

Campanian-Maastrichtian pelagic crinoids from NE Belgium and SE Netherlands: preliminary observations

by John W.M. JAGT

Abstract

During recent years unexpectedly rich and diverse faunules of diminutive, pelagic crinoids of the order Roveacrinida SIEVERTS-DORECK *in* MOORE, LALICKER & FISCHER, 1952 have been collected from early and late Campanian and late Maastrichtian strata in the Maastrichtian type area (southern Limburg, The Netherlands, and contiguous areas). Most, if not all, of these forms appear to be still undescribed. Occurrences known to date are briefly discussed; a taxonomic study with detailed descriptions of the various species is under way.

Key-words: Crinoidea, Roveacrinida, Campanian-Maastrichtian, NE Belgium, SE Netherlands.

Résumé

Au cours des dernières années, des faunules, d'une richesse et d'une diversité inattendues, de minuscules crinoïdes pélagiques ont été récoltées dans des couches du Campanien Inférieur et Supérieur ainsi que du Maastrichtien Supérieur dans sa région-type (Sud du Limbourg, Pays-Bas et régions contiguës). Ces formes appartiennent à l'ordre des Roveacrinida SIEVERTS-DORECK *in* MOORE, LALICKER & FISCHER, 1952 et la plupart, sinon toutes, n'ont pas encore été décrites. Leur distributions telles qu'elles sont actuellement connues sont brièvement discutées; leur étude taxinomique est en cours.

Mots-clefs: Crinoidea, Roveacrinida, Campanien-Maastrichtien, NE Belgique, SE Pays-Bas.

Introduction

Amongst late Cretaceous crinoids those assigned to the order Roveacrinida are generally found in fairly large numbers at distinct levels in the stratigraphic column (see *e.g.* PECK, 1943, 1955; BERTHOU & BENGTON, 1988; ROBASZYNSKI *et al.*, 1990); yet their classification is still unsatisfactory, and taxa are in need of revision. When compared with Triassic representatives of this order (Somphocrinidae, see KRISTAN-TOLLMANN, 1970, 1977, 1987, 1988) their stratigraphic potential has apparently not been fully realised, although several authors have pointed out this attribute (PECK, 1943, 1948, 1955, 1973; GRIFFITHS, 1989). The disjunct distribution seen in their stratigraphic range (see SIMMS, 1988, fig. 21.2) is the main reason why their derivation

and evolutionary history are still a matter of speculation. SIMMS (1988) considered derivation from the stemless Marsupitidae d'ORBIGNY, 1852 unlikely, but suggested derivation through paedomorphosis from some other group of articulate crinoids and remarked that the three groups currently classed in the Roveacrinida, *viz.* Somphocrinidae PECK *in* RASMUSSEN, 1978, Roveacrinidae PECK, 1943 and Saccocomidae d'ORBIGNY, 1852, might even be less closely related to each other than to other articulates. MILSOM (1989) pointed out that because of the strong brachial musculature seen in roveacrinids these were probably active swimmers, whereas the lack of such strong musculature suggests saccocomids may have been possibly benthic and adapted to living on very soft substrates.

In the literature (*e.g.* RASMUSSEN, 1978; SIMMS, 1988) the Roveacrinida are assumed to have become extinct during the Campanian, with the youngest representative to have been recorded so far being the saccocomid *Applinocrinus cretaceus* (BATHER, 1924). Recent collecting from the early Maastrichtian white chalk of Rügen (northeastern Germany, M. Kutscher Collection), and now also from the late Maastrichtian extends the known range of the Roveacrinida. In the Maastrichtian type area (Fig. 1) roveacrinid and saccocomid faunules have turned out to be fairly common at some levels, and to be of an unexpected diversity. Occurrences known to date are briefly described below; detailed descriptions of the various species are deferred to another occasion (JAGT & VAN BIRGELEN, *in prep.*).

The Campanian-Maastrichtian crinoid faunas of the area are still poorly known, and recent studies include RASMUSSEN's 1961 monograph (see also RASMUSSEN, 1965) and short papers by JAGT (1986, 1990) on holopodids and comatulids, respectively. Material collected from bulk samples taken at various carefully selected spots in (disused) quarries and exposures in the area is copious and includes many species (*c.* 10) which either have not yet been recorded from the area or are new to science.

