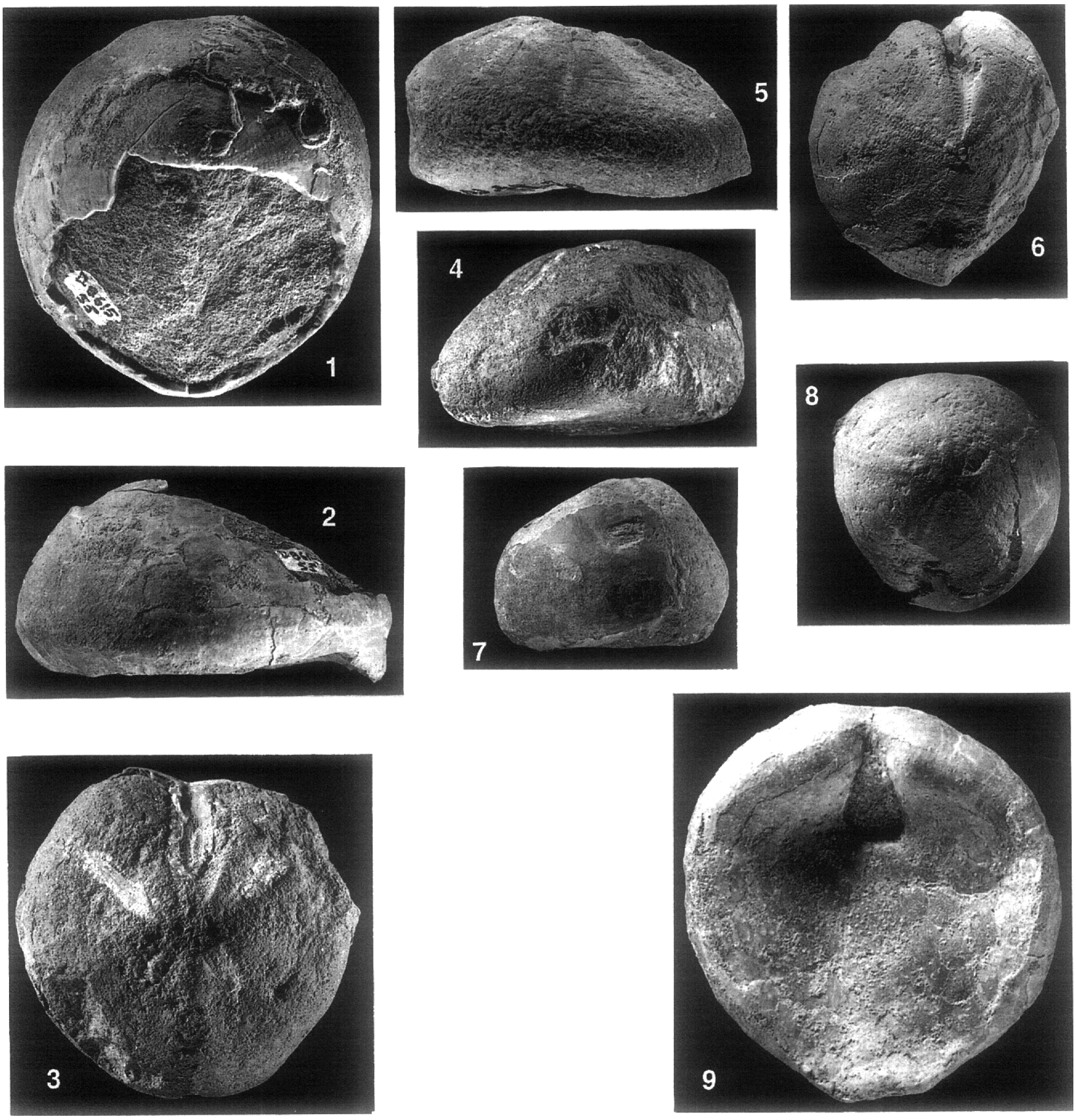

FIGURE 4 - **1,2,9.** *Huttonechinus antarctica* nov. sp. 1. Apical view. 2. Left side view. Lachman Crags Member, Santa Marta Formation, Marambio Group, Late Santonian-Early Campanian, northern James Ross Island. D.8615.55 [x 1]. **3,4.** *Micraster* aff. *regularis* ARNAUD, 1883. 3. Apical view. 4. Left side view. Lachman Crags Member, Santa Marta Formation, Marambio Group, Upper Santonian-Lower Campanian, northern James Ross Island. RF.10/12.[x 1]. **5.** *Giraliaster lorioli* (LAMBERT, 1910). Right side view. Haslum Crag Member, Snow-Hill Island Formation, Marambio Group, Lower Maastrichtian, Snow Hill Island. DJ.615.110 [x 1]. **6.** *Giraliaster* sp. A. Apical view. Hidden Lake Formation, Gustav Group, Santonian, northern James Ross Island. D.8228.264 [x 1]. **7,8.** *Nordenskjoeldaster ? australis* nov. sp. 7. Right side view. 8. Apical view. Rabot Point Member, Santa Marta Formation, Marambio Group, Rabot Point, Lower to mid-Campanian, James Ross Island. DJ.662.6 [x 1]. ***1,2,9.*** Huttonechinus antarctica *sp. nov. 1. Vue apicale. 2. Vue latérale gauche. Lachman Crags Member, Santa Marta Formation, Marambio Group, Santonien supérieur-Campanien inférieur, nord de James Ross Island. D.8615.55 [x 1].* ***3,4.*** Micraster *aff.* regularis *ARNAUD, 1883. 3. Vue apicale. 4. Vue latérale gauche. Lachman Crags Member, Santa Marta Formation, Marambio Group, Santonien supérieur-Campanien inférieur, nord de James Ross Island. RF.10/12 [x 1].* ***5.*** Giraliaster lorioli *(LAMBERT, 1910). Vue latérale droite. Haslum Crag Member, Snow-Hill Island Formation, Marambio Group, Maastrichtien inférieur, Snow Hill Island. DJ.615.110 [x 1].* ***6.*** Giraliaster sp. A. Vue apicale. Hidden Lake Formation, Gustav Group, Santonien, nord de James Ross Island. D.8228.264 [x 1]. 7,8. Nordenskjoeldaster ? australis *sp. nov. 7. Vue latérale droite. 8. Vue apicale. Rabot Point Member, Santa Marta Formation, Marambio Group, Rabot Point, Campanien inférieur à moyen, James Ross Island. DJ.662.6 [x 1].*

