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STRONGYLOCENTROTUS PALLIDUS (G. O. SARS, 1871), AN ADDITION TO THE ECHINODERM FAUNA OF THE SCALDISIAN (PLIOCENE) IN BELGIUM

by

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Geys, Joris F. & Robert Marquet. *Strongylocentrotus pallidus* (G. O. Sars, 1871), an addition to the echinoderm fauna of the Scaldisian (Pliocene) in Belgium. - Meded. Werkgr. Tert. Kwart. Geol., 16 (4): 131 - 138, 1 plate. Rotterdam, December 1979.

The presence of *Strongylocentrotus pallidus* (G. O. Sars, 1871) (Echinoidea, Echinoida, Strongylocentrotidae) in Pliocene deposits in Belgium is reported for the first time. A description of its morphological characteristics is given.

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SAMENVATTING

De aanwezigheid van *Strongylocentrotus pallidus* (G.O. Sars, 1871) wordt voor het eerst in het Plioceen van België vermeld. De soort wordt morfologisch beschreven.

INTRODUCTION

Echinoids from the Scaldisian deposits (Pliocene) in Belgium are not rare, but most of them are known only as fragments or as isolated radioles and plates.

A systematic survey of the Belgian Pliocene echinoids was made by Cotteau (1880). In the past century little atttention was paid to these fossils, probably because of their poor state of preservation, rendering their study strenuous and unattractive.

The recent discovery of a very fine specimen in the Scaldisian at Kallo (municipality Beveren) is therefore not devoid of interest, the more so as it represents a species hitherto unknown from Belgium.

SYSTEMATIC DESCRIPTION

Class Echinoidea Leske, 1778 (nom. correct. d' Orbigny, 1852).
Order Echinoida Claus, 1876.
Family Strongylocentrotidae Gregory, 1900 (nom. emend. Mortensen, 1943).
Genus *Strongylocentrotus* Brandt, 1835 (= *Euryechinus* Verrill, 1866 = *Toxocidaris* Chavan & Cailleux, 1972 ; non *Toxocidaris* Agassiz, 1873 = *Heliocidaris* Agassiz & Desor, 1846 ; non *Strongylocentrotus* Moret, 1966 = *Paracentrotus* Mortensen, 1903).
Type species: *Strongylocentrotus chlorocentrotus* Brandt, 1835 (= *Echinus drøbachiensis* Müller, 1776), by original designation, validated by Opinion 208 of the I.C.Z.N.

Strongylocentrotus pallidus (G.O. Sars, 1873)
Plate 1, Figs. 1 - 6

1873 *Toxopneustes pallidus* Sars, p.25.
1899 *Strongylocentrotus pallidus* - Bidenkap, p. 112.
1906 *Strongylocentrotus droebachiensis* var. *sachalinica* Döderlein, p. 517.
1907 *Strongylocentrotus echinoides* Agassiz & Clark, p. 122.
1912 *Strongylocentrotus sachalinicus* - Clark, p. 353.
1912 *Strongylocentrotus echinoides* - Clark, p. 360, pl. 94, fig. 13 - 16, pl. 113, fig. 1.
1925 *Toxocidaris pallidus* - Lambert & Thiery, p. 255.
1925 *Toxocidaris sachalinica* - Lambert & Thiery, p. 255.
1925 *Toxocidaris echinoides* - Lambert & Thiery, p. 255.
1927 *Strongylocentrotus drøbachiensis* - Mortensen, p. 313 - 314 (pro parte).
1933 *Strongylocentrotus droebachiensis pallida* - Djakanov, p. 57 - 60.
1938 *Strongylocentrotus droebachiensis sachalinica* - Djakanov, p. 470 & 496.
1940 *Strongylocentrotus echinoides* - Ikeda, p. 3, pl. 2, fig. 3.
1943 *Strongylocentrotus drøbachiensis* - Mortensen, p. 219 - 222, pl. 24, fig. 7 - 12, pl. 60, fig. 1, 4 - 7, 14, 15.
1943 *Strongylocentrotus sachalinicus* - Mortensen, p. 215 - 218, pl. 25, fig. 15 - 22, pl. 59, fig. 11, 13 - 24.

