Crabbing around at Roebuck Bay

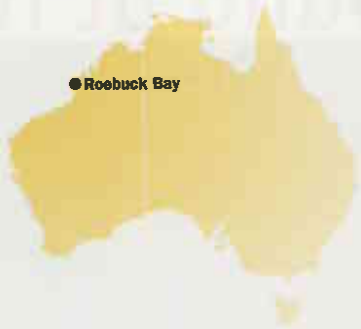
While Roebuck Bay, near Broome, is one of the best places in the world to see migratory shorebirds, it also has a wonderful diversity of crabs. Whether they are marching soldier-like across the flats, waving their claws around like miniature fiddlers or 'gardening' the mangroves, these characters are able to evoke amusement and wonder in anyone who takes the time to watch them.

by Danny Rogers, Theunis Piersma, Marc Lavaleye, Grant Pearson & Petra de Goeij
Photos by Jan van de Kam

Sandflats are especially prevalent in the south and north-west of Roebuck Bay. The sands have a golden yellow tinge, or sometimes a reddish colour because of the material eroded from the pindan cliffs. Sandy flats make for easy walking.

At Cable Beach and in the southern part of Roebuck Bay, the higher and drier sandflats often form a continuum with the beaches. These high sandflats are not very rich in life, and the sand bubbler crab (*Scopimera inflata*) is their only distinctive inhabitant. During low tide, this small crab picks up sand grains with its claws and handles them at great speed. It gleans food particles from the sand with its mouthparts, moulding the processed sand into a neat ball during the procedure. During each low tide, lots of balls are laid down in intricate patterns, radiating out of the burrows.

A bit lower on the shore, where there are considerable water currents, the sand is rippled. The burrowing sand crab (*Matuta planipes*) swims here and digs itself in when disturbed. In contrast to true swimming crabs, which have paddles on only one pair of legs, it is even better adapted to swimming, with paddles on all its walking legs.



Beaches

Beaches form a more or less continuous narrow strip around the bay, broken only by mangrove forests, a few rocky outcrops and by Dampier and Crab creeks. Unlike intertidal flats, beaches have quite a steep slope and, usually, coarser sediments. At low tide in the burning sun, the steep beaches dry out quite quickly. During neap tides, beaches dry out for several days, making them difficult places for marine animals to live.

Nevertheless, ghost crabs (*Ocypode fabricii*) make this harsh environment their home. These omnivores will eat anything left on the tide-line. They live in deep burrows and only come out at night. Ghost crabs are famous for their speed over the sand. If pursued on the beach they start to zigzag, with sudden stops to confuse and avoid their assailant.

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Main Land crabs (*Neosarmatium meinerti*) are usually vegetarian, but as this flame fiddler crab has discovered, may eat meat if the opportunity arises.

Below left A ghost crab or munbar.

Below Small sand bubbler crabs make these radiating patterns with tiny balls, in the process of extracting food particles from the sand.

During the day, their presence is revealed by freshly made burrows, with some sand and shell grit next to them.

On beaches, land hermit crabs (*Coenobita variabilis*) or irramunga can be seen browsing through the leaf litter washed ashore. They carry a snail shell to protect their soft tail. In the shell, they also carry some water to avoid drying out. Now and then they need a refill, and have to take a dip in the sea. If in danger, they retract into their shell and close it off with their large claw. As a strong shell is essential, they battle over the best examples, and have special ways to throw a smaller opponent out of its housing. During the day, they hide in bushes or under shore litter, but their tracks, leading from the shore to the pindan, give their presence away.

Mangroves

Many crabs occur in the mangroves, but two species really stand out. Flame fiddler crabs (*Uca flammula*)

Above left Each of the red dots in this picture is a male flame fiddler crab, a species which occurs in high densities in the mangroves of the bay.