shed with the test or even slightly inflated and non-petaloid, could correspond to several subhemispherical and subglobular Holasteridae but not to the classical *Stegaster*. Moreover, its short apical system shows that it is not related to *Cibaster* and *Duncaniaster*. The supramarginal position of the periproct shows that it is not an *Echinocorys*, a *Galeaster*, a *Gambirretia*, a *Garumnaster*, a *Jeronia*, a *Lampadocorys*, an *Offaster*, or a *Stereopneutes*. In fact, by its general shape, the specimen looks like some holasteroids of uncertain family described by Moore (1966), but according to its poor preservation it is difficult to make a clear generic determination. It could be a *Turanglaster*, holasteroid discovered in the Upper Cretaceous of Azerbaijan, but its periproct is too low to be clearly related to this incertae sedis holasteroid. It is very similar to the Senonian *Physaster* from Senegal but is not so globular. Moreover, it does not correspond to any published species of the previous genera. Finally, with its subglobular shape, its short anterior apical system, its supramarginal periproct, we think, with some reservations, that our specimen is related to the genus *Nordenskjoeldaster* previously created by Lambert (1910) for a rounded echinoid of the Upper Cretaceous antarctic fauna.

Material and occurrence - 1 mould with some pieces of test (DJ.662.6) from the Rabot Point Member, Santa Marta Formation, Marambio Group, Rabot Point, James Ross Island; Lower to Mid-Campanian.