1951 *Strongylocentrotus pallidus* - Vasseur, p. 3 - 16.
1952 *Strongylocentrotus pallidus* - Vasseur, p. 87 - 100.
1960 *Strongylocentrotus echinoides* - Utinomi, p. 340 - 341, pl. 38, fig. 7 - 8.
1962 *Strongylocentrotus pallidus* - Swan, p. 1211 - 1222.
1967 *Strongylocentrotus pallidus* - Hagström & Löning, p. 165 - 170.
1974 *Strongylocentrotus pallidus* - Jensen, p. 119 - 125.

Note : The systematic status of *S. pallidus* has been discussed at length by Swan (1962) and by Jensen (1974).
Locus typicus : Lofoten Islands, Norway.
Geographical distribution : circumpolar species occurring in all arctic and subarctic seas. The southern border of its Atlantic area runs from Cape Cod, south of Greenland, Iceland, the Faroe, north of Scotland, the Dogger Bank (Northsea) to the Skagerak. In the Pacific Ocean the species does not occur south of the Columbia River estuary and south of Tokyo Bay, being common in the Bering Sea, the Aleutians, Alaska and Western Canada.
Specimens studied : 1 almost complete corona (coll. R. Marquet, Antwerpen) ; 85 coronal plates and fragments (coll. E. Huysmans, Antwerpen).

All the specimens were collected from the *Pinna pectinata* Bed, Oorderen Sands, Lillo Formation (sensu de Meuter & Laga, 1976), Scaldisian, Pliocene, exposed in the excavation for the construction of a tunnel and a harbour dock, at Kallo, municipality of Beveren, Oost Vlaanderen, Belgium (approximate Lambert coordinates : x = 142.8 ; y = 217.1). A nearby section has been surveyed and described by Gaemers & Janssen (1972).
Dimensions.

ambital diameter	D = 83 mm
height of test	h = 39 mm
diameter of peristome	d = 28 mm
h/D ratio = 0,47	
d/D ratio = 0,34	

Description.

The test is flattened hemispherical in shape, with regularly convex adapical surface. The adoral side is distinctly concave, but the peristome is not really sunken. The ambitus is circular and situated at 1/4 of the height of the test, owing to its strong dorso-ventral asymmetry.

The peristome is moderately large and decagonal. Gill slits are shallow and surrounded by sickle-shaped low ridges. Large, trapezoid auricles are in contact with each other, bridging the perradial suture and leaving an elongate triangular hole. Sharp apophyses complete the perignatic girdle.

The apical system and some of the adjacent coronal plates are missing.

Ambulacral plates are polyporous, compound of complex echinoid type. Two regular series of 23 non perforate, non crenulate primary tubercles are present in each ambulacrum. The bosses are conical and angular at the base, surrounded by a smooth and flat scrobicular areole. The scrobicules are non confluent, but separated by a thin row of small granules, except on the adoral side, where these granules are missing. An irregular zig-zag series of smaller, secundary tubercles is present near the perradial suture. The tubercles alternate on either side of the suture. Very small secundary tubercles may be present adradially, but these can hardly be distinguished from the granules that occupy the extrascrobicular surfaces. Ambulacral pates are mostly 6-geminate, very rarely 5 or 7. The

pore pairs are arranged in oblique, slightly arcuate series of 6 on each plate. This causes the poriferous zones to show a sinuous appearance. The poriferous zones are simple at the ambitus and adapically. They widen conspicuously on the adoral side. Between succeeding pore pairs fine furrows can be seen, which may be relics of the sutures between the original components of the plates. The pores of each pair are separated by a tiny granule.

Interambulacra are almost twice as large as the ambulacra, at the ambitus. Near the peristome however, the ambulacra are slightly larger than the interambulacra. Non perforate, non crenulate primary tubercles occur in series of 18. These tubercles are only slightly larger than the ambulacral ones. Their morphology is similar. Secundary tubercles are present in regular series. At the ambitus these are slighty smaller than the primary tubercles ; adapically and adorally the differences in size are more important. Adradially two series of secundary tubercles exist at the ambitus. The distal one is the first to disappear upwards and downwards. The interradial suture too is accompanied by a row of secundary tubercles in each half interambulacrum. Being arranged in regular vertical series, these tubercles show subhorizontal rows of 4 in each half interambulacrum at the ambitus. The scrobicules are non confluent, except on the adoral side. Extrascrobicular surfaces are densely granulated.

