

CRETACEOUS CRINOIDEA (COMATULIDA AND ROVEACRINIDA) FROM ENGLAND AND FRANCE

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A collection of small crinoids from the Turonian of South England includes a genus and two species new to science: *Placometra conica* n.sp. (Comatulida) and *Roveacrinoides nudus* n.gen. et n.sp. (Roveacrinida). The juvenile features of *Placometra* and the thecal structure of Roveacrinida are discussed.

A collection of crinoid remains from the Upper Albian of Pas-de-Calais in France is referred to *Glenotremites loveni* (Carpenter, 1880). The material shows several new characteristics to the species.

The collection of crinoids from the Turonian of England

Among material left by R. M. Brydone in the Sedgwick Museum of Cambridge is a collection of fossil remains washed out of the Upper Chalk at his locality 125 "pit at meeting of Barnet Side Lane and Kings Lane, Froxfield Hants" from the "Holaster" *Sternotaxis planus* Zone, Turonian.

Curator A. G. Brighton has carefully picked out all presumed crinoid remains for identification. This collection consists of the following specimens:

- 1 fragment of a serpulid, *Flucticularia* sp. (n. sp.) characterised by 5 high, narrow, uniform, strongly undulating ridges and a smooth surface without growth lines or other ornament between the ridges.
- 1 madreporite of an asteroid (indeterminable).
- 2 vertebral ossicles of an ophiuroid, *Ophiura* cf. *serrata* Roemer, 1840, known from the Cenomanian-Danian.
- 1 basal of *Isocrinus granosus* Valette, 1917, known from the Turonian.
- 1 small centrodorsal (diameter 1.9 mm) of *Glenotremites paradoxus* Goldfuss, 1829, known from the Cenomanian-Santonian.
- 1 small centrodorsal of *Glenotremites?* sp. (indeterminable).
- 2 centrodorsals of *Semiometra courvillensis* (Valette, 1917), known from the Turonian-Santonian.

4 small centrodorsals of *Semiometra* sp. cf. *courvillensis*.

1 small centrodorsal of *Placometra* sp. cf. *laticirra* (Carpenter, 1880), known from the Turonian-Danian.

2 centrodorsals of *Placometra conica* n. sp.

86 thecae of *Roveacrinus communis* Douglas, 1908, known from the Cenomanian-Santonian.

4 isolated brachials of *Roveacrinus* sp. cf. *communis*.

9 thecae of *Roveacrinus alatus* Douglas, 1908 (synonym: *R. carinatus* Nekvasilova & Prokop, 1963), known from the Cenomanian-Coniacian.

35 thecae of *Orthogonocrinus janeti* (Valette, 1917), known from the Turonian-Santonian.

1 theca of *Roveacrinus distinctus* (Peck, 1943) known from the Albian and Cenomanian.

21 thecae of *Roveacrinoides nudus* n. gen. et n. sp.

Placometra conica n. sp.

Figs 2, 3, 7 and 8 (plates 1 and 2)

Type

The centrodorsal figs 2 and 7 is holotype. It is from the Turonian *H. planus* Zone of Froxfield, Hants in England. The specimen is in the collection of the Sedgwick Museum, Cambridge.

Material

The two centrodorsals from the type locality are the only specimens known.

Dimensions of centrodorsal

Holotype: Height 1.9 mm. Radius 1.0 mm. Interradius 0.8 mm. Diameter of centrodorsal cavity 0.4 mm. Paratype: Height 2.2 mm. Radius 1.0 mm. Interradius 0.8 mm. Diameter of centrodorsal cavity 0.4 mm.

Diagnosis

A *Placometra* with a conic centrodorsal with five blunt interrarial ridges and one large cirrus socket on each radial side.

Description of centrodorsal

The centrodorsal is rather high, conical with a five-sided outline and blunt interradiial ridges from apex to the basal plate. In each radial side is seen one large cirrus socket. The socket is elliptical, a little higher than wide and covers most of the width of the radial side and one third to one half of its height. It has a broad rim of radiating crenellae and above the center an axial canal with an articular boss on each side. The rest of the radial surface is smooth and flat or slightly concave in its lower part between the protruding interradiial ridges. The apex although slightly worn is pointed and shows no dorsal star or other indication of the juvenile stem.

