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Original article

A bryozoan fauna from the Mississippian (Tournaisian and Viséan) of Belgium☆

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ABSTRACT

Eleven bryozoan species are described from the Mississippian of southern Belgium, including one new species, *Atactotoechus vaulxensis*, and one species left in open nomenclature (*Stenophragmidium* sp.). From this fauna, four species are restricted to the Tournaisian stage, and seven occur in the Viséan. The fauna is mainly small-sized, represented by branched ramose, encrusting and reticulate growth forms. Bryozoans in the Mississippian of southern Belgium preferred deeper, clay-rich environments. The identified bryozoan species are mainly distributed within the European basin, with some similarities with the Mississippian faunas of Siberia and Kazakhstan.

1. Introduction

The Early Carboniferous was a time of intensive diversification in marine biotas after the Late Devonian turnover (Ross, 1981; Ernst, 2013). Abundant and diverse Mississippian bryozoan assemblages are known from various parts of the world (Tolokonnikova et al., 2014); however, the distribution of these faunas remains not well understood.

Southern Belgium represents the historical type area of the Tournaisian and Viséan stages (Hance et al., 2006a, 2006b; Poty et al., 2014), where marine Mississippian deposits (mainly limestones) are extensively developed and contain abundant and diverse fossils (e.g., Demanet, 1958). Mississippian bryozoans including some fenestrate and cryptostome species have been known from Belgium for a long time (d'Everlange-Witry, 1780; de Koninck 1842–1844; Delépine, 1928; Demanet, 1938; Kaisin, 1942). However, these early unrevised reports are very simplistic and contain limited information about the content of the bryozoan assemblages of southern Belgium. Analysis of facies with bryozoans from Waulsortian buildups of Tournaisian age in southern Belgium was carried out by Lees (1988, 2006) and Wyse Jackson (2006), while McKinney et al. (1987) examined the role of fenestrate bryozoans as sediment bafflers in these buildups. Their abundance in some small reefs of the Lives Fm. (Viséan) was mentioned by Lauwers (1992) and Chevalier and Aretz (2005). Recent taxonomic descriptions of Tournaisian bryozoans from the Namur-Dinant basin were given by Tolokonnikova et al. (2015a).

The present paper provides a taxonomic description of bryozoan assemblages occurring within several Tournaisian (Ivorian) to Viséan (Warnantian) formations from southern Belgium (Namur–Dinant Basin). These assemblages are compared with contemporaneous faunas from different parts of the world.

2. Geological setting and material

Tournaisian–Viséan rocks are exposed extensively in southern Belgium on both sides of the Midi-Eifel fault zone, in the Brabant Parautochton, the Haine-Sambre-Meuse Overturned Thrust sheets and the Dinant Synclinorium (Hance et al., 1999; Belanger et al., 2012) (Fig. 1). These Variscan structural elements constitute the Namur–Dinant Basin that developed along the southeastern margin of Laurussia during Devonian and Mississippian times. The Tournaisian–Viséan lithostratigraphy of southern Belgium was summarized by Poty et al. (2002); several sedimentation areas (see below) were recognized in the Namur–Dinant Basin by Poty (1997, 2016) and Hance et al. (2001). During the late Viséan, the

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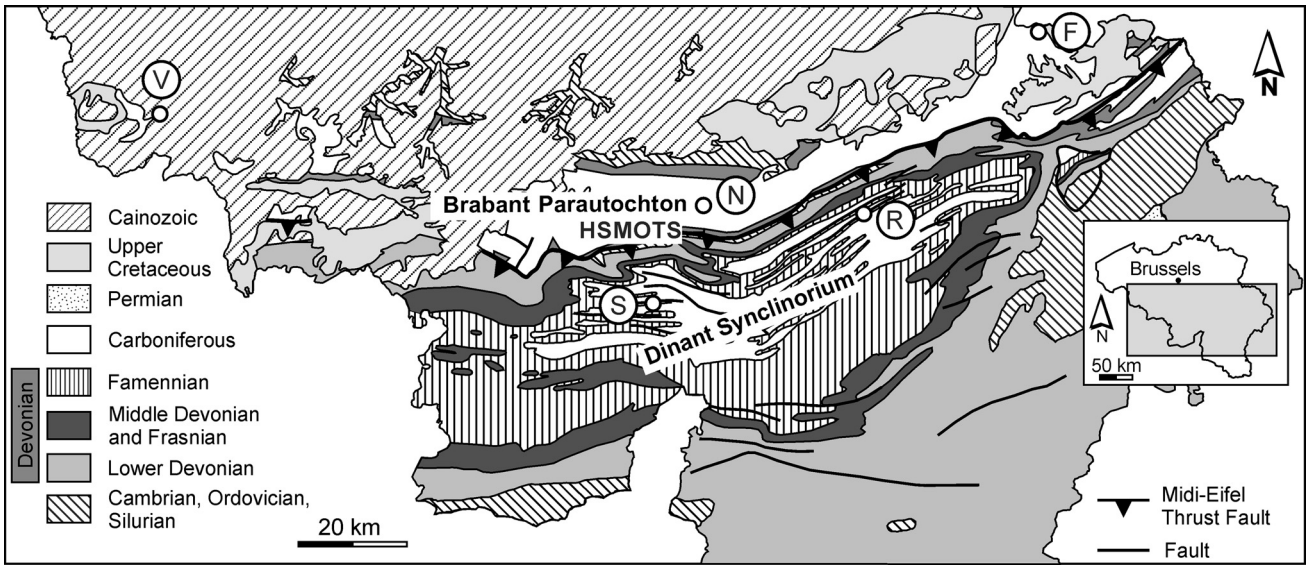

Fig. 1. Schematic geological map of southern Belgium (modified from de Béthune, 1954; see also Belanger et al., 2012). Abbreviations for the localities and structural units listed in the text: F: Fouron-le-Comte ('s Gravensvoeren); HSMOTS: Haine-Sambre-Meuse Overturned Thrust Sheets; N: Namur (Bomel); S: Salet; R: Royseux; V: Vaulx.