DISCUSSION

Previous records of *Strongylocentrotus* from the Neogene of Europe were doubted by Fell & Pawson (1966). These authors presume them to be misidentifications of *Paracentrotus*. The morphology of the auricles permits, however, to distinguish between both genera (Mortensen, 1943). While older records were almost exclusively based on fragments and poorly preserved specimens, leaving indeed ample space for doubts, the almost perfect specimen discovered by one of us, settles the question.

Since Vasseur (1951) demonstrated that not one , but two species of *Strongylocentrotus* live in the northern Atlantic, the differences between them were described in detail by Swan (1961) and by Jensen (1974). *S. pallidus* and *S. droebachiensis* (Müller, 1776) show morphological, physiological and ecological differences. Unfortunately most of the morphological differences deal with colour, radioles, globiferous and tridentate pedicellariae, and are of little use for identifying fossil denuded tests or fragments.

According to Swan (1962) the number of interambulacral and ambulacral plates in each series is lower in *S. pallidus* than in *S. droebachiensis* for specimens with the same ambital diameter. *S. droebachiensis* with a diameter of 78 mm should have 25 interambulacral and 35 ambulacral plates in each series (Mortensen, 1943). In the Kallo specimen these numbers are respectively 18 and 23.

The average number of pore pairs per plate is smaller in *S. droebachiensis* than in *S. pallidus* (Swan, 1962). Jensen (1974) even describes the ambulacra of *S. droebachiensis* as 5-geminate, these of *S. pallidus* as 6- or 7-geminate. The Kallo specimen is 6-geminate.

For these reasons the specimen found at Kallo is probably a *Strongylocentrotus pallidus.*

S. droebachiensis was previously reported by Engel (1941, 1953) from Pliocene deposits in various drill holes in the Netherlands. His statements being based on fragments, it is almost impossible to assign them to one or other of the above species, without having seen the specimens. *S. pallidus*, being a mud burrower, preferring a sand bottom with shell and gravel, seems to be more likely to occur in the Scaldisian sea than *S. droebachiensis*, which grazes on stones, rocks and

Laminaria weeds (Jensen, 1974).

The same remarks apply to the specimens reported as *S. droebachiensis* by Gregory (1891) from the Coralline Crag in East Anglia (England).

S. pallidus is, in recent seas, mainly a littoral form, though occurring at depths down to 1600 m. Its present distribution is restricted to rather cold waters. This statement is in agreement with the idea of Berggren & van Couvering (1974) who postulate the existence of several cold oscillations of indefinite length and amplitude at the end of the Pliocene. An alternation or perhaps a partial mixture of polar and temperate faunas might have been the result.

A systematic revision of the Strongylocentrotidae, previously mentioned from the Western European Neogene promises to be very instructive. It is no longer justified to reject all these records as mere misidentifications.

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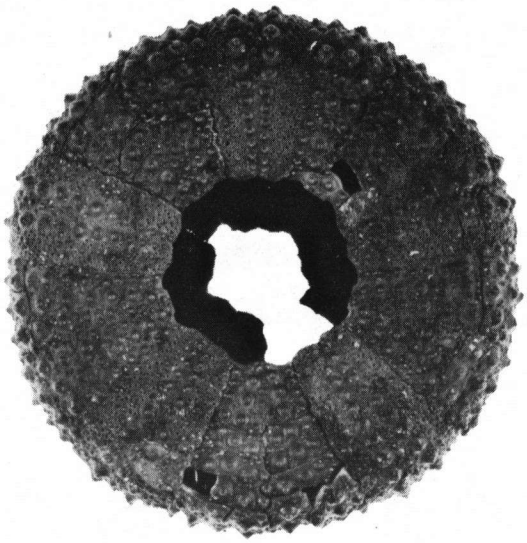
(continued on p. 138)

LEGEND TO THE PLATE

Strongylocentrotus pallidus (G. O. SARS, 1871)
Oorderen Sands, Lillo Formation (Scaldisian, Pliocene) at Kallo (municipality Beveren), Oost Vlaanderen, Belgium. Coll. R. Marquet, Antwerpen.