Pelagic crinoids appear to have been recorded from the area for the first time by CUPEDO (1970) and are also mentioned in an unpublished report by N.M. DE

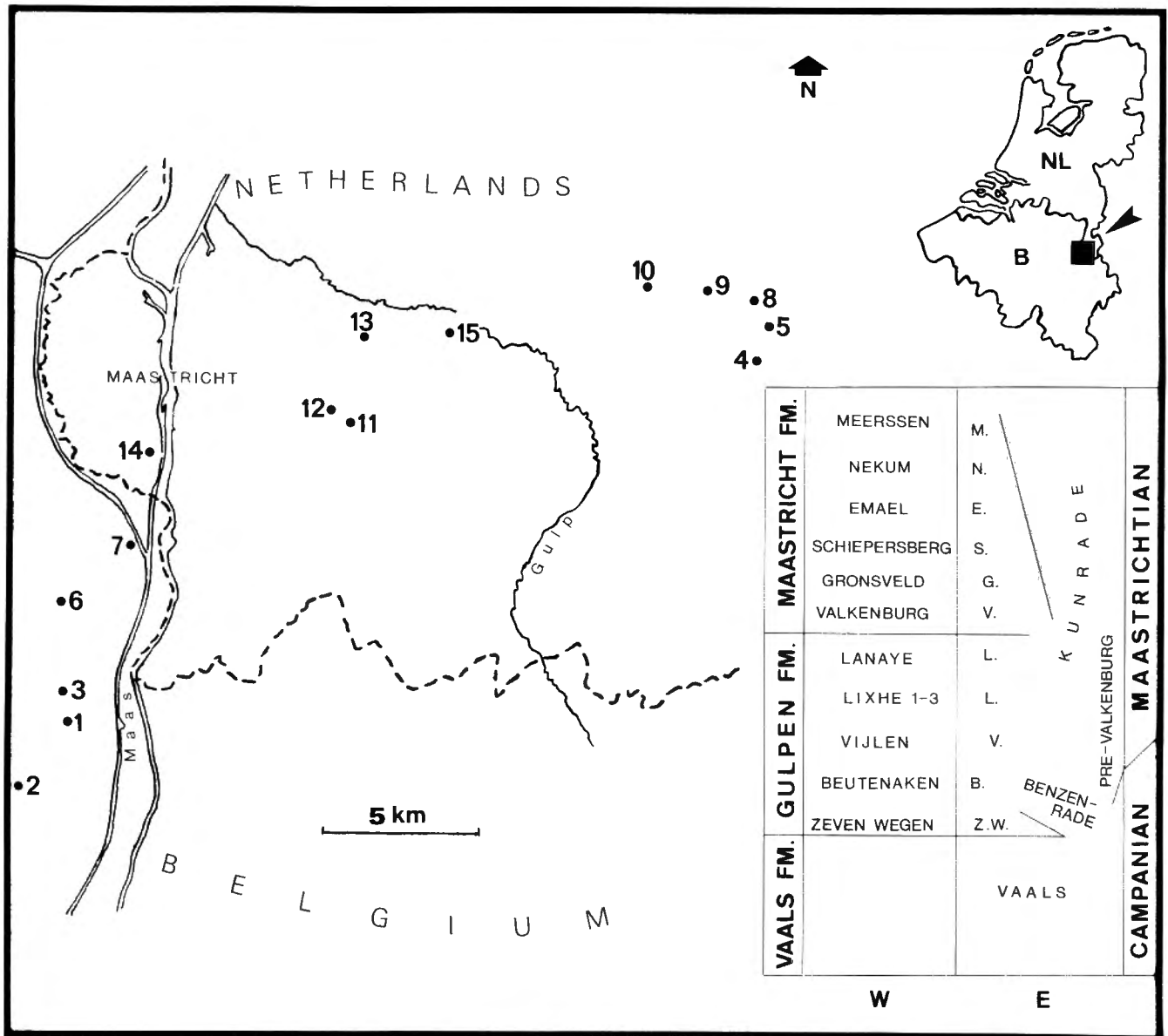


Fig. 1 — Map of the Maastrichtian type area with localities that have yielded pelagic crinoids: 1 - SA CPL quarry, 2 - Heure-Romain quarry, 3 - CBR-Lixhe quarry, 4 - de Wingerd-Ubachsberg, 5 - Benzenrade, 6 - CBR-Romontbos quarry, 7 - Lanaye-Vogelreservaat, 8 - motorway cuttings RW 76, 9 - Kunderberg quarry, 10 - Klimmen-Zevensprong quarry, 11 - Schiepersberg quarry, 12 - Ankersmit Holding BV (Nekami) quarry, 13 - Blom quarry, 14 - ENCI NV quarry, 15 - Thermae 2000 borehole. In addition, local lithostratigraphy (west and east of the River Meuse [Maas]) is indicated.

