

My earliest memory of mussels is from attending dinner parties in the early 1970s with my parents, and discovering new cuisines—olives, kabana, cheese cubes, salami, prawns and smoked mussels. It was radically different from our standard meat and three veg dinners but, as a fussy, spotty teenager, I wasn't particularly fond of any of these new flavours. Mussels were at the very bottom of my list. However, they have been a rich food source for indigenous Australians for millennia as they are highly nutritious and easy to harvest from seashore and freshwater habitats. Middens formed from thousands and thousands of discarded shells can be found around our shoreline testifying to their abundance and culinary appeal.

Mussels belong to a diverse class of molluscs called Bivalvia, so named because they bear a pair of 'valves', forming the shell that protect the animals' innards. They open them to feed, breathe, mate and give birth, and can snap them shut using the strong muscles attached to each valve. Freshwater mussels occur all over the world, but the sole freshwater mussel found in south-western Australia is Carter's freshwater mussel, (*Westralunio carteri*). This endemic species is unique, while the eastern Australian fauna comprises other, more distantly related genera.

A recent study published in the journal *Hydrobiologia* by Michael Klunzinger, Alan Lymbery (Murdoch University/WA Museum), Manuel Lopes-Lima, Andre Gomes-dos-Santos, Elsa Froufe (Portugal) and Lisa Kirkendale (WA Museum) took a new look at *Westralunio carteri* by obtaining DNA from various populations across south-western Australia. The results are fascinating. The researchers found three distinct genetic groups. The most northerly group was found from Gingin Brook, through the Darling Range to the Preston River. The most southerly group occurred from the Blackwood River to the Waychinicup River. The third group was restricted to Margaret River. Although the northern and southern groups were highly divergent, the Margaret River group was more closely related to the



Freshwater mussels

southern group, suggesting a more recent evolutionary history.

What did they deduce from their study? First, they're old. The Western Australian *Westralunio* populations living today had a most recent common ancestor during the mid-Miocene, ca. 11 million years ago—that's a very old mussel-ly Eve. And the southern and Margaret River populations separated during the late Miocene/Pliocene, ca. 5 million years ago. This also coincides nicely with the geology of south-western Australia, which formed two drainages, one on the south coast and the other on the west coast, during the Eocene (56–34 million years ago). Furthermore, an earlier study by Michael and other collaborators discovered that *Westralunio* separated from most of the eastern Australian species during the Jurassic, ca. 170 million years ago, when dinosaurs walked the Earth.

Second, mussels don't migrate and have a limited dispersal ability. This seems rather obvious as they live their entire lives in the sediments of freshwater ecosystems. The genetic data prove the three groups lack gene flow between regions, spending their entire lives in different water catchments.

Third, the authors suggest each of the three *Westralunio* groups should be managed for their own unique conservation values, as the molecular evidence suggests they represent more than one biological species,

Above Freshwater mussels (*Westralunio carteri*) show significant genetic divergence across south-western Australia.
Photo – D.L. Morgan

even though morphological differences in their shells appear to be lacking.

The humble mussel isn't flamboyant (although they have gorgeous nacre on the inside of the valves). In fact, the only evidence I have ever seen of them is their discarded shells on the side of pools and rivers. And now I come to think of it, how did the shells get there? Natural events? Pigs? Humans? Natural predators such as rakali (water rats)? Water birds? Or perhaps our iconic marron? The shells rarely exceed eight centimetres, and they may live up to 50 years, making them a long-lived and iconic element of our south-western fauna. They play an important role in maintaining healthy ecosystems with their filter-feeding activities.

If you are not able to see them in the wild at your local waterway, you can find them in the WA Museum's new showcase museum, Boola Bardip, where they are featured in the Wildlife Gallery.

Michael, his collaborators and indeed other researchers are shining a bright scientific light into a very dark place and uncovering ancient animals that deserve some love from us.