

EARLY DEVONIAN RIFT-RELATED FELSIC IGNEOUS ROCKS IN THE WESTERN LOOE BASIN, SOUTH-WEST ENGLAND

L.R.G. PENFOUND-MARKS AND R.K. SHAIL



Penfound-Marks, L.R.G. and Shail, R.K. 2015. Early Devonian rift-related felsic igneous rocks in the western Looe Basin, South-West England. *Geoscience in South-West England*, **13**, 471-482.

The Looe Basin records the extension of South-West England continental lithosphere during the Early Devonian. Its syn-rift infill, comprising the essentially non-marine Dartmouth Group (?Lochkovian-Pragian) and largely marine Meadfoot Group (Pragian-Emsian), includes low volume bimodal intrusive and extrusive igneous rocks that are predominantly mafic. Felsic igneous rocks are rare and have been described from several locations in the eastern Looe Basin, most notably the area around Whympton, south of Modbury, where they have also been investigated for their mineralisation potential. In the western Looe Basin a single occurrence, the poorly exposed Hendra Felsite, was recognised by Ussher during re-mapping of the Bodmin sheet at the beginning of the 20th Century. Previously undescribed Early Devonian felsic igneous rocks, defined here as the Hoblyn's Cove Felsite, crop out in the structurally complex coastal section through the Start-Perranporth Zone between Ligger Point and Holywell Bay. The felsites exhibit bedding-parallel contacts with the host Trendrean Mudstone Formation (Meadfoot Group), share its Variscan high strain composite S1/S2 fabric, and are interpreted to have originated as horizontal quartz- and feldspar-phyric rhyolite sills. Thinly-bedded crystal-lithic volcanoclastic sandstones, sandy mudstones and possible felsic pyroclastic rocks occur in the host rock succession in the vicinity of the intrusive felsite sheets and suggest that felsic magmatism was both contemporaneous with sedimentation and had a volcanic expression. Contemporaneous felsic magmatism is compatible with previous suggestions of a sedimentary or volcanic exhalative origin for the earliest sulphide-rich paragenesis of the nearby Perran Iron Lode. The felsite whole-rock trace element geochemistry is similar to that reported for Early Devonian felsites from the eastern Looe Basin. The Hoblyn's Cove Felsite and associated volcanoclastic and pyroclastic rocks were re-orientated, during latest Carboniferous-early Permian post-Variscan extension, to their sub-vertical attitude within the steep limb of the large-scale S-verging monoformal F3 fold that defines the Start-Perranporth Zone. Early Permian elvans are readily distinguished from the Early Devonian felsites by their lack of Variscan foliation and distinctive trace element whole-rock geochemistry (low Zr, high P₂O₅ at low TiO₂).

*Camborne School of Mines, College of Engineering, Mathematics and Physical Sciences, University of Exeter, Penryn Campus, Penryn, TR10 9FE, U.K.
(E-mail: R.K.Shail@ex.ac.uk)*

Keywords: rifting, bimodal magmatism, Devonian, Variscan, Rhenohercynian, Start-Perranporth Zone.

INTRODUCTION

During the Devonian and Early Carboniferous, much of South-West England comprised a series of rift basins that were infilled with terrestrial and marine sedimentary rocks and subordinate rift-related igneous rocks (Floyd *et al.*, 1993; Leveridge and Hartley, 2006). Magmatism was bimodal but is overwhelmingly represented by mafic igneous rocks that occur as high-level intrusive sheets, lavas and volcanoclastic rocks (e.g. Floyd *et al.*, 1993; Merriman *et al.*, 2000; Leveridge and Hartley, 2006). Felsic igneous rocks are far less abundant and commonly occur as small bodies that are too small to be represented on geological maps. Several occurrences have been described from the eastern Looe Basin where they were first recognised by Ussher during re-mapping of South Devon (Ussher, 1903, 1904, 1912). Some of these locations have attracted further investigation (Durrance, 1985; Jones and Floyd, 2000) and have been evaluated as potential sites of volcanogenic or exhalative mineralisation (Leake *et al.*, 1985, 1992).

The purpose of this contribution is to describe two locations in the western Looe Basin where felsic igneous rocks are hosted by Early Devonian sedimentary rocks of the Meadfoot Group. One of these locations, Hendra, is very poorly exposed and was briefly described by Ussher *et al.* (1909). The other, at Hoblyn's Cove, is very well exposed but occurs within the complexly deformed Start-Perranporth Zone and has not previously been described. At both locations Early Permian post-Variscan felsic igneous rocks also crop out as intrusive microgranite sheets or 'elvans'. Data are presented on the field relations, petrography and whole-rock geochemistry of the Early Devonian felsites that: (i) demonstrate their characteristics and how they can be readily distinguished from the Early Permian elvans, and (ii) allow comparison with more extensively studied Early Devonian rift-related felsites in the eastern Looe Basin.