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## 6 Lussa Bay, Jura

[NR 637 865]–[NR 648 870]

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### 6.1 Introduction

Much of the island of Jura consists of rugged hills, which are composed almost entirely of monotonous Jura Quartzite, but along the south-east coast there are excellent exposures of spectacular rocks that reflect the change in the depositional environment from the shallow-water Jura Quartzite Formation to the deeper water Scarba Conglomerate Formation. The transition between these formations is well exposed at Lussa Bay, which is located about half way along the south-east coast of the island. Sedimentary structures are particularly well preserved in the coarser-grained metasedimentary rocks of Jura, and this is superbly demonstrated around Lussa Bay.

The Dalradian rocks of Jura were first described by Peach *et al.* (1911) and later by Allison (1933). More recent work includes that of Anderton (1976, 1977, 1979, 1980), which is mainly concerned with the sedimentology of the Islay and Easdale subgroups of the Argyll Group. A revised edition of the BGS 1:50 000 Sheet 28W (South Jura) was published in 1996.

### 6.2 Description

The coastal section at Lussa Bay is described below from west to east (Figure 2.14).

Cross-bedding may be observed in the metasandstones of the Jura Quartzite Formation (e.g. at [NR 6383 8662]), where the overall bedding dips moderately steeply to the south-east. The Jura Quartzite is overlain conformably by a thin unit of slaty metamudstone with subordinate metasandstones that almost certainly correlates with the Jura Slate Member that forms the base of the Scarba Conglomerate Formation elsewhere on Jura. This slaty unit is around 20 metres thick and is overlain conformably by fine-grained, grey metasandstone. Beds in this metasandstone unit are around half a metre thick and they exhibit small-scale cross-bedding, load structures and abundant graded bedding (Allison, 1933).

At least one conglomeratic bed occurs in this succession. This consists of a pebbly bed with subangular quartzite clasts up to 1.5 cm across. It varies in thickness, with a maximum of about 1 m.

The succession of metasandstones and rare metaconglomerates is approximately 150 m thick and is overlain by another metamudstone unit. This metamudstone crops out along both the north-west and south-east shores of Lussa Bay itself (Figure 2.14), and erosion of this unit is probably responsible for the development of the bay. On both shores the metamudstone has a well-developed slaty cleavage. Along the south-east shore there is an abrupt facies change from the metamudstone to a superb section of metaconglomerates. Approximately 200 m of this succession are exposed along the coastline from Lussa Bay around Lussa Point and then north-east along the coast. The massive beds vary from a few tens of centimetres to a metre or more in thickness. Most fine upwards from coarse pebbly bases (clast sizes up to 10 cm and generally matrix-supported) to coarse metasandstone. Individual beds have sharp bases, and erosional features such as rip-up clasts of mudstone and sandstone are quite common (Figure 2.15). The phyllitic mudstone rip-up clasts are irregularly shaped lenses varying in size from a few centimetres to a few tens of centimetres. They are generally elongate and are aligned approximately parallel to bedding. Sandstone clasts also form lenses but generally tend to be flatter and more elongate. They vary from a few tens of centimetres to around 1 m in length, and are also aligned approximately parallel to bedding. There are rare beds of fine-grained material (metamudstone and metasiltsone) interbedded with the metaconglomerates. Mass-flow deposits of incompletely mixed mud, sand, and gravel with large

partially disintegrated boulders of sand and mudrock also occur (Anderton, 1977). Towards the top of the succession the beds take on a more-recognizable turbiditic nature; they are coarse grained but the grading is more pronounced.

Structurally this site lies on the south-east limb of the Islay Anticline (Bailey, 1917; Roberts and Treagus, 1977c). Bedding strikes approximately north-east and dips between 35 and 50° to the south-east. The slaty cleavage has approximately the same strike and dip direction but is steeper, giving a sense of vergence towards the Islay Anticline to the north-west. Tectonic structures appear to be restricted to the finer grained lithologies, and are expressed as minor folds and a slaty cleavage. The coarser grained lithologies are only weakly deformed and show little evidence of tectonic strain. The majority of the clasts in the metaconglomerate appear to be undeformed. Hence, because of the low strain in the coarse-grained rocks, they retain their original sedimentary characteristics.

The rocks here have been subjected to greenschist-facies metamorphism although, apart from the slaty cleavage in the finer grained horizons, there is little direct evidence of metamorphism. The deformation and the metamorphism occurred during the Grampian Event.