The upper surface of the centrodorsal shows the centrodorsal cavity and a narrow interradiial furrow with raised edges, where the rod-shaped basals were placed. No interradiial pit is seen around the dorsal cavity. No trace of vaults growing out to form new cirrus sockets is indicated except in one radial section of the paratype.

The species differs from *P. laticirra* (Carpenter, 1880) by the high, conic form, the interradiial ridges and the single cirrus socket on each side.

The juvenile features of *Placometra*

The small size and the small number of cirri in species of *Placometra* are juvenile features in the comatulids. I have previously (Rasmussen 1961, p. 352) discussed the possibility that species referred to *Placometra* may be juvenile of other species of comatulids, but found no transition forms. In the present specimens the conic form of the centrodorsal and the five radial sides separated by blunt ridges would indicate a possible affinity with *Amphorometra* and specially *A. parva*, which is the only *Amphorometra* known from the Turonian of England. This *Amphorometra* has a centrodorsal of similar size, the height being a little less and the diameter a little greater. However, *A. parva* has 5–8 cirrus sockets on each radial side, forming two rows and the lowermost cirrus sockets have a diameter of ab. 0.3 mm, while in *P. conica* it is 0.6–1.0 mm. The conclusion is, that *P. conica* like other species of *Placometra* is different from juvenile specimens of other comatulids in having fewer and greater cirrus sockets, and no transition forms are known. In spite of the juvenile features they appear to be mature specimens.

Roveacrinoidea n. gen.

Derivation of name

Roveacrinoidea (Greek) similar to *Roveacrinus*.

Type

Roveacrinoides nudus n. sp. is type of the genus and the only species recorded.

Diagnosis

A stemless, pelagic crinoid belonging to the Roveacrinidae. It differs from *Saccocoma* by a small lower swelling of the theca formed by 5 basals surrounding an independent cavity below the radial cavity. It differs from other Roveacrinidae in that the exposed basals are not overgrown by the radials.

Roveacrinoides nudus n. sp.

Figs. 1 and 9–13 (plates 1, 2 and 3)

Derivation of name

Nudus (Latin) naked.

Type

The theca figs. 1, 9 and 10 is holotype. It is from the Turonian *H. planus* Zone of Froxfield, Hants in England. The specimen is in the collection of the Sedgwick Museum, Cambridge.

Material

The 21 thecae from the type locality are the only specimens known. In most of the specimens the apex of theca with most of the basal ring is broken off.

Dimensions of theca

Holotype: Height 1.4 mm. Height of lower (basal) swelling 0.3 mm. Radius at top of theca 1.0 mm. Interradius 0.6 mm. Width of radial articular face 0.6 mm.

Description of theca

The theca consists of 5 radials and 5 basals. The greater part of the theca is formed by the conical or mitriform, thin-walled radial ring surrounding a

great radial cavity. The upper edge has 5 outwards protruding radial lobes with articulation for the brachials, and separated by upwards protruding edges, which form narrower embayments in the outline. The surface shows 5 radial narrow ridges and 5 less distinct interrarial ridges. The protruding lobe below the brachials has a reticulate ornament of ridges. The rest of the surface is almost smooth.

In the mitriform part of the theca, the lowermost part is formed by the five basals, which also form the small lower swelling 0.4 mm in diameter and 0.3 mm high. The sutures between radials and between basals are seen in most specimens and are distinct when one of the plates is brought to reflect the light. This is observed on the outside of the theca as well as in the bottom of the broad radial cavity. In most specimens the lower swelling or most of it is broken away, and it is seen that the swelling surrounds a lower cavity separated from the radial cavity by a thin wall with 5 radial sutures. This wall is thus a part of the five basal plates.

The radial articular face for brachials is directed upwards and slightly outwards. It is almost semicircular with a large, dorsal ligament fossa, a straight articular ridge and small, indistinct interarticular ligament fossae and ventral muscular fossae.