Species name derivation - Because of its austral origin, we name this new holasteroid *Nordenskjoeldaster* ? *australis*.

Diagnosis - Subglobular *Nordenskjoeldaster* with subconical upper mid-test and slightly concave area on upper mid-height of the posterior interambulacrum. Test without anterior groove and notch and ambulacra slightly in relief adapically. Periproct located between the margin and the mid-height of the test.

Size and shape - The specimen is subglobular, with a subconical upper mid-test, and measures 38 mm in length (L), 35 mm in width (92 % L) and 28 mm in height (74% L). The upper mid-height of the posterior interambulacrum shows a slightly concave area.

Apical system - The test is not preserved in the apical area. However, the mould shows that the apical system was slightly anterior and not elongate; its length is less than 4 mm, that is to say less than 10% of the test length.

Tuberculation - Although the test is encrusted by a hard gray sediment, it is possible to observe enlarged tubercles on the adoral plates and smaller tubercles on adapical plates.

Frontal ambulacrum - The specimen has no frontal groove and no anterior notch.

Anterior paired ambulacra - The single ambulacrum that has preserved test shows conspicuous double pore series. Its seems, from the mould, that the apical parts of the pair ambulacra were slightly in relief.

Periproct and peristome - No test is preserved around the periproct and the peristome, but the mould shows a large excavation on the oral side at the likely location of the peristome (the rest of the oral side is flattened or slightly convex). The location of the periproct is difficult to define, but it is clear that it is not located on the adoral face or between the apical system and the mid-height of the

posterior interambulacrum. So, the periproct is most likely located between the margin and the mid-height of the test.

Remarks - Compared to the *N. antarcticus* of Lambert (1910), our specimen is more inflated and subconical and is characterized by a concave area on the upper mid-height of the posterior interambulacrum.

Family CORYSTIDAE Foster & Philip, 1978

Genus *Huttonechinus* (HUTTON, 1873)

Systematic position - This egg-shaped holasteroid has double pores in the upper part of its pair ambulacra and so cannot be referred to the groups with single pores series, Urechinidae, Calymnidae and Pourtalesiidae (Wagner & Durham 1966; David 1988), even if its general shape is closely similar to those of the Danian Urechinidae *Basseaster* and *Pomaster* (Solovjev 1994).

According to its lack of frontal groove and notch, its lack of marginal fasciole, its nonpetaloid ambulacra that are flush with the test, its elongate outer pores, its low supramarginal periproct, and its subanal rostrum (keel), it cannot be attributed to any of the known Holasteridae genera (Wagner & Durham 1966): owing to its supramarginal periproct and subanal rostrum it cannot be a classic egg-shaped (e.g. *Echinocorys*), or globular holasteridae (e.g. *Offaster*); owing to its nonpetaloid ambulacra that are flush with the test it cannot be an uncommon rounded Holasteridae such as *Duncaniaster*; owing to its lack of frontal groove and notch, it cannot be a cordate Holasteridae (e.g. *Galeaster, Hemipneustes, Holaster* or *Stegaster*).

Moreover, it is clearly different from the incertae sedis holasteroids described by Wagner & Durham (1966): the frontal part of the ambitus is too rounded and the test too big to correspond to the small *Coraster* and *Corechinus*; the low periproct on the posterior end and the flattened oral face are main differences with *Habanaster, Nordenskjoeldaster, Physaster* and *Turanglaster*; due to the supramarginal periproct and the lack of wide ambulacral fasciole and raised plastron it cannot be a *Menuthiaster.*

Finally, this irregular echinoid corresponds in several characters to the definition of the Corystidae, an holasteroid family defined by Foster & Philip (1978) a dozen years after the Treatise of Moore (1966). These holasteroids, like the present specimen, are rounded in shape, with anterior notch either feeble or absent and with a subanal rostrum. Among the Corystidae, our specimen differs from the genera *Corystus* by its lack of deep anterior notch and from the small *Cardabia* by its conspicuous pore series of the ambulacra and its large size. Conversely, it is closely related to *Huttonechinus spatangiformis*, a large size egg-shaped corystid.