Fig. 1. Adoral view, x1.
Fig. 2. Adapical view, x1.
Fig. 3. Lateral view, x1.
Fig. 4. Part of an ambulacrum, near the peristome, x3.
Fig. 5. Auricles of the perignatic girdle, x3,5.
Fig. 6. Part of an ambulacrum and half of the adjacent interambulacrum, at the ambitus, x2.



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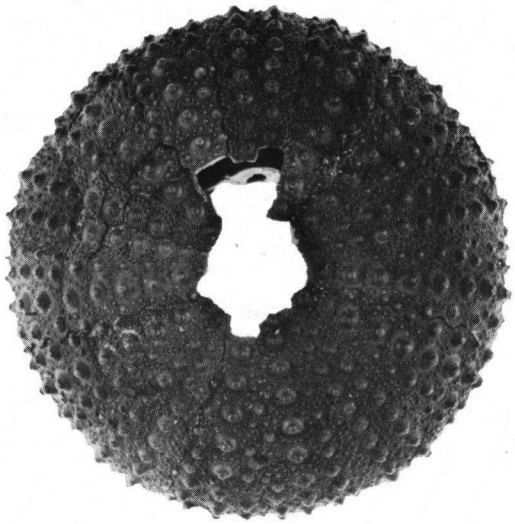

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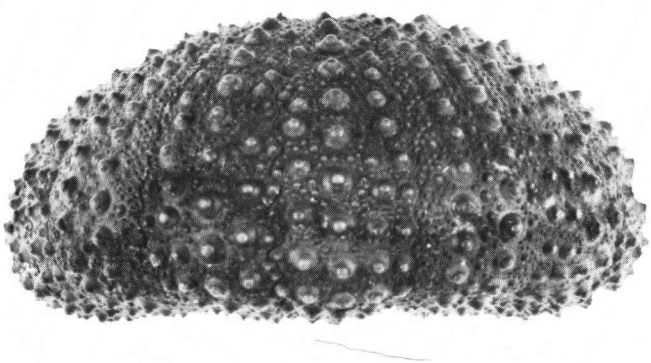

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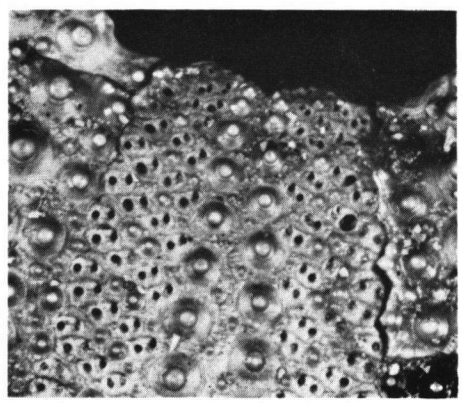

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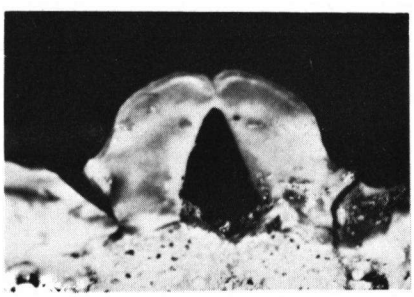

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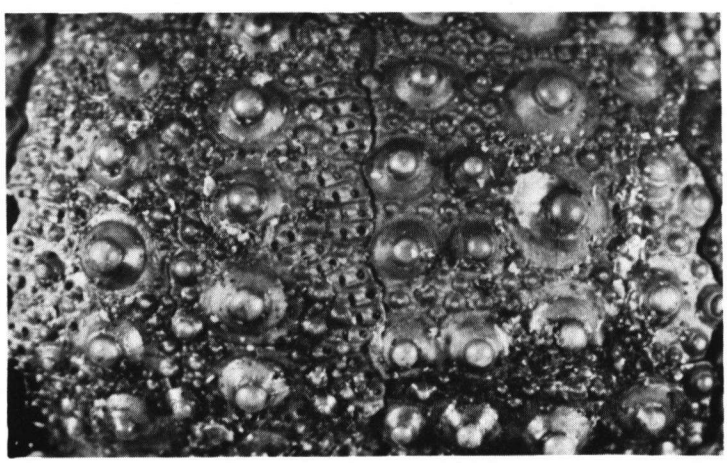

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