Roveacrinus distinctus (Peck, 1943)

Figs 4 and 14–16 (plates 1 and 3)

1943 *Plotocrinus distinctus*. – Peck: p. 471 pl. 72 fig. 1, 7, 13.

1961 *Roveacrinus distinctus* (Peck). – Rasmussen: p. 369 pl. 54 fig. 8–9.

Diagnosis

A *Roveacrinus* with rather low and broad conical theca with a narrow, prominent, smooth radial flange from the articular face of each radial to the apex of the theca and a less prominent interrarial ridge along the suture. The surface between the ridges has a reticulate ornament. The articular faces are large, outward-sloping, and separated by prominent interradial processes.

Material

This species has previously been known from the Albian of Texas and from the Cenomanian of England. In the collection from the Turonian of Froxfield, Hants, is a single theca of *R. distinctus*.

The Turonian specimen

The present specimen differs from the type in the rounded apex and almost hemispherical form. This is a result of the radial flange not reaching or passing the dorsal pole of theca.

Apparently only radials are seen in the theca, and the sutures can be followed almost to the apex. However, when light is brought to reflexion in the calcite lattice of single radials, it is seen that there is a small apical area, about 0.1 mm in diameter, which is not included in the reflecting radial plate, and presumably consists of a part of the basal ring, which is not completely overgrown by the radial in this specimen.

The structure of theca in Roveacrinidae

The differing interpretations of the thecal structure in Roveacrinidae have previously been discussed (Rasmussen 1961, pp. 360–362). In the species hitherto studied, only radials are seen on the outside of the theca. The basals are seen in a few well preserved specimens to form the delicate wall between the radial cavity and the lower cavity.

In *Roveacrinoides nudus*, however, the basals are seen on the surface of the theca and form the lower swelling surrounding the small lower cavity as well as the separating wall between the radial cavity and the lower cavity. It is possible, therefore, that the basals in other Roveacrinidae form not only the wall between the two cavities, but also the lower part of the theca with the lower swelling, although this part is overgrown and concealed by the radials. This was not visible in the specimens previously studied, but may explain why broken specimens in only rather few cases show an interrarial fracture on the lower part of theca.

In the new specimen of *Roveacrinus distinctus* it seems that the radials have not completely overgrown the basal ring but left a small apical area uncovered.

A careful examination of the 96 thecae of *Roveacrinus* and 35 thecae of *Orthogonocrinus* shows, that in a few specimens of *R. communis*, the radials, although they have overgrown the lower part of theca, do not conceal the basals completely. Where the radials in these specimens are not in complete contact on the lower swelling, a part of the basal is seen in the gap and can be recognized where the edge of the radial is sufficiently distinct, or when either the radial or the basal is brought to reflect the light, see figs 5 and 17–18.

The collection of crinoids from the Albian of France

From the Upper Albian clay of Wissand in the department of Pas-de-Calais, France, Professor J.-P. Jacob found several specimens of a comatulid. The specimens were transmitted by Dr. J. Roman to me for determination and description. The samples consist of clay closely packed with the remains of the crinoid including 5 individuals exposed from the dorsal side and showing the theca with centrodorsal and proximal parts of the arms. Also large parts of the arm branches as well as pinnules, cirri and single brachials are seen. Parts of the samples are indurated or cemented together by secondary calcite, but after repeated washing, freezing and preparation it was possible to pick out several parts of the fossils and study the brachial articulations. The specimens all agree with *Actinometra loveni* Carpenter, 1880, and show several details not exposed in the type. A redescription and a review of the generic determination is therefore needed. There is no indication of more than one species, or of other macrofossils in the sample.

Glenotremites loveni (Carpenter, 1880)

Figs 6 and 19–20 (plates 1 and 4)

1880 *Actinometra Lovéni*. – Carpenter: p. 51, fig.

1924 *Palaeocomaster loveni* (Carpenter). – Gislén: p. 144.

1961 *Palaeocomaster loveni* (Carpenter). – Rasmussen: p. 357 pl. 52 fig. 1.

Type

The specimen described and figured by Carpenter 1880 and refigured by Rasmussen 1961 is holotype. It is from the Albian of Folkestone in Kent, England. Collection of the Sedgwick Museum, Cambridge.