Huttonechinus antarctica nov. sp.

Fig. 4.1-2,9

Derivation of name - From its Antarctic origin.

Material and occurrence - 1 specimen (D.8615.55) from the Lachman Crags Member, Santa Marta Formation, Marambio

Group, northern James Ross Island; Late Santonian-Early Campanian.

Diagnosis - Large size *Huttonechinus* with an oval ambitus, slightly pointed posteriorly, an inflated profile with a prominent posterior rostrum and a very anterior peristome.

Size and shape - The test is 62.5 mm in length (L), 60 mm in width (96% L) and 35-36 mm in height (56-58% L). The test is crushed adorally and could have been more inflated. The ambitus outline is oval (egg-shaped). An angulous and rostrate heel is present in the posterior part of the test.

Apical system - Adapically the test is broken and the apical system is not preserved. However, the mould shows that the apical system was subcentral and elongate; its length is about 17% of the test length.

Anterior ambulacrum - The anterior ambulacrum is narrower than the other ambulacra, and has a series of small double pores. The anterior margin has no groove and almost no notch.

Anterior paired ambulacra - The anterior ambulacra are rather narrow, right and nonpetaloid with double pore series. The pores of the anterior series are smaller than in posterior ones. In each series, the anterior pore, with a rounded or slightly elongate shape, is smaller and more rounded than the posterior pore. The posterior ambulacra are not preserved.

Tuberculation - The test shows a lot of scattered primary tubercles, both perforated and crenulated. On the adoral side, the tuberculation is dense between the ambulacra and near the margin, but comprises mostly miliaries on the ambulacra.

Fasciole - The aboral tuberculation is well preserved but no fasciole can be observed in a marginal position. Unfortunately, the tuberculation is eroded near the periproct and it is difficult to assert the presence of a subanal fasciole.

Periproct - The periproct is wider than high, supramarginal but low on the truncate posterior.

Peristome - The peristome is located very anteriorly in a deep and wide ambulacral adoral groove but is covered by hard sediment and its shape cannot be determined precisely.

Remarks - *H. antarctica* differs from *H. spatangiformis* by its more anterior peristome, its more rounded ambitus and its more pointed posterior rostrum. Moreover, *H. antarctica* comes from Late Santonian-Early Campanian levels when *H. spatangiformis* is Early Oligocene in age.

Incertae sedis holasteroid

Fig. 3.14

Material and occurrence - 1 mould (DJ.612.34) from the Haslum Crag Member, Snow Hill Island Formation, Marambio Group, Seymour Island; Lower Maastrichtian.

Size and shape - The length of the mould is 32 mm, but the specimen is flattened and incomplete, and the real length of the test is probably about 35 mm. Adapically, the architecture of the test can be partly observed because of the plate impressions on the mould.

Apical system - The apical system is slightly anterior and does not seem to be very elongate.

Frontal ambulacrum - Only the upper part of the frontal ambulacrum is well preserved. It seems that there is no frontal groove and the anterior notch is very faint or lacking.

Paired ambulacra - The paired ambulacra are nonpetaloid and rather large according to the small size of the specimen.

Periproct and peristome - The periproct is supramarginal; its shape is impossible to define. The peristome area is not preserved.

Remarks - Due to its rather flattened shape, lack of frontal groove, and slightly anterior and non-elongate apical system, this *incertae sedis* holasteroid seems to be closely related to the previous *Huttonechinus.*