Above As the sun rises, land hermit crabs that have harvested the beach at night climb the cliffs to seek shade and shelter in the pindan.

are abundant, and almost all areas of open and moist mud in the mangroves are subdivided into tiny territories, each of which is defended as conspicuously as possible by a brilliantly coloured male.

Flame fiddler crabs are, without doubt, the most beautiful crabs in Roebuck Bay. The males have one very large colourful claw, which they wave into the air to attract females and scare off other males. Though the claw looks very impressive, it functions as a flag and does not have the crushing power of the claws of predatory crabs. Fiddler crabs, instead, are mostly vegetarian, and the males use the other much tinier claw for picking up the small food-rich layer on the mud that has been deposited by the last tide. Females have it much easier, as they can feed with both claws and do not seem to worry about the imposing gestures of the males.

Their eyesight is very good and when danger approaches fiddler crabs run for their burrows, which are never far away. Their eyes are on long stalks and it is comical to see them cross a murky pool, as only the top of the eyes stick out of the water. Fiddler crabs live in muddy areas close to the beach or near the creeks in the mangroves. Accordingly, they only use a very narrow band of the huge mudflats of Roebuck Bay. On the one hand, they don't want to be covered for too long by water, as they then have breathing problems, but on the other hand they depend on food that is deposited by the high tide. When tides are coming in, they retreat into their burrow and close it off with a patch of mud, which is cut out with their claws. The diversity of fiddler crabs in Roebuck Bay is puzzling. On 100 square metres it is possible to find all five of the different species that live in the bay, and it is hard to understand how they live so peacefully next to each other.

In the shade of the mangrove trees, a stockier brown crab known as the mangrove crab (*Sesarma*) also defends territories. It is less flamboyant than the fiddler crabs, but leaves its mark by cropping any leaves it can reach from overhanging mangroves. The resultant leafless layer (about 10 centimetres high) above the mud is so neat that it appears to have been trimmed by a gardener. Actually, this is exactly what has happened! Cropped and fallen mangrove leaves are taken underground into deep and complex burrow systems, to decay and become more palatable. As a result, the energy of decomposing mangrove detritus remains within the mangroves, instead of being washed away by the tides. This is thought to be an important factor in making mangroves such remarkably rich environments.

Intertidal flats

Most invertebrate animals of the intertidal flats hide in the mud or sand at low tide. There are, however, a few species that are still pretty busy. One of the most abundant of these is the sentinel crab (*Macrophthalmus* sp.), which grows to a few centimetres. With its good eyes on very long stalks it notices danger and people from afar, then retreats quickly into its oblique nearby burrow. Hence the name—it always stays near the burrow as if guarding it. Even when it is hiding, the presence of the sentinel crab is revealed by the tracks

Left Sentinel crabs have to burrow far underground to get beyond the reach of the 20-centimetre-long bill of a female eastern curlew. This crab did not escape!

Below left A mating pair of blue manna crabs.
Photo – Marc Lavaleye

Below Photographing the big mudcrab.

made by its eight feet, diverging from the opening of its burrow. For feeding, it uses its claws like a sort of fork and spoon to pick up the food-rich upper layer of the sediment. Sometimes, two fighting males, recognisable by their bigger and more colourful claws, are so busy with female matters that they do not pay attention to life-threatening dangers.

Crushing power

The largest crab of the mudflats is the muderab (*Scylla serrata*). Adults have a carapace that is 20 centimetres across and a pair of mighty claws. In this state, it does not have any enemies except for people, who seek it for food. However, like other crabs, even the mighty muderab has weak moments, when it has to moult for growing. When the crab climbs out of its old shell it is covered by a soft new shell, and the claws are like rubber, unfit to crush anything. It takes between a few hours and some days for the shell and claws to harden. During this period, muderabs are vulnerable to all sorts of predators, and hide in their burrows. The muderab seems slow on the mud—although, if irritated, it reacts very quickly by raising its claws at the offender and, if necessary, clapping them together to make a frightening crashing noise. In water, it can walk and swim elegantly.