Remarks on the type

The type specimen is partly covered by pyrite, and several characters of importance in the taxonomy of comatulids are unknown in the type. Thus it is not possible to see whether there have been cirrus sockets on the centrodorsal or not. It seems that there was most likely a central depression, presumably a dorsal star.

Material

Only the type specimen has hitherto been known. The material from France contains 5 individuals and numerous fragments. One of the specimens has

been used for serial sections, the other specimens are in the collection of Museum National d'Histoire Naturelle, Institut de Paléontologie, Paris.

Dimensions

The specimens are almost equal in size. The specimen figs 6 and 19 shows the following dimensions: Radius of centrodorsal 2.0 mm. Interradius 2.5 mm. Height 1.0 mm. Radius of dorsal star 0.5 mm. Articular surface of radial for I Br 1 is 3.8 mm wide and about 4 mm high.

Description

The material from France agrees with the type specimen and reveals several details hitherto unknown.

The centrodorsal is pentagonal and very low arched, almost flat, with sloping sides and a central depression with a radial dorsal star surrounded by cirrus sockets. The sockets tend to form 2 radiating rows in each of the five sides. Those near the dorsal star are rudimentary but there are generally about 4 large and deep concave sockets in each radial section with an elevated edge and a marginal rim of radiating crenellae, which are not always distinct. There is a large articular boss on each side of the axial canal. The height of the centrodorsal is about 0.2 of the diameter. The ventral surface of the centrodorsal is not exposed, and the presence of radial pits in the ventral surface of the centrodorsal is therefore not demonstrated.

The thecal plates and brachials are smooth. The rod shaped basals are seen in the section of one of the specimens and are visible on the surface in the interradiation corners between the radials. The radials have a free surface around the edge of the centrodorsal and sloping in continuation of the dorsal surface. There is no radial embayment or ventral area of the centrodorsal uncovered by the radial plate. The articular surface of the radial is high and rather steep with a large, concave dorsal ligament fossa and a deep ligament pit, a straight articular ridge, two concave interarticular ligament fossae and two well developed ventral muscular fossae. There is a narrow radial cavity widening at the top.

I Br 2 is axillary and there are no further axillaries. The primibrachials and first secundibrachial meet laterally and form together with the theca a low bowl. I Br 1-2 and II Br 1-2 are synarthrial. II Br 3-4 and II Br 9-10 are syzygial. Distal parts of arms show in almost all specimens syzygial articulations in every fifth joint. All other articulations are oblique muscular. Pinnules are attached to the abaxial side of II Br 2 and to alternating sides of all succeeding brachials except in hyposyzygials.

The determination of genus

The present species was referred by Carpenter 1880 to the modern genus *Actinometra* Müller, 1841, which is a synonym of *Comatula* Lamarck, 1816. Gislén 1924 referred the species to a new genus, *Palaeocomaster*, the type of which is *Actinometra guirandi* Loriol, 1888.

The reference of the present species to both of these genera is due to the imperfect preservation of the holotype. Characteristic to both genera are the absence of dorsal cirri and of a dorsal star, the absence also along the centrodorsal margin of distinct cirrus sockets with articular ridge, the rudimentary ventral muscular fossae of the radials and the very large radial cavity. None of these features are exposed in the type specimen of *G. loveni*.

The new material here described shows that there is a distinct dorsal star and large cirrus sockets with articular ridge and marginal crenellae. The muscular fossae of the radials are large and the radial cavity is rather narrow. These features and the articulation of I Br 1-2 agree with the diagnosis and the type of *Glenotremites*.