Order SPATANGOIDA Claus, 1876
Family MICRASTERIDAE

Genus ***Micraster*** Agassiz, 1836

Micraster aff. *regularis* Arnaud, 1883
Fig. 4.3-4

Systematic position - Although the main parts of the test are lacking, the general heart shape and the rather flattened profile of this spatangoid, together with its very unequal petals, demonstrate that it is not a subglobular hemiasterid such as the Senonian *Hemiaster (Bolbaster)* (Néraudeau, 1994). Its straight petals are very different from those of schizasterids with flexuous or subflexuous petals such as the Cretaceous *Proraster.* Moreover, for numerous schizasterids (e.g. *Linthia* or *Schizopneustes*), the anterior petals make a very open angle, around 120° and more, while those of the antarctic specimen are less divergent, with an angle of about 90°. Finally, even if the broadly heart-shaped specimen under study is very similar to the Danian schizasterid *Dipneustes aturicus* of Arnaud in Cotteau (1891), it has conspicuously shallower frontal ambulacrum and sinus, and wider not rudimentary posterior petals and does not correspond to any known schizasterid (especially for Cretaceous genera). In fact, with its very anterior peristome, its rather shallow frontal groove and notch associated to a broadly heart-shaped test and straight unequal petals, this spatangoid is much more likely to be a micrasterid such as the common Senonian *Micraster*. Indeed, a broadly heart-shaped test characterizes the *Micraster* of the upper mid-part of the Senonian (David & Fouray 1984). However, the specimen is mainly a mould and no subanal fasciole can be observed. But, it is common to find some specimens without any fasciole in populations of typical *Micraster*, such as the morphotype *renati* of *M. decipiens* (NÉRAUDEAU et al., 1998) and in different primitive species previously put in the genus *Epiaster*, such as *Micraster distinctus* (cf. Smith et al. 1988). Consequently, the lack of a conspicuous subanal fasciole cannot be an obstacle identifying the present specimen as a *Micraster*.

Material and occurrence - 2 moulds (RF.10/12 and D.8617.59) with small pieces of test from the Lachman Crags

Member, Santa Marta Formation, Marambio Group, northern James Ross Island; Upper Santonian-Lower Campanian.

Size and shape - The test is broadly heart-shaped and moderately inflated, with a vertical posterior side. The length (L) and the width of specimen RF.10/12 are almost equal and can be estimated at about 49-50 mm, with a test height of about 31-32 mm (62-65% L). The length of specimen D.8617.59 is about 57 mm with the width and height being about 60 mm (105% L) and 35 mm (61 % L), respectively. The dorsal part of interambulacrum 5 constitutes a heel.

Apical system - The apex is subcentral. No trace of genital pores can be distinguished on the moulds.

Anterior ambulacra - The ambitus has a conspicuous but shallow anterior notch from which the depth corresponds to 3-4% of the test length. The frontal groove is not very wider than pair ambulacra and moderately depressed.

Paired ambulacra - The pair ambulacra are petaloid and moderately depressed. The anterior and posterior petal lengths correspond approximately to 40% and 25% of test length, respectively. For specimen D.8617.59 (the best preserved) the anterior and posterior petals have the same width (respectively 32% and 50% of the petal length).

Periproct - The shape and size of the periproct cannot be precisely measured on the mould RF.10/12, but its position is clearly on the upper part of the posterior face. The periproct is covered by hard sediment on specimen D.8617.59.

Peristome - The shape of the peristome seems reniform and partly covered by the labrum on specimen D.8617.59. It is located very anteriorly on the adoral side.

Fascioles cannot be observed on the mould RF.10/12 or on the eroded test of the other specimen.

Remarks - The discovery of *Micraster* in Antarctic regions is new. However, *M. meunieri* and *M. trangahyensis* have been previously described by Lambert (1896, 1936) in the Late Cretaceous echinoid fauna from Madagascar. These species have a very high and conical test, their petals are slightly depressed or almost flushed with the test while the Antarctic specimen is moderately inflated and definitely not conical, with depressed petals. So, our *Micraster* and the species from Madagascar are clearly different. Compared to the Senonian European *Micraster* analyzed by Stokes (1975), the *Micraster* from Antarctica seem closely related to *M. douvillei* from the

Santonian of Spain, and perhaps most closely to *M. regularis* from the Lower Campanian of South-West France. Both the species from Antarctica and France have the same general shape and similar proportions of the petals. However, the Antarctic material is too badly preserved to be attributed without doubt to *M. regularis.*