### 6.3 Interpretation

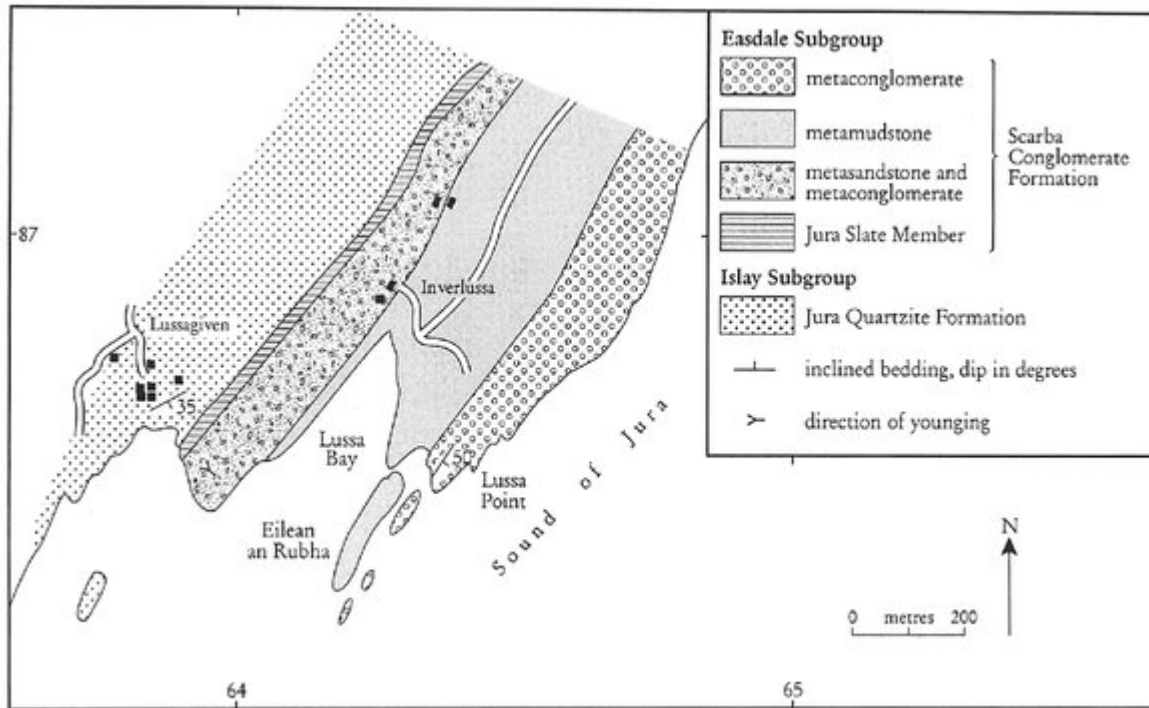
The transition from the Islay Subgroup into the Easdale Subgroup at Lussa Bay and elsewhere on Islay and Jura (see the *Kilnaughton Bay* and *Kinuachdrachd* GCR site reports) demonstrates a distinct change in sedimentary environment from shallow-marine shelf to a deeper marine slope. This is clearly shown by the metasedimentary rocks that crop out at Lussa Bay. The metasandstones of the Jura Quartzite were interpreted by Anderton (1976) as shallow-marine tidal deposits, as is indicated by sedimentary structures such as cross-bedding. The metamudstones indicate basin deepening, and the metaconglomerates were interpreted by Anderton (1979) as marine-slope slump deposits. These are deposits that formed when clastic material building up on the upper parts of a marine slope became unstable and started to flow down slope. This process tends to disrupt the material, and results in the deposition of coarse-grained, poorly sorted massive beds. The slumping commonly ceases before the material can mix with water and develop into turbidity flows. However, some mixing probably took place and this resulted in the observed grading. Towards the top of the succession, where the grading is better developed, it is likely that this water–sediment mixing proceeded further, producing the coarse-grained turbidites. Most of the fine-grained material would have been winnowed out and removed as suspended load, which was then deposited farther out into the basin.

The rapid deepening event, from the shallow-water Jura Quartzite to the deeper water Scarba Conglomerate, indicates tectonic instability and is good evidence for fault-controlled rifting, which probably had a strong control on sedimentation during the deposition of much of the Easdale, Crinan and Tayvallich subgroups of the Argyll Group.

