



## Clustered bourgueticrinid crinoid holdfasts on late Maastrichtian echinoids from northeast Belgium and southeast Netherlands\*

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### Abstract

In general, holdfasts (including distalmost stalk plates) of bourgueticrinid crinoids (Comatulidina, Bourgueticrinina) are comparatively rare in Maastrichtian (Upper Cretaceous) strata in the extended type area (northeast Belgium, southeast Netherlands). Here we describe a number of examples of such holdfasts. Two of these are of note in comprising up to two dozen specimens in different size classes, with a predominance of juveniles, in close proximity to larger, ‘fully grown’ individuals. All specimens are of late Maastrichtian age and are found on tests of holasteroid echinoids of the genus *Echinocorys* Leske. The majority stem from the Lixhe 1 and 3 members (Gulpen Formation) at the former CPL SA quarry (Haccourt, Liège, Belgium), and at a disused quarry between Houtain-Saint-Siméon and Roclange-sur-Geer (Liège). A single example is from the underlying Vijlen Member (Gulpen Formation) at the ENCI-Heidelberg Cement Group quarry (Maastricht). The clustering of juvenile and ‘fully grown’ holdfasts on two tests suggests at least three different spat falls. Settlement of crinoid larvae close to the tallest point of the test would have been conducive to further development, but the close proximity may also have had a detrimental effect on feeding, by interference from neighbours. Current action or probing by a predator or scavenger appears to have tumbled the echinoid tests, leading to the premature death of the recently settled crinoids by smothering.

**Key words:** Crinoidea, Bourgueticrinina, holdfasts, Cretaceous, Belgium, the Netherlands

### Introduction

Amongst articulate crinoids, bourgueticrinids predominate at many levels within the Campanian-Maastrichtian of the extended type area of the Maastrichtian Stage (Jagt 1999b). Usually, these have radix-type attachment, which at times can be highly intricate and extensive (see *e.g.*, Brünnich Nielsen 1913: Pl. 1, Fig. 15; Rasmussen 1961: Pl. 60, Fig. 2; Klikushin 1982: Fig. 1G–I; Jagt *et al.* 1998: Pls 1–2, 7); attachment by holdfasts, or terminal discs, is comparatively rare. In extant taxa, the distal stalk is attached either by ‘roots’ penetrating soft sediment (see *e.g.*, Clark 1977: Fig. 3; Roux 1977: Pl. 2, Fig. 5; Donovan 1997: Pl. 10, Figs. 1–3, 7; Mironov 2000: Fig. 4; Mironov & Pawson 2010: Fig. 5), or by encrusting discs on hard substrates (Clark 1973: Fig. 6; 1977: Fig. 2; Roux 1977: Pl. 2, Fig. 5; Donovan & Pawson 1994: Figs. 2, 4; Messing 2007: Fig. 5). The two types of attachment are occasionally found in the same genus, such as in *Democrinus* (Clark 1977). Until recently, only a