Title [4817]: *Nocturnal sampling reveals usage patterns of intertidal marsh and subtidal creeks by penaeid shrimp and other nekton in south-eastern Australia*

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Definitions:

- 'penaeid' means any prawn of the family Penaeidae, many of which have economic importance.
- 'nekton' refers to aquatic animals that are able to swim and move independently of water currents.

Summary

Eastern King Prawn (*Melicertus plebejus*) and School Prawn (*Metapenaeus macleayi*) are important species of prawn for both commercial and recreational fishers. This study demonstrated that juvenile EKP and SP do not utilise intertidal marsh habitats directly.

What prompted the research

The life cycle of most penaeid prawns includes a juvenile phase in protected coastal environments such as estuaries and embayments. Broadly, mangrove creeks and intertidal marsh habitats are understood to be important habitats for juvenile penaeid prawns. In the tropics, some penaeids are known to utilise intertidal habitats, yet in temperate regions of Australia the use of marshes, and the potential extended habitat along the edges of subtidal creeks, has not been investigated. Studies elsewhere have shown that juvenile prawns use some estuarine habitats more than others.

What we did

We focused on determining the extent to which Eastern King Prawn (EKP), School Prawn (SP) and other nekton directly utilise intertidal marsh habitat and adjacent subtidal creeks. The sampling was done in the Hunter River estuary, located on the coastline of temperate New South Wales, which contains large intertidal wetlands. Importantly, sampling occurred at night and within 5 days of the new moon when prawns are most active.

Using cast nets, we assessed the abundance of nekton in middle and edge habitat of adjacent subtidal creeks. The shallow intertidal ditches that drain the mangrove and marsh were sampled using double-wing fyke nets, set to coincide with spring tides when the marsh was fully inundated, which are effective in sampling this type of habitat. Basic water quality parameters in the subtidal creeks were also measured.

What we found

Water quality varied little across all wetlands and was consistent with summer conditions in tidal estuaries in this area, with a mean salinity of 20.55, pH of 7.41, dissolved oxygen of 9.31 and temperature of 26.0 Celsius.

Within subtidal creeks, a total of 31 species were collected in cast net samples including 22 species of fish and nine of crustaceans. The most abundant was the Pygmy Prawn (*Acetes sibogae australis*), which made up over 90% of the 'other crustaceans' found. Castelnau's Herring (*Herklotsichthys*

castelnaui) was the most abundant fish. Within the subtidal creeks larger SP were collected in the middle habitat and the abundance of both prawn EKP and SP varied among different creeks.

As expected, the marsh only became inundated during spring high tides, with the marsh remaining exposed during the entire neap cycle. During the sampling period, for each lunar month, the marsh was inundated for a period of between 3 and 6 hours.

Within intertidal marsh and mangrove habitats, fyke net catches were dominated by the Striped River Prawn (*Macrobrachium intermedium)*, which accounted for more than half of all nekton and 80% of all crustaceans. Despite collecting 8300 crustaceans and 4259 fish, only 8 EKP were sampled on the marsh. There were more SP, with 90 individuals collected. The most abundant of the 20 species of fish was the Glass Goby (*Gobiopterus semivestitus*) followed by Port Jackson Glassfish (*Ambrassis jacksoniensis*), which collectively accounted for 85% of fish using the marsh habitat.

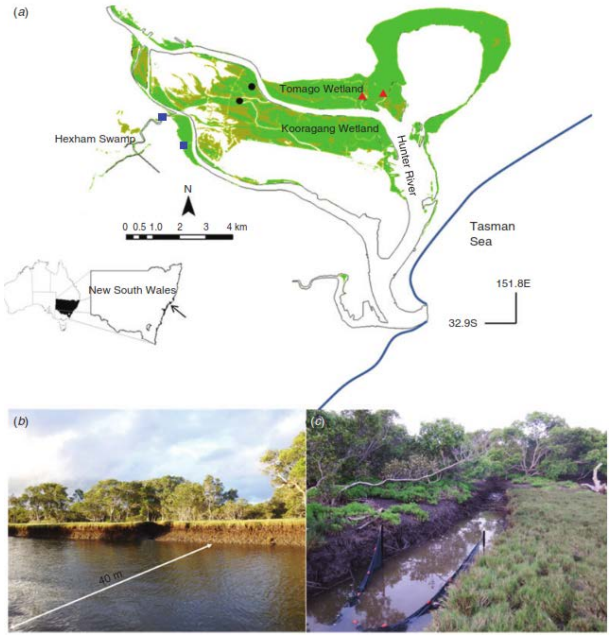

Figure: (a) Map of the Hunter River estuary showing the location of the subtidal creeks that were sampled within each major intertidal wetland including Tomago Wetlands (triangles), Kooragang Wetlands (circles) and Hexham Swamp (squares). The thick solid line shows the coastline. (b) width of the typical subtidal creek at low tide. (c) fyke net deployed in an intertidal ditch as it drains a marsh. Fyke nets were positional so they faced upstream and less than20m from where the ditch empties into the subtidal creek.

Implications

Flooding duration and depth are important factors that can govern the numbers and types of species that move laterally into intertidal habitats so the short flooding duration of intertidal wetlands undoubtedly restricts access to these habitats for nekton. Reduced access, and therefore abundance of penaeids in intertidal wetlands, raises an important consideration about the differences in direct use of intertidal habitats by penaeids in temperate Australia.

Penaeids are also regularly found in many intermittently closed and open lakes or lagoons (ICOLLs) that are common in temperate south-east Australia and that generally lack large intertidal habitats. High abundance of prawns both in systems with large intertidal wetlands but limited inundation, and ICOLLs with only small intertidal habitats, may suggest penaeids in temperate systems are less reliant on such areas.

Surprisingly, this study demonstrated minimal direct interaction between EKP and SP and the marsh surface. However, these areas could still support prawn populations within estuaries through the export of carbon resources. Tidal transport of both dissolved and particulate organic carbon and the feeding migration of small nekton shift carbon resources from vegetated intertidal habitat into nearby estuarine waters. Future isotope studies would provide valuable information in this regard, providing a broader understanding of juvenile prawns and specific estuarine habitats.