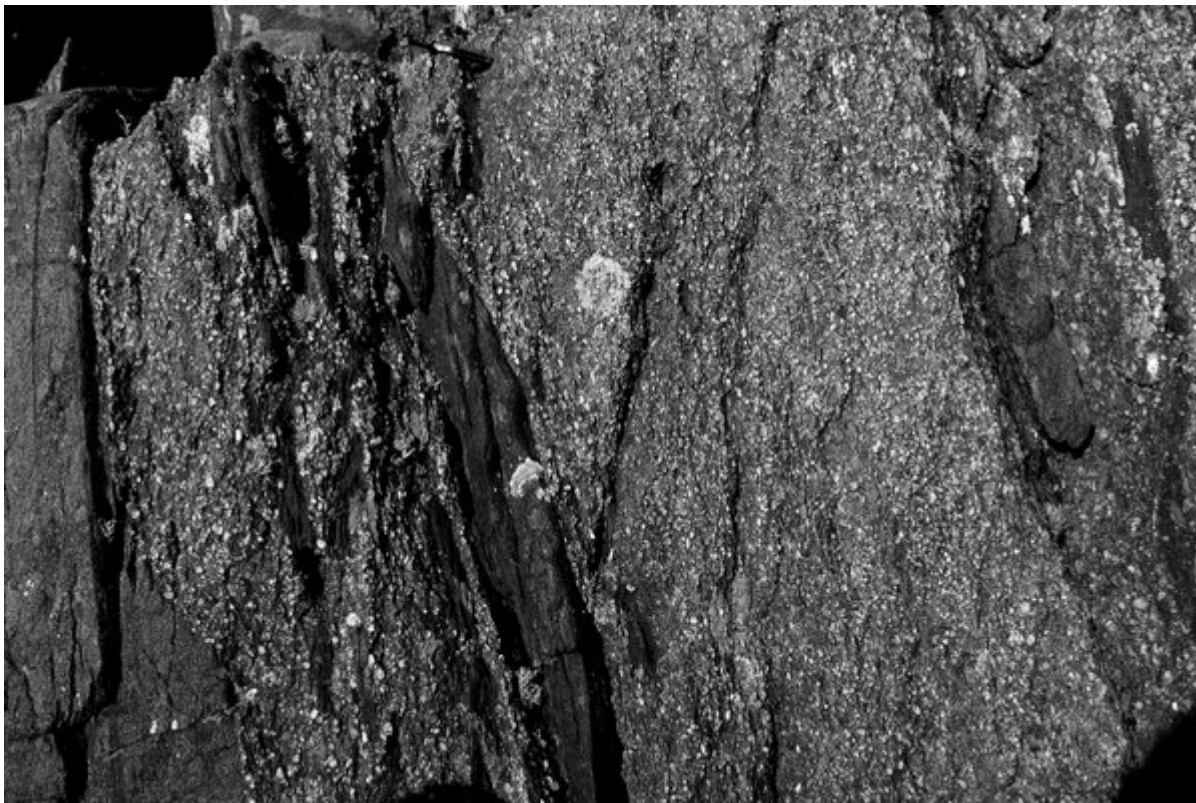
### 6.4 Conclusions

Along with exposures at other GCR sites along strike at *Kilnaughton Bay* on Islay and *Kinuachdrachd* on Jura, the Lussa Bay GCR site provides vital clues for tracing the evolution of the Dalradian basin in early Argyll Group time. This GCR site exposes in particular an almost complete representative section through the Scarba Conglomerate Formation, which occurs here in a region of relatively low tectonic strain and hence has spectacular exposures of some of the best-preserved sedimentary features seen in Dalradian metaconglomerates. On the islands of Scarba and Jura, these rocks are particularly coarse grained and formed by material ‘slumping’ down a deep marine slope. Such was the energy of this slumping that material was ripped up from the sea floor and incorporated into the slump deposit as large ‘rip up clasts’.

### [References](#)



(Figure 2.14) Map of the area around the Lussa Bay GCR site, Isle of Jura.



(Figure 2.15) A representative, 55 cm-thick, pebbly unit from the Scarba Conglomerate Formation at Lussa Bay, Isle of Jura, showing poorly developed graded bedding with rip-up clasts of metamudstone. Beds young to the right of the photo (south-east). Spirit level (top left) is 5 cm long. (Photo: P.W.G. Tanner.)