Family HEMIASTERIDAE Clark, 1917

Genus ***Hemiaster*** AGASSIZ, 1847

Subgenus ***Bolbaster*** POMEL, 1869

Hemiaster (Bolbaster) vomer LAMBERT, 1910

Fig. 3.9-13

1910 *Hemiaster vomer* - Lambert, p. 10-11, pl. 1, fig. 44-46.
1920 *Vomeraster vomer* (LAMBERT) - Lambert & Thiéry (1909-1925), p. 27.

Material and occurrence - 1 specimen (DJ.618.51) from the Sanctuary Cliffs Member, Snow Hill Island Formation, Marambio Group, Snow Hill Island; Upper Campanian. 2 specimens (DJ.610.4, DJ.615.75) from the Haslum Crag Member, Snow Hill Island Formation, Marambio Group, Snow Hill Island; Lower Maastrichtian.

Size and shape - The test of DJ.615.75 is crushed, but the length of the specimen can be estimated at about 24-25 mm. The ambitus outline seems subcircular, without anterior notch. Specimen DJ.610.4 is about 28 mm in length (L) and width, and 19-20 mm in height (68-71% L). The length and width of the last specimen are about 20-21 mm, with a height of about 16 mm (76-80% L).

Apical system - Although the test is incomplete, the apex is conspicuously posterior. It is situated at 62-66% of the test length from the anterior margin. A mould shows the traces of four genital pores.

Anterior ambulacra - The test has a rounded ambitus without anterior notch. However, the frontal groove is rather deep adapically and becomes flushed with the test at only 3 or 4 mm from the ambitus.

Paired ambulacra - The paired ambulacra are short, especially the posterior ones, and are petaloid, right and shallow. The anterior petal length is approximately 32-34% (8 mm) of test length, with the posterior petal lengths corresponding to 50% (4 mm) of the anterior one's.

Both the peristome and the periproct are lacking and the fasciole cannot be observed on the mould.

Remarks - Lambert (1910) described an *Hemiaster vomer* from the Upper Cretaceous ferruginous sandstones of Snow Hill Island. Two from our specimens (DJ.610.4, DJ.615.75), with the same test and petal shapes, and the same lithological and stratigraphical occurrence, undoubtedly belong to this species. The third specimen (DJ.618.51) is slightly older (Upper Campanian and not Lower Maastrichtian) but is very similar to the other ones and probably belongs to the same species. According to our own observations, the criteria 'slightly depressed sutures' and 'coarse tuberculation' used by Lambert in Lambert & Thiéry (1909-1925) to define the genus *Vomeraster* are too variable on our material to be applied to this species. *Hemiaster vomer* is a typical *Hemiaster (Bolbaster)* with globular test and very short petals and not a *Vomeraster.*

DISCUSSION

The seventeen specimens described here were collected from approximately the lower two-thirds of the Marambio Group (Fig. 2). *Giraliaster* sp. A is Santonian (undifferentiated) in age, and *Huttonechinus antarctica* sp. nov. and *Micraster* aff. *regularis* Arnaud are Late Santonian-Early Campanian. *Nordenskjoeldaster* ? *australis* sp. nov. is Early to Mid-Campanian, and *Hemiaster (Bolbaster) vomer* Lambert both latest Campanian and Early

Maastrichtian. All other taxa (*Cyathocidaris nordenskjöldi* LAMBERT, *C. patera* LAMBERT, *Giraliaster lorioli* (LAMBERT), incertae sedis holasteroid, and *Hemiaster (B.) vomer* LAMBERT are taken to be Early Maastrichtian. As far as can be judged, the antarctic ages of these taxa are consistent with those of their closest taxonomic relatives.