The blue manna crab (*Portunus pelagicus*) is a spectacular crab too. The carapace and legs have attractive blue colouration. The claws are long and slender, and built to catch fast-moving prey like fish and shrimps. The last pair of legs are paddle-like and used to swim. During low tide, blue manna crabs migrate to deeper waters or hide underneath rocks in larger pools.

Surprisingly, another fairly large crab, a land crab (*Neosarmatium meinerti*), lives on the dry saltmarsh behind One Tree Point. Though it has robust claws, it is a vegetarian that collects plant material around its burrow. The saltmarsh can be very dry, but the burrows are deep enough to reach the groundwater, so the crabs can wet their gills regularly. Once a year, the adults come out of their burrows and migrate to the sea to lay and fertilise their eggs. But many get lost in the pindan (flat country with red, sandy soils), where they die from desiccation—their macabre bleached shells can be found everywhere. The mangroves harbour similar smaller crabs (in the family Sesarmidae). Some of these are able to climb trees. Others have been seen marching the roads to reach the open sea.

Above The umbrella crab has four legs with hooks adapted to hold a shell over its body for camouflage and as a protective shield. The other four legs are normal and are used for walking.
Photo – Marc Levaleye

Right A mangrove crab (*Sesarma* sp.) climbs over mangrove roots to look for fallen leaves.

Below Soldier crabs.

Many other crabs on the flats do not have much power in their claws. There are the pebble crabs (family Leucosiidae), which have a strong rounded carapace and relatively tiny legs. The soldier crabs (*Myctiris longicarpus*) have a similarly-formed body, although it is much softer and has a bluish colour. They walk around in huge hordes over the sandier flats. When frightened, they aggregate more and more, and even climb on top of each other. They also dig into the sand in a peculiar way by screwing themselves in. The umbrella crab (*Dorippe australiensis*) is soft-shelled and protects itself by holding a flat bivalve over its body with four specially adapted legs. A kind of false spider crab (*Halicarcinus australis*) is abundant in the mud, but hardly visible, as it is tiny and inconspicuous. Its colour, or rather its transparency, is its sole protection against the keen eyes of birds.

So next time you visit Roebuck Bay, don't just look at the bay's famous migratory wading birds, look down at the sands and search out these fascinating creatures. Without the bay's diverse crabs, the birds would not have such an abundance of food resources.

Danny Rogers, a birdwatcher, mudbasher and PhD student, has had a lifetime association with shorebird research.

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Marc Lavaleye, a biologist with the Royal Netherlands Institute for Sea Research, has been involved in benthic work in Roebuck Bay since studies began.

Grant Pearson, a researcher with CALM's Biodiversity Conservation Group, has had a long association with shorebird and benthic research with a particular interest in intertidal ecosystems.

Petra de Goeij is a freelance biologist and ornithologist from The Netherlands. She was half of the first two-person team of biologists to study the feeding ecology of shorebirds in Roebuck Bay.

Dutch wildlife photographer Jan van de Kam has spent most of his life making pictures and films, and writing books about landscapes, plants and animals. In recent years he has focused mainly on shorebirds, following them from their Arctic breeding grounds to the places where they spend their winter. This work brought him to Australia, where he became hooked on the beauty of Roebuck Bay.

This article is based on *Life along land's edge: wildlife on the shores of Roebuck Bay, Broome*, a full colour hard cover book just released by CALM for $39.95.

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Regulars

Erratum

The photograph in the Autumn 2004 issue of *LANDSCOPE* (mid left, page 52) is the rare *Diuris purdiei* not *Diuris corymbosa* as stated in the caption.

The photograph in the Summer 2003-04 issue of a snail on p. 56 and p. 61 was incorrectly captioned. The photo is of the introduced predatory snail *Oxychilus* sp., which is thought to be at least partly responsible for the extinction of the Pemberton and Albany snails, and is a threat to many of our native terrestrial snails.

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