**HYDRODYNAMIC CLASSIFICATION OF ESTUARIES:   
CHALLENGES AND ALTERNATE APPROACHES**

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BACKGROUND

Globally, estuaries are environments that are under increasing stressors from dense populations, pollutants, and changing ecosystems with pressures only likely to increase with climate change. Estuaries are systems with widely variable morphology that are typically spatially vast and highly dynamic, hence site-specific investigation is often costly and practically challenging. As such, conceptual approaches that allow the translation of information from one estuary to another due to similar classifications in conceptual models are widely used for management purposes.

Estuary classification schemes, such as those by Roy (1984) and Boyd (1992) are useful to enable these types of translations of information, however, they are limited by their nature as categorical rather than continuous classification schemes. This is exemplified in some estuaries where multiple tributaries display differing hydrodynamic behaviour but the system is classified as a single morphological class. This paper will use case study examples to identify challenges associated with the current categorical estuary classification schemes and suggest alternate approaches that capture the varying dynamics of the full spectrum of estuary systems.

CASE STUDY

Camden Haven estuary, on the NSW mid-north coast, is classed as an immature wave dominated estuaries under the NSW estuary classification scheme (Roper 2011). Despite this classification, the site has significantly more sedimentary infilling than other immature WDEs along the NSW coast. For example, coastal lakes, like Lake Macquarie on the NSW central coast, are significantly less infilled with much larger central basins and estuary areas relative to the size of the inlet.

Analysis of long-term water level records in the Camden Haven estuary reveal that the hydrodynamics of the system, while similar to those of coastal lakes, show a more gradual decrease in tidal range with distance from the inlet rather than the more marked and rapid decrease in tidal range typically seen in coastal lakes. Analysis also shows that the southern and northern tributaries show different tidal plane behaviour (Figure 1). These features therefore suggest that a classification scheme that captures these differences in the behaviour of estuaries is warranted to ensure these differences are captured and accurately reflected in site specific analyses. Ultimately, it would be hoped that a more nuanced approach such as this would drive improved coastal management of some of Australia’s most under threat coastal environments.

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Figure 1 – Tidal planes for the southern and northern tributaries of Camden Haven estuary, NSW, shown as river kilometres from the estuary entrance (Source: Broadfoot, 2020).