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April 27th, 1970.*

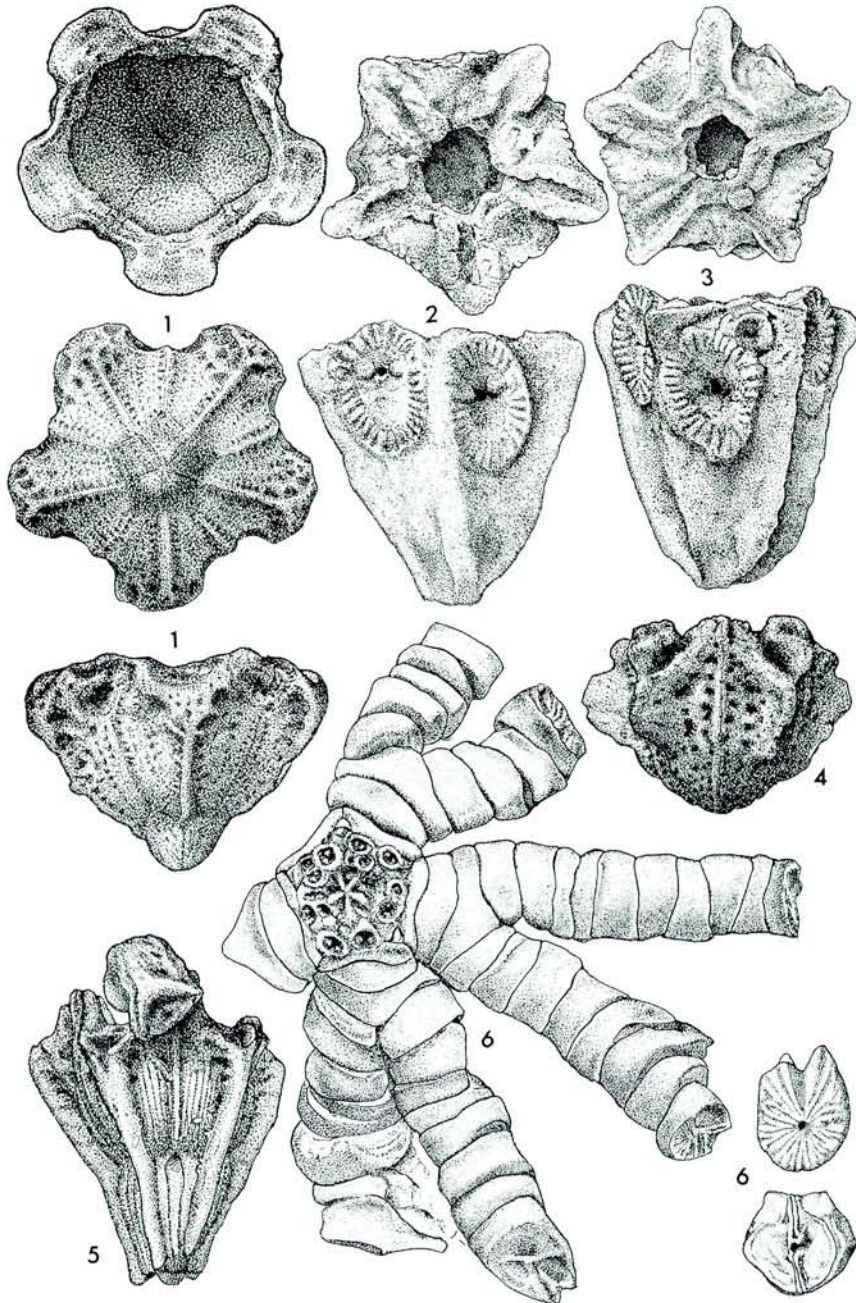
Dansk sammendrag

I et materiale af små søliljer fra Englands Turon er fundet en ny slægt, *Roveacrinoïdes*, og to nye arter, *Placometra conica* og *Roveacrinoïdes nudus*. En sammenligning med andre comatulider støtter den opfattelse, at *Placometra* trods de juvenile karakterer er en selvstændig slægt, og de beskrevne arter er baseret på fuldt udvoksede individer. Roveacrinida er en gruppe af små, pelagiske søliljer, hvis bygning har været omdiskuteret. Bægeret består tilsyneladende kun af fem radialplader. Det er tidligere påvist, at en centrodorsale mangler, men fem basalplader er til stede i en væg, som adskiller bægerets indre fra en hul, nedre opsvulmning. Undersøgelsen af *Roveacrinus* i det ny materiale viser, at basalpladerne ikke kun danner den indvendige skillevej, men hele den nedre del af bægeret, som imidlertid omvokses og skjules af radialpladerne. Dette ses i individer, hvor omvoksningen har været ufuldstændig og i den ny art, *Roveacrinoïdes nudus*, hvor basalerne forbliver blottede.