VOS. Several years ago, saccocomids and roveacrinids were recognised by Dr M. JÄGER in samples collected from the Meerssen Member (Maastricht Formation, late Maastrichtian) as exposed at the ENCI NV quarry, and from the Emael Member (Maastricht Formation) of the Thermae 2000 borehole, respectively. These specimens were entrusted to me for description; they will be included in the study under way (JAGT & VAN BIRGELEN, in prep.).

Comparative material has been described extensively in the literature: saccocomids are especially abundant in

the Jurassic and early Cretaceous (BIESE, 1935-1937; FARINACCI & SIRNA, 1960; GLUCHOWSKI, 1987; HESS, 1972; HOLZER & POLTNIG, 1980; JAEKEL, 1892; JURKOVSEK & KOLAR-JURKOVSEK, 1988; KNAUER, 1966; LEFELD & RADWANSKI, 1960; MANNI & NICOSIA, 1985, 1986; MÜLLER, 1969; NICOSIA & PARISI, 1979; PATRULIUS, 1964; PISERA & DZIK, 1979; TURNER, 1965; VERNIORY, 1955, 1960, 1961, 1962a, 1962b), whereas Roveacrinidae are confined to the early and late Cretaceous (DESTOMBES, 1984; DOUGLAS, 1908; GASSE & WERKMANN-HÜGEL, 1985; NEKVASILOVÁ & PRO-

KOP, 1963; RASMUSSEN, 1961, 1971; SCHMID, 1971; SCHNEIDER, 1988; SCOTT *et al.*, 1977; SIEVERTS, 1933a, b; VALETTE, 1917). Admirably detailed studies on German late Cretaceous Roveacrinidae are those by SCHNEIDER (1987, 1989), who commented on the systematics of the subfamily Roveacrininae and described the ontogeny of one of its members. NEKVASILOVÁ & PROKOP (1964) described late Cretaceous (latest Cenomanian-earliest Turonian) brachials which they referred to saccocomids, while KUTSCHER & HARY (1991) referred a single brachial from the early Lias with a query to the Roveacrinidae.

The genus *Pseudosaccocoma* (see REMEŠ, 1905; BACHMAYER, 1958), which was referred to the Saccocomidae until recently (see RASMUSSEN, 1978), has been removed from this family and referred to Isocrinida by KÄSTLE (1982).

Campanian occurrences

VAALS FORMATION

From the early Campanian Vaals Formation (JAGT, 1989) at the SA Ciments Portland Liégeois quarry (Fig. 1, locality 1) at Haccourt (Liège, NE Belgium) a single roveacrinid secundibrachial (IIBr) comparable with specimens found in the upper part of the overlying Zeven Wegen Member, is available for study. This unit has so far not yielded any other crinoids.

GULPEN FORMATION

Zeven Wegen Member (late Campanian)

A fairly extensive material has recently been collected by processing bulk samples of the late Campanian Zeven Wegen Member as exposed at the SA Ciments Portland Liégeois, Ciments Belges Réunis (CBR-Lixhe) and Heure-le-Romain quarries (Fig. 1, localities 3 and 2, respectively). From this unit numerous isolated brachials of various types of Roveacrinidae are before me, in addition to a specimen from the uppermost 4 metres (Jagt Collection), in which IBr1, IBr2 (axillary), IIBr1/IIBr1-4 are still in contact. Unfortunately, thecae or thecal fragments have not yet been found. Other crinoids from this unit include several species of bourgueticrinids (3 or 4), comatulids (2) and isocrinids (1 or 2).

Pre-Valkenburg strata

Strata in eastern southern Limburg which are in part correlatable with the Zeven Wegen Member, the Benzenrade sandy chalk and Pre-Valkenburg strata (JAGT *et al.*, 1987; FELDER & BLESS, 1989), at Benzenrade and Ubachsberg (de Wingerd; Fig. 1, localities 4 and 5) have yielded quite different crinoid faunules. One of the species (a single rather poorly preserved specimen) encountered is very similar to, if not conspecific with, the saccocomid *Applinocrinus cretaceus* (BATHER) (see BATHER, 1924; RASMUSSEN, 1961, p. 390, pl. 57, figs 9,

10; WRIGHT & SMITH, 1987, p. 211, pl. 45, figs 5, 6). In southeastern England, this species appears to be confined to a distinct horizon within the early Campanian (GASTER, 1932; MORTIMORE, 1983). It is also known from Mississippi, Texas, Florida, Mexico and the West Indies (APPLIN & APPLIN, 1967; PECK, 1953, 1973). Others are typical Roveacrinidae (Fig. 2m) that do not show any resemblance with genera described so far, the thecae of which show well-developed radials with fairly large articular and numerous openings and a star-like base.