The presence of *Micraster* in Antarctica is of special interest as representatives of this genus have been used extensively for biostratigraphical subdivisions within the European Upper Cretaceous (David & Fouray 1984). There is possibly some potential here for enhancing correlations between Boreal, Tethyan and Austral regions. The same applies to *Hemiaster (Bolbaster)*, where different globular species have been used with some success to zone the Senonian of Western Europe (Néraudeau & Floquet 1991). In their future field investigations in Antarctica, geologists must be especially careful with the collect of these two spatangoid groups, that occur during Late Cretaceous from South Atlantic and Madagascar area to northern Africa, Europe and even to USA (Néraudeau & Mathey 1999).

Due to the scarcity of deep-shelf echinoids from the Cretaceous levels of the different regions of the world, apart from the European Chalk, it is difficult to define the palaeobiogeographical distribution of the Antarctic echinoid fauna under study. As far as the genus *Huttonechinus* is concerned, the available material is very poor, and it is impossible to assert that the new genus is an austral endemic. However, it is important to note that both the Late Cretaceous and the Oligocene occurrences are located in the austral regions (New Zealand and Antarctica). Of the other taxa, *Cyathocidaris* has been recorded from Patagonia both as the Tertiary '*Cidaris*' *antarctica* (Ortmann 1900, 1902), and as the Upper Cretaceous '*Cidaris*' *ortmanni* (DE LORIOL, 1902). These two species were attributed subsequently to *Cyathocidaris* by Lambert (1910), who recognized the similarities between these Patagonian species and the three Antarctic species, *Cyathocidaris nordenskjoeldi, C. patera* and *C. erebus*. Moreover, Lambert (1910) underlined the fact that other species of this genus also occurred in the Jurassic, Cretaceous and Tertiary of south-west Europe. As far as the irregular echinoids are concerned, *Giraliaster* seems to be typical from the austral regions, with occurrences in Australia, in Antarctica and may be in Madagascar. Indeed, the Campanian *Cardiaster orientalis*, from Madagascar and from which fascioles have not been observed (Lambert 1936), should probably be another *Giraliaster.* Finally, *Hemiaster (Bolbaster)* has a cosmopolitan distribution in the Late Cretaceous (Néraudeau 1994).

The best palaeoecological indices in this echinoid assemblage are spatangoids, such as *Hemiaster (Bolbaster)* and *Micraster,* together with large holasteroids, such as *Giraliaster* and *Huttonechinus.* Indeed, in the Coniacian marls of Spain (Néraudeau & Floquet 1991) and in the Campanian Chalk of France (Néraudeau & Villier 1997), there is an ecological spatial succession where cassiduloid echinoids (e.g. *Nucleopygus*) characterize the shallowest part of the shelf when holasteroids (e. g. *Echinocorys*), like their Recent relatives (David 1988), mark the deepest part. Spatangoids indicate intermediate environments, hemiasterids being shallower than micrasterids. In the Antarctic echinoids under study, the lack of cassiduloids shows that this fauna was not in a shallow water environment of the shelf. On the contrary, the abundance and the diversity of holasteroids (4 or 5 species) and the presence of both a globular hemiasterid (*H. (B.) vomer*) and a *Micraster* characterize a deep outer shelf environment. So, *Huttonechinus* was previously found in New Zealand in deposits from a deep environment (Foster & Philip 1978).

Finally, from the biological point of view, and within the limits of the available material, there is no conspicuous marsupiate species or, more precisely, no female specimen with brooding pouches in the previously described Antarctic echinoid fauna of James Ross Island. This paucity of marsupiate taxa can be considered as surprising because most of the Tertiary and Recent marsupiate echinoids have been found in the austral regions (Philip & Foster 1971; Pearse & MacClintock 1990). Moreover, a marsupiate cidaroid and a marsupiate spatangoid have been previously collected in the Maastrichtian and the Eocene of Seymour Island respectively (McKinney et al. 1988; Blake & Zinsmeister 1991). So, the lack of marsupiate species concerns the echinoids of James Ross Island only. Is it this anomaly related to the deepness of the palaeoenvironment, the geographical location, or to the lack of faunal data ?

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