

# National Commission for Stratigraphy Belgium

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## 2.3.2 Abbaye de Villers Formation - ADV

### Lower Paleozoic

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**Version:** revised october 2011, A. Herbosch and J. Verniers

**Authors:** named after the Abbaye de Villers situated to the north of the town of Villers-la-Ville in the Thyle valley. After Anthoine & Anthoine (1943): « Quartzophyllade siliceux de Villers » Ar3 de l'Assise de Villers-la-Ville.

**Description:** Grey or dark grey fine-grained sandstone to mudstone, with an irregular, lenticular cm-scale lamination. Characteristically, the fine-grained sandstone laminae have rather diffuse limits. Frequent and abundant bioturbation, more frequent along bedding planes, disturbing or even rubbing out the laminar structure. Oblique stratification occurs in plurimetric scale sets, some have been interpreted as large-scale bedforms (megaripple and sandwaves; Herbosch and Verniers, 2002 fig. 17) and others as synsedimentary slumps on which tectonic fold where surimposed (Beckers and Debacker, 2006). These structures have been studied in detail in the Sennette valley (Debacker et al., 2003) and also in the particularly demonstrative outcrops near Quenast, Senne valley (Debacker and De Meester, 2009). They conclude that in most cases these folds are pre-cleavage and can be interpreted as slump folds, with a southwards oriented slump direction. This interpretation implies that during the late Early to Middle Ordovician (Chevlipont to Tribotte formations) a regionally persistent S-dipping palaeoslope existed in the southern part of the Brabant Massif.

**Problematic outcrop:** In the Sennette valley just south of the Asquemont fault an unnamed member is present with decimetric grey quartzitic sandstone beds, often showing low amplitude convolute lamination, alternating with dark to medium grey siltstone and slate beds, interpreted as quite distal turbidites of the Bouma-type. The lower or upper contacts are by faults and however not observable. This unnamed member is interpreted (Verniers, unpublished) on the basis of the acritarch and the chitinozoan biozonations as either a lateral facies of the upper part of the Abbaye de Villers Formation or as a unit in between the Abbaye de Villers and the Tribotte formations. This interpretation is difficult to admit on sedimentological ground and moreover this unit looks much like the turbidite of the Ittre Formation (Herbosch, unpublished).

**Geomorphology:** This formation is more resistant to alteration and erosion than other Ordovician formations: where ever a valley incised through this unit, the valley becomes narrow to form a kind of cluse. This is particularly visible in the Senne valley at about 750 m east of Quenast, also in the Coeurq valley where a waterfall of 4 m high is present at the old Coeurq mill, or in Ways (Genappe) in the Dyle valley and also in the type locality.

**Interpretation:** The contact with the underlying Chevlipont Formation was nowhere observed, but it marks a very distinct sedimentological break from a deep marine environment (continental slope) in the Chevlipont Formation to a shelf environment in the Abbaye de Villers. This break correspond to a stratigraphic hiatus of about 15 Ma (see under) and is interpreted as the result of an uplift possibly co-occurring with volcanism corresponding to the drifting of Avalonia away from Gondwana (Cocks and Fortey, 2009).

**Stratotype:** Thyle valley just north of the old Abbey of Villers, in the trench of the railway from Km 38.7 (50°35'35.28" N/ 4°31'52.83" E) to 39.0 (50°35'22.77" N/ 4°31'52.46" E) and/or also along the road Abbaye de Villers to La Roche (21 discontinuous outcrops have been studied in detail by Debacker and Beckers, 2006 fig. 2), from: 50°35'35.28" N/ 4°31'52.83" E to 50°35'28.35" N/4°31'36.98" E (old quarry at the rear of the Café de la Forêt).

**Area:** Outcrop area of the Brabant Massif: in the Senne basin (Senne, Coeurq and Sennette valley) and in the Dyle basin (Dyle and Thyle valley) and the unnamed member in Sennette valley (Asquemont).

**Thickness:** Between 130 and 180 m. More than 130 m in the section along the road Abbaye de Villers to La Roche (Beckers, 2004). >25 m for the unnamed member.

**Age:** No macrofossils were found in the formation. Chitinozoans from the middle part of the formation in the Thyle valley contain *Eremochitina brevis* (Samuelsson & Verniers, 2000), a N. Gondwana assemblage belonging to the upper Floian (Ogg et al., 2008, fig. 5.4). The species found in the upper part are less significative but suggest a Dapingian to early Darrivilian (mid arenig to early Llanvirn) age. It is, however, known that the latter unit cannot be dated precisely, due to its shelf facies.

A renewed study of the acritarchs on old and new samples by Vanguetaine & Wauthoz (2011) show a relatively homogeneous assemblage of species corresponding to the *Frankea hamata* – *Striatotheca rarirrugulata* Acritarch Zone of the English Lake District (Cooper et al. 2004) dated as early Darrivilian (late Fennian) and corresponding to

the *Aulograptus cucullus* graptolite zones (Ogg et al., 2008, fig. 5.4). According to the acritarchs, the middle part of the Abbaye de Villers Fm. is placed quite higher than according to the chitinozoans. Combining both acritarch and chitinozoan evidences and taking into account recent correlation schemas of graptolite biozonations (Ogg et al., op. cit.) a latest Dapingian to early Darriwillian age (c. 469-467 Ma) is indicated for the formation.

An important time gap, of about 15 my, is thus proven to be present between the Chevlipont and the Abbaye de Villers formations. This gap is more important than previously thought (Verniers et al., 2002). In the Wépion borehole (Graulich, 1961; Vanmeirhaeghe, 2006; Owen and Servais, 2007) the time gap between the Chevlipont and Huy formations is slightly more important (from lowest Tremadocian to mid Darriwillian, c. 20 my) and show a 5 cm basal conglomerate.

In the unnamed member also no macrofossils are found. The acritarch assemblage is similar to the one in the Abbaye de Villers Formation and indicates a Dapingian to Darriwillian age (Arenig-Llanvirn) (Vanguetaine, 1978). The chitinozoans contain *Desmochitina ornensis* and *Conochitina pseudocarinata*, an assemblage occurring in Brittany above the Grès Armoricaïn Formation (Paris, 1981) indicating a Dapingian (mid Arenig) age (Samuelsson & Verniers, 2000).

**Remarks:** Synonyms: Dyle-Thyle valleys: "Assise de Villers-la-Ville" (Malaise, 1911); "quartzophyllades siliceux de Villers" (Anthoine & Anthoine, 1943); "couches de l'Abbaye" (Michot, 1978); Abbaye de Villers-la-Ville Formation (André et al., 1991; Servais et al., 1993). Senne valley: part of the "quartzophyllades zonaires de Quenast" (Beugnies in Waterlot et al., 1973); lower part of the Quenast Formation (André et al., 1991; Servais et al., 1993). Synonyms of the unnamed mbr: Rv2, formation des phyllades et des quartzites noirs" (Beugnies in Waterlot et al., 1973), "Grès noirs zonaires, quartzophyllades et phyllades noirs (Vanguetaine, 1978), unnamed (Asquemont) unit (Samuelsson & Verniers, 2000).