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Geo(Im)pulse

An unexpected fossil crinoid from the 'Kor en Bot' trawling trips on the Oosterschelde (Zeeland, the Netherlands)

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Abstract

During the 2007 'Kor en Bot' collecting trip across the Oosterschelde (province of Zeeland, southwest Netherlands), on board trawler cutter ZZ10, a stem fragment of a fossil isocrinid was recognised amongst the contents of the nets pulled on deck. This specimen is here interpreted to be of Early Jurassic age and assignable to the genus *Isocrinus*. However, because only internodals are preserved in this pluricolumnal, specific identification cannot be but approximate (*Isocrinus* (*Chladocrinus*) cf. *tuberculatus*). In the absence of any outcrop of Jurassic deposits in Zeeland and adjacent Dutch and Belgian territory, the most likely explanation is that this crinoid represents erratic material transported by precursors of the present-day River Maas (Meuse). Between the Langres Plateau and Sedan (northeast France), this river cuts through several occurrences of Lower Jurassic strata from which the present isocrinid might have originated. A less likely explanation is that it stems from boulders used for coastal reinforcement or from a Roman limestone votive altarpiece put up at the temple complex for the goddess Nehalennia, formerly present at Colijnsplaat, near Domburg (Noord-Beveland, Zeeland). Transportation from either northwest France or the southern or eastern United Kingdom, where there are coastal exposures of Jurassic strata, via the North Sea, is another option which, however, is also considered less feasible in view of the good state of preservation of the crinoid.

Keywords: Echinodermata, Crinoidea, Isocrinidae, Jurassic, the Netherlands, provenance

Introduction

The annual collecting trips on the Oosterschelde on board trawler cutter ZZ10, organised by the society 'Kor en Bot', invariably yield good finds, especially with regard to skeletal elements of Early Pleistocene fossil mammals (Reumer 2008). During the 2007 trip, the net contents dispersed on deck produced a pluricolumnal of a fossil crinoid, undoubtedly a species of isocrinid. This specimen, contained in the collections of the Natuurhistorisch Museum Rotterdam (abbreviation NMR), is here described, illustrated and briefly compared to material recorded from Jurassic strata elsewhere in Europe. To account for the presence of a Jurassic isocrinid in the Oosterschelde, several explanations can be offered.

Description

There can be no doubt that the fairly stout, dark yellow to beige-coloured stem fragment (inv. no. NMR 9974-0639; Fig. 1) represents an extinct species of isocrinid. It is a pluricolumnal, consisting entirely of internodals; nodals (columnals to which the cirri attached) are not preserved. The greatest length of this weakly curved fragment is 15.2 mm, while the largest diameter of an internodal at either end is 9.2 mm. The specimen comprises nine internodals; it is seen that the first (counting from the imaginary base), the fifth and ninth are slightly taller and wider (Fig. 1A, B). In Webster's (1974) notation this would be: 132313231, i.e. markedly constant. However, because both ends show well-developed symplexial articular facets (Fig. 1C, D), the stalk must have been longer originally. Nodals have a distal

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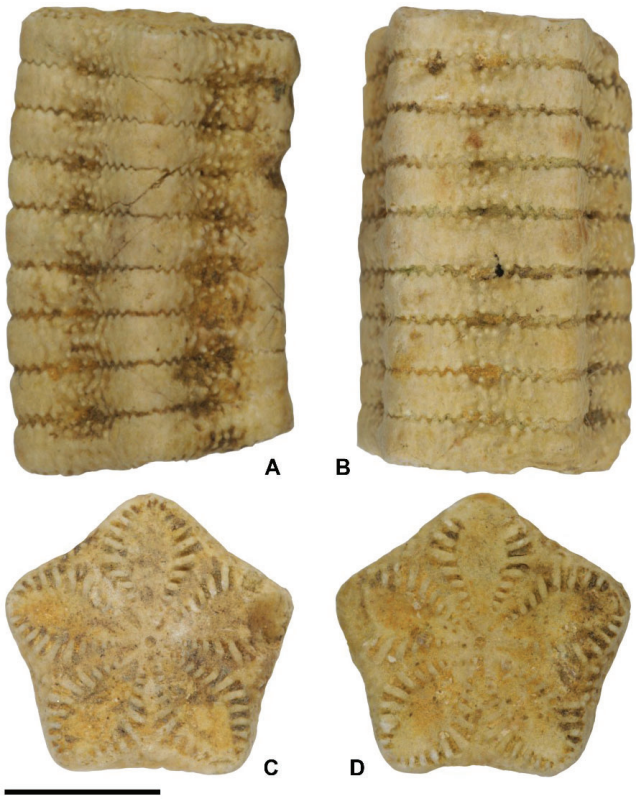