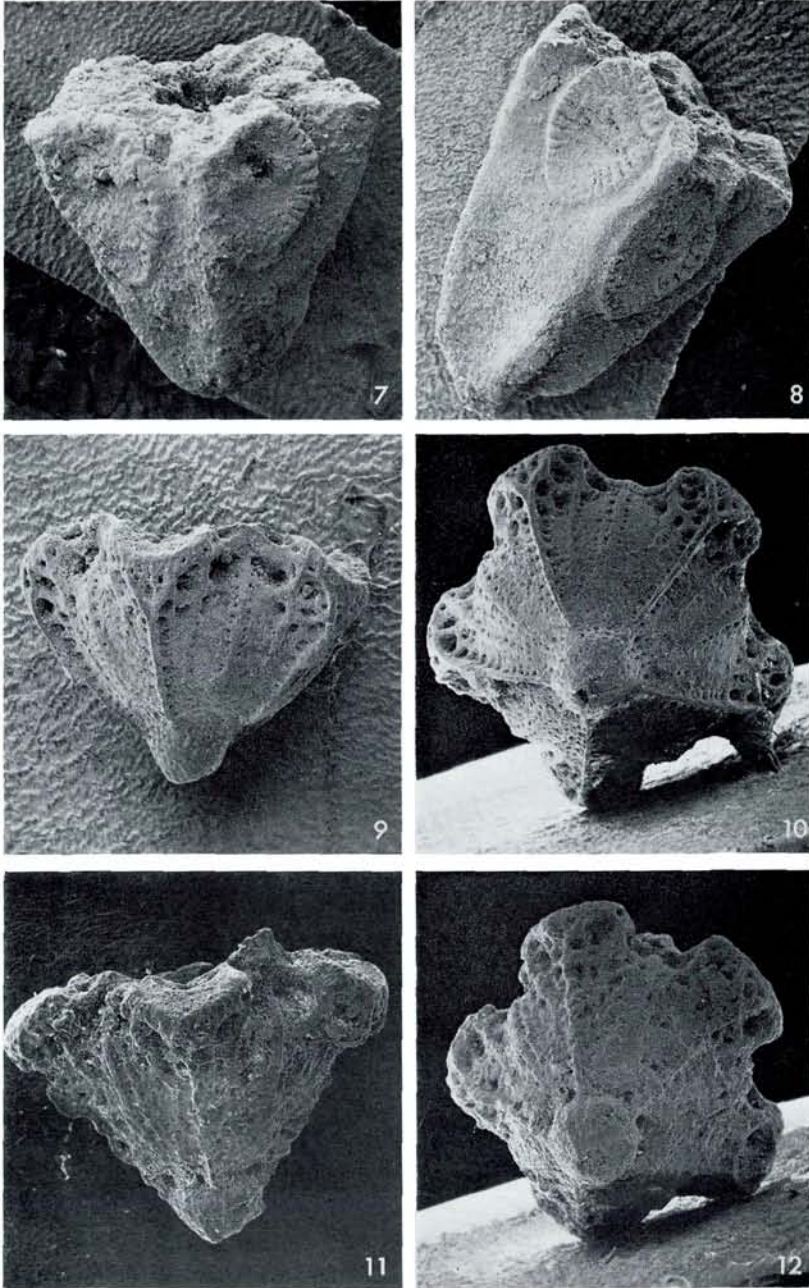
I ler fra øvre Albien i Frankrig er fundet linser af søliljerester med talrige velbevarede skeletdele og ret fuldstændige individer af en comatulid, *Glenotremites loveni*. Denne art har hidtil været henført til *Actinometra* og *Palaeocomaster* på grundlag af en fejltolkning af de vigtigste karakterer i de meget dårligt bevarede eksemplarer fra Albien i England.

