Holocene Geomorphology of the Macdonald and Tuross Rivers

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Except where otherwise indicated, this thesis is my own original work.

Paul Rustomji

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To Ely . . .

Go E . . . Go!

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Abstract

The floodplains that grade to the estuaries along the New South Wales coast primarily record a history of valley aggradation induced by post-glacial sea level rise. However, post-glacial sea level along this coast has both risen, then fallen, relative to the land during the Holocene due to isostatic compensation to loading of the ocean basins. Geomorphological and stratigraphic data from the Macdonald and Tuross valleys, which drain to this coast, are combined with radiocarbon and optically stimulated luminescence dating to examine how the floodplains of these coastal rivers have responded to such base level changes and also to the variable Holocene climate.

From 9000 to 6000 years BP, as sea level was rising to its Holocene maximum, aggradation occurred in the alluvial reaches of both the Tuross and Macdonald rivers but at very different rates. In the Macdonald valley, aggradation occurred at 5.6mm per year, which greatly exceeded the 0.5 to 0.9mm per year rate of the Tuross valley. This difference reflects the shoreline transgression into the Tuross valley by rising sea level, whilst the Macdonald River, on account of its confined valley which was more conducive to sediment entrapment, was prograding.

When sea level stabilised 6500 years ago, progradation of the Tuross River was initiated, but continued to occur in the Macdonald valley. The aggradation that formed the highest and most extensive alluvial surfaces along the two valleys occurred between 6000 and 2000 years ago. The floodplain sediments of this period are comprised of slightly coarser sand with less silt and clay than the underlying early Holocene deposits, and show weak pedogenesis. Aggradation in this interval occurred at 1.2 to 1.9mm per year in the Tuross Valley which was comparable with the 2 to 4mm per year rate of the Macdonald valley. The fluvial landforms such as the land-tied bars,

levees and floodbasins built at this time are the dominant landforms of the present day valley floors. Aggradation of the alluvial reaches of both rivers was synchronous with progradation into their estuaries and demonstrates the link between these two processes.

The alluvial surfaces constructed by each river during the 6000 to 2000 year period were abandoned as active floodplains about 2000 years ago. This represented an important change in floodplain evolution and was accompanied by the construction of a mid-level bench inset below the abandoned floodplains. The relationship of the mid-level bench to this abandoned floodplain surface in each case is consistent with a climate change involving a shift to smaller floods occurring 2000 years ago. Consequently, it is concluded that this was the main reason these high floodplain surfaces were abandoned. However, subsequent abandonment of the Macdonald River's mid-level bench between 600 and 800 years ago, and the formation of a modern floodplain surface below it, are consistent with a stronger influence of post-highstand base level fall upon floodplain formation and evolution along this river.

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