Fig. 1. The 'Kor en Bot' crinoid, Isocrinus *(*Chladocrinus*) cf.* tuberculatus *(Miller, 1821) (NMR 9974-0639); A, B. radial and interradial view, respectively, showing radial pores and lateral granules; C, D. views of both articula, showing fully developed syzygies. Scale bar represents 5 mm.*

articular facet which is developed as a cryptosymplexy, a weak form of a symplexy, which serves as severance point (Fig. 2); such is not preserved in the present specimen. The absence of nodals means that the development of articular facets of cirrals cannot be assessed. Thus an important feature for species identification is lacking.

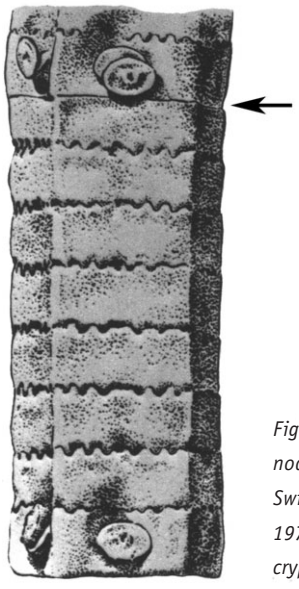

Fig. 2. Example of a typical isocrinid noditaxis from the Middle Jurassic of Switzerland (modified from Rasmussen, 1978, p. T856, fig. 574/1b); arrow denotes cryptosyzygial facet below nodal.

In outline, this stalk portion is clearly pentagonal (weakly pentalobate) (Fig. 1C, D), with rounded interradii and lightly concave radii. Obvious is the ornament of granules (varying in size) which concentrate around radial depressions occurring between adjoining internodals. In some columnals, a few granules are arranged in rows; in lateral aspect, the 'toothed' articulations (symplexies) between successive elements are easily visible (Fig. 1A, B). Radial pores cannot be seen in the depressions.

Seen from above, symplexies are well developed (Fig. 1C, D); around the central, circular canal (lumen) are five lengthened, elliptical areoles: the slightly deepened, petal-like interradial surfaces, closed at their outer rims. The raised elements (crenulae) around the areoles are arranged in a regular fashion and remain separated from adjoining ones. The outermost adradial crenulae are longest; the marginal ones decrease in size interradially. None of the crenulae reaches the central canal. On the areoles there is no trace of minute pores (tubuli).

Taxonomy

First of all, the possibility that NMR 9974-0639 is an extant form can be ruled out entirely. Only a handful of crinoid species is known from the present-day North Sea and all are much smaller and more fragile. In addition to stalked bathycrinids, which occur exclusively in deeper water, feather stars or comatulids, which lack a stalk but can reposition themselves actively, attach by their cirri and even swim to escape predators, have been recorded (Mortensen 1977). Extant isocrinids are unknown from the rather shallow North Sea. Extinct representatives of the order Isocrinida have been described from Upper Cretaceous (Campanian and Maastrichtian) strata of the St Pietersberg area (Maastricht) and environs (southern Limburg and adjacent Belgian territory). However, these comparatively rare and generally smaller species are characterised by different latera and symplectial articular surfaces; bourgueticrinids and comatulids predominate at these levels (Jagt 1999). Erratic flint boulders and nodules of Late Cretaceous and early Paleogene age in the north of the Netherlands also occasionally contain isocrinids (Van der Lijn 1986, pp. 296, 297, fig. 293) of the genera *Nielsenicrinus* Rasmussen, 1961, *Isselicrinus* Rovereto, 1914 and '*Isocrinus*' sensu Rasmussen, 1961. All of these are easily differentiated from the present specimen on details of ornament, articular facet and columnar structure.

