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# Bivalve molluscs of Walpole and Nornalup Inlets Marine Park

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## Background

Despite their often barren appearance, shallow sand habitats of temperate estuaries can support surprisingly high densities of invertebrates like polychaete worms, small crustaceans and molluscs. These animals are mostly inconspicuous as they are often tiny and remain buried to avoid predators and being dislodged by tidal currents. Benthic invertebrates are sensitive to human disturbance and are important indicators of environmental quality and change in estuaries. Despite being small, these animals can be ecologically significant as predators or consumers and as a source of prey for other animals such as fishes and birds. For these reasons, benthic invertebrates are a key ecological value of Walpole and Nornalup Inlets Marine Park (WNIMP), which comprises a permanently open estuary located on Western Australia's south coast.

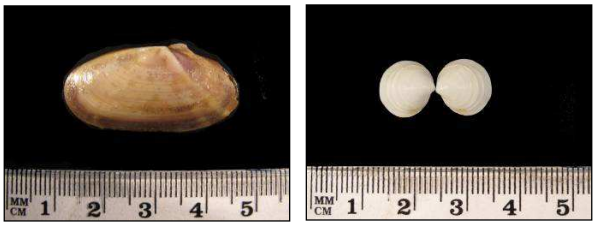
While bivalve molluscs can be among the largest and most visible benthic invertebrates, their distribution and abundance in temperate estuaries, including WNIMP, is poorly understood. Understanding how the assemblage of bivalve molluscs varies over time is important as the salinity and water temperature of estuaries like WNIMP can change dramatically over the year as fresh water winter rainfall enters the system from surrounding catchments. These natural cycles can kill many invertebrates, which then recolonise the estuary from the adjacent ocean when conditions again become suitable. A key challenge for managers is to identify changes to invertebrate assemblages caused by human activities in systems that have such pronounced natural variation.

**Above:** Shallow sand-flat habitat near the ocean entrance of Walpole and Nornalup Inlets Marine Park (Photo: Alan Kendrick). **Below:** The locations of 19 bivalve sampling sites in the Nornalup Inlet and ocean entrance channel.

During a broader study of benthic invertebrates in WNIMP, scientists from Parks and Wildlife's Marine Science Program and Edith Cowan University sampled bivalve molluscs at 19 sand sites around the shallow margins and entrance channel of the Nornalup Inlet during April of three years from 2011 to 2013. Five replicate samples were collected from each site by digging the substratum to a depth of 20 cm from within a randomly placed 1.0 $m^2$ quadrat. Bivalves were then collected by sieving the sand from each quadrat and each living shell was identified to species and counted to calculate abundances.

## Findings

A total of 8144 bivalves from nine species were collected during the three years of this study and densities of up to about 200 shells/m$^2$ occurred at some sites. The assemblage was dominated by only three species which accounted for 98% of the total catch, and these species exhibited different distributional patterns in the inlet which were broadly stable from 2011 to 2013.



**Above:** Most abundant bivalves: *Soletellina alba* (left) and *Wallucina assimilis* (right) (Photos: Mike Rule).

The most abundant species collected were *Soletellina alba* (Psammobiidae) and *Wallucina assimilis* (Lucinidae), which accounted for 75% and 19% of the total catch, respectively. Both are typically marine species whose presence in the Nornalup Inlet is probably due to the occurrence of marine-like conditions for extended periods when river flows are low. Although widely distributed across the inlet, *S. alba* was consistently most abundant at sites near the estuary's ocean entrance.

In contrast to the widespread *S. alba*, *W. assimilis* was restricted to the inner part of the entrance channel that connects the Nornalup Inlet to the ocean. In marine habitats, this species occurs among seagrass rhizomes and it is likely that the distribution of *W. assimilis* in the inlet is linked to the presence of the seagrass *Zostera polychlamys*.

The third most abundant species was *Paphies elongata* (Mesodesmatidae), which comprised 3% of the total catch and occurred only at the oceanic end of the entrance channel where waves and tidal currents create particularly turbulent conditions. These bivalves are called surf clams and do not typically occur in calmer habitats.

**Above:** Less abundant bivalves: *Macamona deltoidalis* (left) and *Katelysia scalarina* (right) (Photos: Mike Rule).

Less abundant bivalves included *Katelysia scalarina* (Veneridae), *Macamona deltoidalis* (Tellinidae), *Spisula trigonella* (Mactridae) and *Venerupis crenata* (Veneridae). Among these, the cockle *K. scalarina* is of particular interest as it has been harvested in the inlet for food and bait for many decades. The current scarcity of this species contrasts with anecdotal reports that it was previously abundant in WNIMP.

## Management Implications

- This study represents a baseline assessment of the bivalve assemblage associated with shallow sand habitats of WNIMP. Future monitoring studies will enable managers to determine if the composition, abundance and distribution of this key ecological community changes over time.
- Bivalves were most common in parts of the Nornalup Inlet and entrance channel which are also a focus for recreation and tourism activity. While few visitor activities directly affect bivalves, managers should be aware of possible indirect impacts, such as anchor damage to seagrass rhizomes or the frequent disturbance of animals like shorebirds that feed on bivalves.
- *Soletellina alba* is the only large bivalve that is abundant and widespread in the Nornalup Inlet and managers should be aware that natural or anthropogenic pressures that affect this species could have broader ecosystem implications for the marine park.
- It is currently unclear if the apparent decline of *K. scalarina* in WNIMP over recent decades is due to human activities, natural processes or both. A better understanding of these processes is needed before informed management decisions can be made regarding this species.

**References and further reading:**

Kendrick AJ, Rule MJ, Lavery PS, Hyndes GA (2015) Spatial and temporal patterns in the distribution of large bivalves in a permanently open, temperate estuary: implications for management. *Marine and Freshwater Research*. **66**, 41-49.

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