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Original article

Silurian radiolarians from the Jenolan Caves region, New South Wales, Australia

Radiolaires du Silurien de la région de Jenolan Caves, Nouvelle-Galles du Sud, Australie

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Abstract

Moderately-preserved Silurian radiolarians have been recovered from the Jenolan Caves region, eastern NSW, Australia. Radiolarians were first reported from this area in the late 19th Century by T.W. Edgeworth David, but were not described in detail, neither were they illustrated. Nearly 120 years later, the first images of these fossils are presented. The radiolarians reported include: *?Futobari* cf. *solidus* Furutani, *?Zadrappolus* sp., Haplentactiniid gen. and sp. indet, *Borisella* sp., *?Palaeoephippium* sp., *?Insolitignum vivanima* MacDonald and *?Helenifore speciosus* (Furutani). The fauna is similar to others described from Upper Silurian strata in Japan.
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Keywords: Radiolarians; Silurian; Jenolan Caves; Campbells Group; Lachlan; Fold Belt; Australia

Résumé

Des radiolaires du Silurien, moyennement préservés, ont été récupérés de la région de Jenolan Caves, partie orientale de Nouvelle-Galles du Sud, Australie. Des Radiolaires étaient rapportés auparavant de cette zone, à la fin du 19^e siècle par T.W. Edgeworth David, mais sans étude détaillée, ni d'illustrations. Près de 120 ans plus tard, les premières images de ces fossiles sont présentées. Les radiolaires rapportées comprennent : *?Futobari* cf. *solidus* Furutani, *?Zadrappolus* sp., Haplentactiniid gen. et sp. indet, *Borisella* sp., *?Palaeoephippium* sp., *?Insolitignum vivanima* MacDonald et *?Helenifore speciosus* (Furutani). La faune est semblable à d'autres décrites du Silurien supérieur du Japon.
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Mots clés : Silurian ; Radiolarians ; Jenolan Caves ; Lachlan Fold Belt

1. Introduction

The Jenolan Caves are a well-known scenic attraction located 182 km west of Sydney in eastern New South Wales, Australia. They include some of the best-known limestone caves in Australia. The occurrence of radiolarians in the Jenolan Caves region has been known since the 19th Century. David (1897) reported

that chalcidonic casts of radiolarians occurred in vast numbers in rocks from west of the main limestone belt at Jenolan Caves with traces observed in other shales located east of the Caves. However, techniques available at the time only allowed for the study of radiolarians in thin section, which provided very limited information on their morphology and no identification was possible. David (1897) indicated that he was not able to recognise any latticed structures or spines on the material he studied (David and Pittman, 1899). The main aim of this paper is to report a new investigation of these fossils and both document and illustrate the taxa present thereby allowing them to be compared with other Lower Paleozoic faunas that have now been described from other