Although the absence of nodals in NMR 9974-0639 complicates matters, we have tried to identify this crinoid. The combination of successive columnals, features of symplexy and lateral ornament allows to assign this specimen to the genus *Isocrinus* Agassiz, 1836 and, within that, to the subgenus *Chladocrinus* Agassiz, 1836 (compare Sieverts-Doreck 1971). From northwest, central and eastern Europe a number of species of Early and Middle Jurassic age have been described (Hess 1972, 1975; Jäger 1985; Fischer et al. 1986; Simms 1989; Klikushin 1992; Hunter & Clark 2009a, b; Hunter & Underwood

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2009). Amongst these, there is a pluricolumnal from the Lower Jurassic (Sinemurian, *resupinatum* Subzone; Gloucestershire, UK) and assigned to *Isocrinus tuberculatus* (Miller, 1821), illustrated by Simms (1989, p. 40, pl. 7, fig. 17), which is particularly close to the present specimen. This species was diagnosed by Simms (1989, p. 41) as, '*Isocrinus* with 10-18 columnals per noditaxis and 13-21 secundibrachs. Columnal latera weekly (*sic*) to strongly tuberculate, particularly on radii. Interradii rounded.' *Isocrinus* (*Chladocrinus*) *tuberculatus* has so far been recorded from Dorset, Gloucestershire, Hereford and Worcester and Warwickshire in the United Kingdom, but also from France, Switzerland, northern Italy and southern Germany (see synonymy in Simms, 1989, pp. 40, 41). Simms (1989, fig. 25) showed this species to range from the lower to the lower upper Sinemurian (Lower Jurassic) and to be part of a lineage with the precursor species, *I. psilonoti* (Quenstedt, 1858) and the successor, *I. robustus* (Wright, 1858).

In view of the fact that isocrinids are well known for their wide range of variation, and in the absence of nodals from NMR 9974-0639, identification as *I.* (*C.*) *tuberculatus* is tentative at best. Hence the use of open nomenclature.

Provenance

To account for the find of an Early Jurassic crinoid in the Oosterschelde, three possibilities may be considered, two of which appear more plausible than the third. First of all, transportation via precursors of the present-day River Maas (Meuse) should be considered. Between the Langres Plateau (northeast France) and the French/Belgian border area north of Stenay, and in particular south of Charleville-Mézières, the River Maas cuts into deposits of the appropriate age (Fig. 3; compare Bosch, 1992, pp. 62, 63, fig. 1; Pieńkowski et al., 2008). However, to date mostly ammonites, bivalves, brachiopods and scleractinian corals of Middle and Late Jurassic age have been recorded from the sedimentation area of the precursors of that river (see e.g. Van der Lijn, 1986; Bosch, 1992). The sole crinoids to have been described so far from such fluvial erratics are millericrinids, mostly of Late Jurassic age (Van der Lijn, 1986, p. 296, fig. 292), although this group ranges throughout the Jurassic (Rasmussen, 1978).

Secondly, the specimen may have eroded out of a boulder used for coastal reinforcement, or out of a votive altarpiece put up at the temple complex dedicated to the goddess Nehalennia (Bogaers & Gysseling, 1971; Van Es, 1972; Pörtner & Tadema Sporry, 1975). Rock material used for coastal reinforcement mostly comprises much older (i.e., Devonian or Carboniferous) greyish black limestones, either from Ireland or Belgium (personal observations). These are extremely resistant to weathering. For this reason alone this seems an unlikely source for our crinoid.