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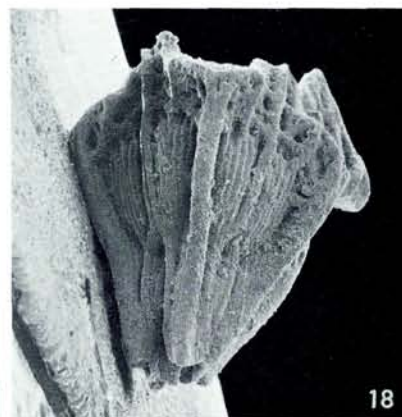
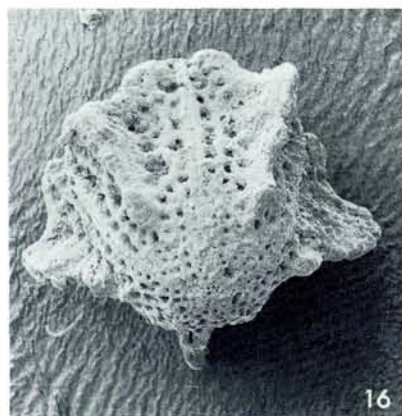
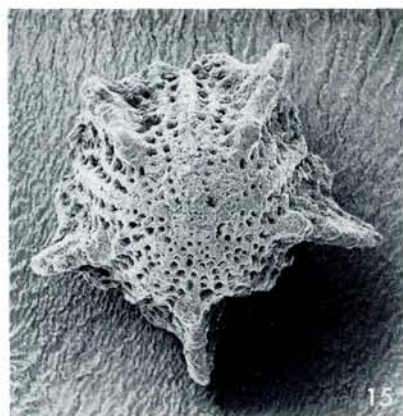
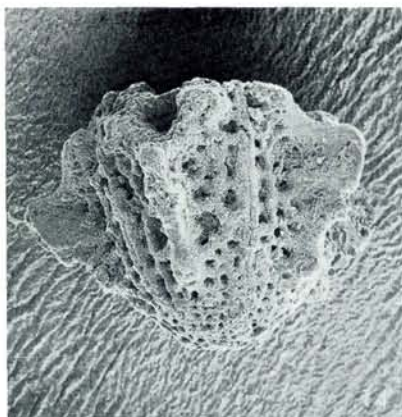
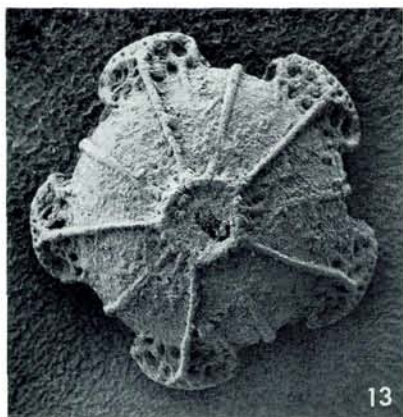


Figs 1-5. Crinoids from the Turonian of Froxfield, Hants. $\times 20$. 1: *Roveacrinoides nudus*, holotype. 2: *Placometra conica*, holotype. 3: *Placometra conica*. 4: *Roveacrinus distinctus*. 5: *Roveacrinus communis* with incompletely covered basals.
Fig. 6. *Glenotremites loveni* from the Upper Albian of Vissand, Pas-de-Calais. $\times 3.2$.



Figs 7-18. Scan electron micrographs of crinoids from the Turonian of Froxfield, Hants. \times abt. 25. Some of the sutures mentioned in the text and shown in the drawings are visible only by reflection of light along the sutures or in the lattice of the single plates and are not seen in the electron micrographs.

7: *Placometra conica*, holotype. 8: *Placometra conica*. 9-10: *Roveacrinoides nudus*,



holotype. 11–12: *Roveacrinoides nudus*. 13: *Roveacrinoides nudus*, most of basal ring broken off but wall between lower and upper swelling almost complete. 14–16: *Roveacrinus distinctus*. 17–18: *Roveacrinus communis*, in the upper part of theca the radials meet in a suture, in the lower part is a gap where the basals are uncovered.



Figs 19-20. *Glenotremites loveni* from the Upper Albian of Vissand, Pas-de-Calais.
× 2.5.