DOWN-DIP TERMINATION OF THE CARBONIFEROUS ROSS FAN SYSTEM IN THE INNER SHANNON AREA, WESTERN IRELAND – NEW INSIGHT FROM CORE AND OUTCROP

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The Pennsylvanian Ross Sandstone Formation forms part of a major progradational and shallowing-upward basin-fill succession in western Ireland. It is well-exposed in the sea cliffs in the outer Shannon Estuary (Loop Head peninsula) where a combination of behind-outcrop drilling and biostratigraphy correlation have established a 490m thick stack of at least nine sandy deep-water fan systems separated by variable condensed sections. Palaeoflow measurements indicate a north-easterly dispersal and it is likely the system was weakly confined by a pre-existing trough (earlier Mississippian-age crustal extension). Previous work has shown that the Ross thins to the east and north, and must shale-out by onlap and/or down-dip pinch-out. The onlap is confirmed by biostratigraphy correlation but details are poorly constrained. The Ross is underlain by mudstone-dominated basin-floor strata (Clare Shale Formation) and is overlain by base-of-slope and slope deposits (Gull Island Formation) recording advance of an unstable slope, although the direction of progradation has been controversial (axially from the SW or transversely from the NW).

Scattered outcrops and limited borehole data in the inner Shannon estuary and mid-Clare are critical to constrain the down-dip extension of the Ross system. Previous outcrop studies have described a much thinner Ross section at Inishcorker and Foynes (over 50km east of the Ross type section on the Loop Head) involving only the youngest Ross cycles in the west. A re-interpretation of the inner Shannon outcrops is now possible given a new GSI 09/04 borehole in the Inishcorker area, a re-analysis of Foynes Island sections and new biostratigraphic data. The biostratigraphy underpins a composite section linking all the key inner Shannon sections and establishes that the Ross-equivalent succession is c. 40m thick and is wholly in Clare Shale facies (barren and goniatitic mudstones with local nodules). This is sharply overlain by 4m of fine-grained turbidites that thicken northwards and which are covered by an 8-15m thick mass-transport deposit (MTD) in all sections. The remaining section (c. 120m) comprises at least eight MTDs (each up to 20m thick) alternating with turbidite packages (each up to 14m thick) that locally contain megaflute erosion surfaces. The sandstone sedimentary structures suggest transport to either the NE or SSW. Deformation structures (mainly folds) in the MTDs infer southerly transport and they rework deep-water sand and mud.

The biostratigraphy indicates the transition from Clare Shale to the MTD-dominated succession in the Foynes and Inishcorker sections are of similar age (R70-R90 zone), coeval with the Ross-Gull Island transition in the west. The Ross system is inferred to shale-out by eastwards and north-eastwards downlap along the trough axis; there is no evidence for a significant southerly confining slope in the inner Shannon outcrops although the Ross-equivalent Clare Shale section thickens north from Foynes to Inishcorker. A coeval age for the arrival of slope facies in the outer and inner Shannon confirms rapid advance of a separate transverse slope system from the NWN that presumably overstepped any extension of the earlier Ross system into east Clare with slumps shed from the slope interacting with residual axially-sourced sands.