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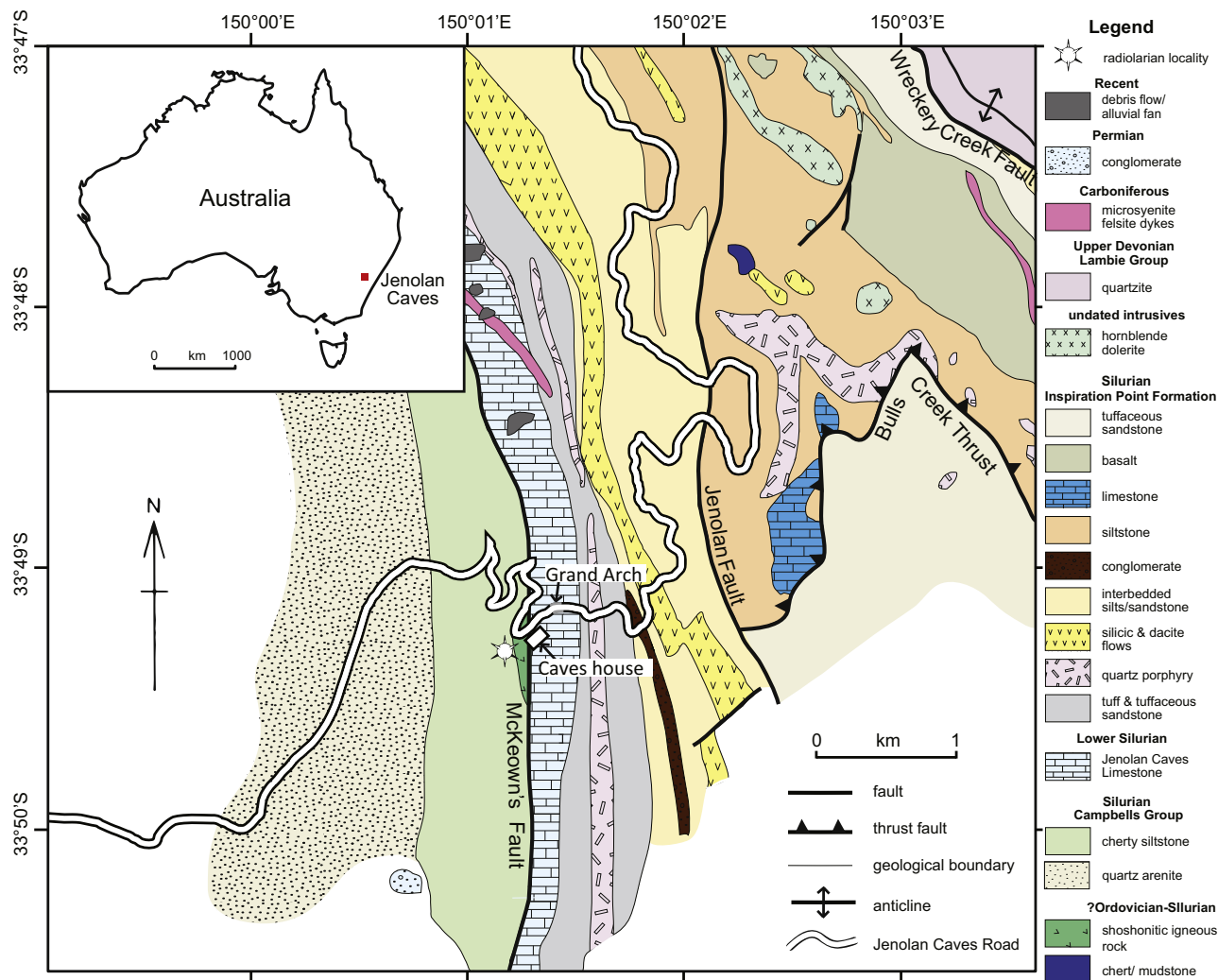


Fig. 1. Geological map of the Jenolan Caves region, after a compilation by Branagan et al. (2014), showing the main access road and the radiolarian locality; inset map shows Jenolan Caves region in relation to Australia.

locations: Cape Phillips, Canada (Goodbody, 1986; MacDonald, 1999), Japan (Furutani, 1990) and New South Wales (Jones and Noble, 2006; Noble and Webby, 2009).

Radiolarians were recovered from finely laminated, black siliceous mudstones that crop out immediately west of Caves House, 350 m SW of the Jenolan Caves Grand Arch (Fig. 1). These sedimentary rocks form part of a north-south trending fine grained siliceous sedimentary unit around 500 m thick that dips steeply to the west (Branagan et al., 2014). Black laminated siliceous mudstones are a minor component and are interstratified with coarser black siltstones that are devoid of radiolarian tests. No independent biostratigraphic data with which the age of this unit can be constrained are known. These strata have been assigned a Silurian age (Chalker, 1971; Talent et al., 1975; Lishmund et al., 1986; Branagan et al., 2014) on the basis of their stratigraphic position and are referred to the Campbells Group.

2. Stratigraphic framework

The study site is located amongst Lower Paleozoic rocks within the northeastern part of the Lachlan Fold Belt, close to

the western edge of the Permo-Triassic Sydney Basin. Although the Lachlan Fold Belt has been regarded as part of a long-lived convergent continental plate margin that developed along the eastern margin of Gondwana (Glen, 2005), recent detailed consideration of the stratigraphic and structural architecture and lithological content of these rocks has resulted in challenges to this interpretation. Taking into account the rare nature of cherts that are associated with voluminous quartzites, which dominate the fold belt and overall stratigraphic architecture, Aitchison and Buckman (2012) suggested that autochthonous Ordovician elements of the Lachlan Fold Belt actually represent a passive continental margin assemblage. Arc-continent collision and subsequent subduction flip characterise the Late Ordovician to Silurian of the region.

The thinly bedded, black siliceous mudstones to the east of the main limestone belt have been previously correlated with the Campbells Group by local geologists (Pickett, 1982; Branagan et al., 2014). The age and the exact nature of the Campbells Group, also remains uncertain, although poorly preserved specimens of the graptolite *Bohemograptus bohemicus* (Barrande) indicate a Ludlovian age (Talent et al., 1975). Volcanic rocks that

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