A temple was present at Colijnsplaat, on the island of Noord-Beveland, during Roman times and its remains are often found by trawling in the Oosterschelde. Although most of these

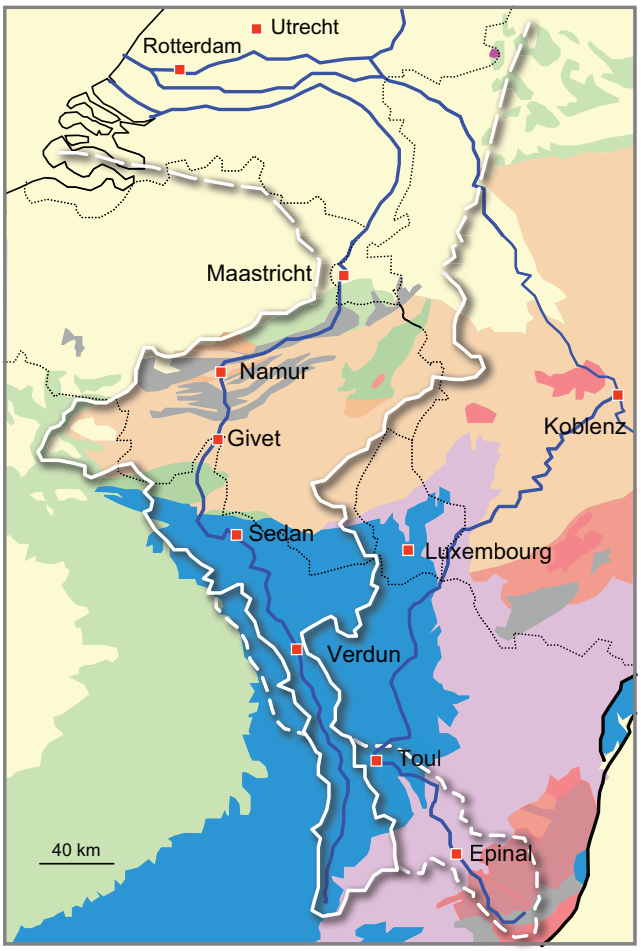

Fig. 3. Present-day course of the River Maas and its former sedimentation area, with indication of Lower Jurassic strata (in blue) cut between the Langres Plateau (northeast France) and the North Sea (modified after Bosch, 1992, fig. 1 and unpublished data).

Roman altarpieces reportedly were made of sandstone, there are records of limestone ones. For instance, Klok (1977, pp. 178, 179) illustrated an example erected by a salt merchant from Colonia Claudia Ara Agrippinensium, the present-day Cologne (Köln, Germany). In the absence of any Jurassic strata in Zeeland and adjacent Dutch and Belgian territory, such altarpieces must have been produced elsewhere (France, Germany) and subsequently transported to Zeeland. Since 1647, the beach at Domburg has been producing such remains where in former days the Schelde (Scheldt) estuary used to be. However, with the exception of some small outliers, there are no Jurassic deposits in the sedimentation area of that river (see Pieńkowski et al., 2008), although some other Belgian river (Westerhoff, 2009, pp. 136, 137, fig. 6.9) may have transported Jurassic material from the southern Ardennes and Belgian Luxembourg northwards into the sedimentation area of the Rhine-Maas river complex (see also Westerhoff et al., 2008).

The third option which needs to be considered is transportation across the North Sea. In southern and eastern England strata of Jurassic age are widely distributed (Simms, 1989; see

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also Hunter & Underwood, 2009), and even from further afield (e.g., Scotland) Early and Middle Jurassic isocrinids have been recorded (Hunter & Clark, 2009a, b). Although the stereom lattice of NMR 9974-0639 is entirely filled in (as seen at one end which is chipped), preservation of tuberculation on the latera and of the symplectial columnal facets is such that long-term transportation can be ruled out unless the specimen was originally encased in matrix, now eroded away. There may have been some leaching during transport; the outer surface is semi-glossy to dull.

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