Visé–Maastricht sedimentation area was not connected to the Namur–Dinant Basin, but to a graben opened to the Campine Basin (Poty et al., 2002). Furthermore, this particular area yields faunal assemblages (e.g., rugose corals) that are different from coeval ones within the Namur–Dinant Basin (e.g., Poty, 1981; Poty and Delculée, 2011).

The studied material is deposited at the Department of Geology of the University of Liège (prefix: ULg). It was collected from localities situated in the Condroz sedimentation area (Royseux), the Dinant sedimentation area (Salet), the Hainaut sedimentation area (Gaurain-Ramecroix), the Namur sedimentation area (Bomel), and the Visé–Maastricht sedimentation area (Fouron-le-Comte ['s Gravensvoeren]) (Figs. 1, 2). A part of the studied material (Salet) was collected by two of us (A.E. and Z.T.) in 2013, complemented by E.P.'s collections of lithological and coral thin sections.

The Royseux locality (N50°27.460, E05°16.422) is located in the Dinant Synclinorium (Fig. 1). Here the Chabôfosse facies (Poty in Poty et al., 2002) of the Anhée Fm. (Warnantian) is exposed (Fig. 2), with highly fossiliferous limestones including coral biostromes (see Denayer et al., 2016 for an assessment of the diversity of this locality). Detailed descriptions of the Royseux trenches are notably given by Poty et al. (1988), Aretz (2001) and Denayer et al. (2016). Sixteen thin sections have been investigated from this profile.

At Salet (Dinant Synclinorium), the Debras (= Tanret-Debras) quarry (N50°18.401, E04°49.611; Fig. 1) mainly exposes the Molignée Fm. (Moliniacian, formerly known as the 'black marble' of Denée; Fig. 2), which has yielded an exceptionally preserved Mississippian fossil assemblage (fishes, dendroid graptolites, giant echinoids; Mottequin, 2008; Mottequin et al., 2015). The Molignée Fm. consists of a succession of thin-bedded, commonly laminated black limestones (the typical 'black marble' facies) which alternate with thick-bedded, dark-grey limestones ('thick beds') (Hance, 1988; Mottequin, 2004). The bryozoans were collected in thick beds corresponding to the bed 27 of Mottequin (2004).

Material from the Tournai area (Vaulx; Fig. 1) was collected at the Le Milieu quarry (N50°35.082, E03°27.565; 23 thin sections studied) within the Providence Mb. (Tournai Fm., Ivorian; Fig. 2), including dark grey to black, argillo-siliceous crinoidal limestones (for more details on the Tournai Fm., see Poty et al., 2002).

The disused Bomel quarry (N50°28.316, E04°52.013), situated in the suburbs of Namur, exposes well-bedded, dark limestones of the Corphalie Mb. of the Lives Fm. (Livian; Fig. 2) that include small microbe–fenestellid bryozoan reefs (Lauwers, 1992; Chevalier and Aretz, 2005; Aretz and Chevalier, 2007).

The Fouron-le-Comte ('s Gravensvoeren) borehole (Belgian Geological Survey 108W-359) belongs to the Maastricht block system (Poty, 1991; Poty and Delculée, 2011) and was notably described by Muchez (1988) and Laenen (2003). The studied material is from the Viséan Berneau Fm., between 303 and 561 m depth (4 thin sections were prepared; see log 4 in Laenen, 2003;Fig. 2) that mainly includes thin to thick-bedded, dark limestones corresponding to slope and relatively deep-water deposits; this lithostratigraphic unit passes laterally to deep-water dark calcareous shales, silicified shales and limestones (Poty in Poty et al., 2002; Poty and Delculée, 2011). In terms of rugose coral biostratigraphy (RC; Poty et al., 2006), the sample 303 m belongs to the upper RC7α–RC7β zones (lower Warnantian), whereas those collected between 550 and 600 m belong to the lower RC7α Zone (lower Warnantian).

3. Systematic palaeontology

Bryozoans were studied in thin sections using a binocular microscope. A total of 45 thin sections were studied. Morphological character terminology is partly adopted from Anstey and Perry (1970) for trepostomes, from Hageman (1991) for fenestrates, and from Hageman (1993) for cryptostomes. The spacing of structures is measured as the distance between their centres. Statistics were summarized using number of measurements (N), arithmetic mean (X), sample standard deviation (SD), coefficient of variation (CV), and minimum (MIN) and maximum (MAX) values.

Phylum Bryozoa Ehrenberg, 1831
Class Stenolaemata Borg, 1926
Superorder Palaeostomata Ma et al., 2014
Order Cystoporata Astrova, 1964
Suborder Fistuliporina Astrova, 1964
Family Fistuliporidae Ulrich, 1882
Genus ***Fistulipora*** M'Coy, 1849

Type species: *Fistulipora minor* M'Coy, 1849. Carboniferous; England.

Occurrence: Ordovician to Permian; worldwide.