This unit has also yielded rare bourgueticrinids, isocrinids and comparatively many comatulids (Conometridae, Pterocomidae, and Notocrinidae, with at least four species).

Maastrichtian occurrences

GULPEN FORMATION

Lanaye Member (late Maastrichtian)

The Lanaye Member (especially between flint beds 20 and 21) at the CBR-Romontbos quarry at Eben-Emael (Bassenge) (Fig. 1, locality 6) has yielded the first complete saccocomids that show their close relationship to *Applinocrinus cretaceus*. These specimens (Fig. 2d-f, j-l) represent a new species which is characterised by a discrete central plate and a well-developed basal cirlet (see Fig. 2c, d, n), the plates of which are larger than those seen in *A. cretaceus* (see JAGT, 1988).

At Lanaye-Vogelreservaat (Fig. 1, locality 7) this unit has also yielded a few Roveacrinidae that are closely related to, if not conspecific with, forms collected from the upper Meerssen Member (see below). Unfortunately, their rather poor preservation (with recrystallisation tending to obliterate surface details) precludes a thorough study of their structure.

MAASTRICHT FORMATION

Valkenburg, Gronsveld and Schiepersberg Members (late Maastrichtian)

Samples taken at the Ankersmit Holding BV quarry (Nekami) at Bemelen and at the disused Schiepersberg quarry nearby (Fig. 1, localities 12 and 11, respectively) for ecostratigraphic purposes by P.J. FELDER and M.J.M. BLESS have yielded small numbers of isolated brachials of pelagic crinoids. This material is apparently conspecific with specimens from the Kunrade Limestone facies.

Emael Member (late Maastrichtian)

From the base of this member numerous saccocomid specimens (*Applinocrinus* n. sp., see above) and two species of Roveacrinidae have been collected at the Ankersmit Holding BV quarry (Nekami). One of these roveacrinids is also known from the middle Maastricht Formation as penetrated in the Thermae 2000 borehole



Fig. 2 — Camera lucida drawings (adoral, aboral, lateral and oblique aboral and oblique adoral views) of several types of roveacrinid and saccocomid crinoids encountered: a-f, j-l, n, o *Applinocrinus* n. sp. [a-c, n, o in Voigt Collection, Meerssen Member, ENCI NV quarry, x 25 and x c 52, respectively; d-f, j-l in Jagt Collection, Lanaye Member, CBR-Romontbos quarry, x 25]; g-i Roveacrinidae n. gen. (?), n. sp., Jagt Collection, Meerssen Member, ENCI NV quarry, x 25; m Roveacrinidae n. gen., n. sp., Jagt Collection, Benzenrade sandy chalk, Benzenrade, x 25. A.W. Janssen del.

(Fig. 1, locality 15) (BLESS *et al.*, 1986; KRINGS *et al.*, 1987).

Meerssen Member (late Maastrichtian)

The upper Meerssen Member as exposed at the ENCI NV quarry, south of Maastricht (stratotype of the Maastrichtian Stage, Fig. 1, locality 14), has yielded a considerable number of thecae (Fig. 2g-i) of the type of roveacrinid illustrated by CUPEDO (1970). Superficially, these thecae are reminiscent of somphocrinid taxa (see KRISTAN-TOLLMANN, 1970, 1977). It has not yet been possible to determine whether the thecae consist of radials only or of a radial and a basal ring.

Saccocomids (*Applinocrinus* n. sp., Fig. 2a-c, n, o) from the base of this unit are also known from the Blom quarry (Fig. 1, locality 13) at Berg en Terblijt, municipality of Valkenburg aan de Geul.

Kunrade Limestone facies (Maastricht Formation)

Samples taken from sections of the Kunrade Limestone along the RW 76 motorway (Fig. 1, locality 8) near Benzenrade (late Maastrichtian, see FELDER & BLESS, 1989), which are correlatable with the Lanaye Member (Gulpen Formation), the section exposed at the former Zevensprong quarry (Craubeek-Klimmen; lower-middle

Maastricht Formation; Fig. 1, locality 10) and that exposed at the Kunderberg (middle Maastricht Formation; Fig. 1, locality 9) have been shown to contain Roveacrinida as well. These specimens are conspecific with the ones that are known from the tuffaceous chalk facies of the Maastricht Formation, with the exception of saccocomids.

As a sequel to the taxonomic study of the above-mentioned Campanian-Maastrichtian roveacrinids and saccocomids from the Maastrichtian type area, a thorough search of samples of all exposures and boreholes in the area for these crinoids will be carried out to test whether events can be recognised in their stratigraphic distribution.

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