The Lithostratigraphy and Palaeoenvironmental Context of the Ilfracombe Formation, North Devon, UK

What these specific rocks are made of and what the world looked like when they were formed.

Subject: Regional Geology of the South West Peninsula (UK)

Location Focus: Combe Martin to Ilfracombe, North Devon UK

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1. Introduction

The Ilfracombe Formation represents a significant sequence of Middle to Upper Devonian strata within the North Devon Basin. Exposed along the rugged coastline between Ilfracombe and Combe Martin, the formation is primarily composed of slates with subordinate sandstones and limestones. These units provide critical evidence of the Variscan Orogeny and the shifting marine environments of the Paleozoic Era.

2. Geological Setting and Structure

The formation is situated within the Exmoor Group and was heavily influenced by the Variscan Orogeny (geological process of mountain building): a period of intense mountain building caused by the collision of Euramerica and Gondwana (Leveridge & Hartley, 2006). This tectonic pressure resulted in the characteristic silvery-grey, heavily folded, and cleaved slates observed in the Wild Pear Slates Member.

Orogeny: primarily driven by convergent plate boundaries, including continental collision (e.g., Alps) and subduction, where oceanic crust sinks beneath continental crust (e.g., Andes).

3. Lithostratigraphic Members

The Ilfracombe Formation is subdivided into several distinct members, each reflecting specific depositional energies and environmental conditions:

3.1 Kentisbury Slates Member

Characterised by rhythmic, alternating layers of slate-rich and sandstone-rich units, this member suggests a fluctuating sedimentary supply in a marine setting.

3.2 Combe Martin Slates Member

This member is of high stratigraphic importance due to its limestone content, specifically the Jenny Start, Combe Martin Beach, and David's Stone limestones. These carbonate units act as a proxy for the Middle Devonian climate.

- **Palaeontology:** The presence of coral and brachiopod fossils indicates a warm, shallow marine environment (BGS, 1993).
- **The Brachiopod Assemblage:** Brachiopods (familiarly 'lamp shells') are found in abundance here. Despite a superficial morphological resemblance to bivalve molluscs, they are phylogenetically distinct.
- **Unlike The Mirror-Image Left/Right Symmetry Of Clams: B**rachiopods possess dorsal (top) and ventral (bottom) valves and anchor to the substrate via a fleshy pedicle (Evans, 1922).

3.3 Lester Slates-and-Sandstones Member

This sequence comprises dark grey slates and brownish-grey sandstones. A notable feature is the presence of gritty sandstone units with cross-bedding structures reaching up to 1.4 metres in thickness, indicating high-energy palaeocurrents (Edmonds et al., 1985).

3.4 Wild Pear Slates Member

Representing the most tectonically altered sequence, these silvery-grey slates are heavily cleaved and folded. They contain minor intercalations of iron-stained sandstones and siltstones, reflecting the intense deformation typical of the North Devon coast.

4. Economic Geology and Human Impact

The geological makeup of Combe Martin significantly influenced its industrial history. The presence of silver-bearing galena (lead sulphide) within the Devonian strata led to extensive mining operations during the 19th century (Mindat.org, n.d.). Furthermore, the extraction of limestone for "lime-burning" in local kilns was a staple of the 19th-century agricultural economy (Combe Martin History Project, 2025).

5. Conclusion: The 'Living Fossil' Legacy

The Ilfracombe Formation serves as a testament to the resilience of Paleozoic life. While the end-Permian mass extinction devastated global brachiopod populations, genera such as *Lingula* persist today. These 'living fossils' remain remarkably similar to their Cambrian ancestors, providing a direct biological link to the Devonian seas of North Devon.

6. Selected Bibliography

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- **Leveridge, B., & Hartley, A. J. (2006).** The Variscan Orogeny: the development and deformation of Devonian/Carboniferous basins in SW England and South Wales. *The Geology of England and Wales*.
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