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GNAMMAS AND THEIR AQUATIC LIFE

by Ian Bayly

"GNAMMA" (or "namma") is a very distinctively Australian word, derived from the Western Desert group of Aboriginal languages, which refers to a rock-hole or more especially a rock-hole capable of holding water. In written form, the word first appeared in a list of Aboriginal words published in a pamphlet written by George Moore, a Western Australian lawyer, in 1842. The word was used commonly in a number of travelogues written at the end of the nineteenth century. For example, David Carnegie in his well known book, "Spinifex and Sand" (1898), has a whole chapter devoted to "namma-holes" and "soaks". Although widely used, the term "gnamma-hole" is incorrect; the word "gnamma" by itself means "a rock-hole", so why say "a rock-hole -hole"?!

Gnammas are formed very slowly over long periods through the enlargement by chemical weathering of what initially may be only a cup-size depression. All that is necessary for this process is water and carbonic acid which is formed when carbon dioxide dissolves in the water. However, humic acids derived from lichens and mosses may have an additive effect. One ancient Roman scholar formulated the following paradox: "What is harder than rock, or softer than water? Yet soft water hollows out hard rock." The ability of slightly acidic water to slowly dissolve a wide variety of solid materials resolves this paradox. Accordingly, "solution pit", an alternative for "gnamma", used by some overseas geologists, is a very appropriate and enlightening term.

Gnammas are found commonly, but not exclusively, on granite outcrops. They may be found on the top of most of the hundreds of domed granite hills that occur in the southern regions of Western Australia where the slope is less than 20 degrees. There are several different kinds of gnammas but the most common variety is the flat-floored pan.

Pans are usually irregular in outline, have a small depth to surface area and are formed where the granite has horizontal planes of weakness. A less common type of gnamma is the hemispherically-shaped pit (see pic). Pits are typically circular or ovoid in plan, have a large depth to surface area ratio, and develop in granite that is quite solid and lacks planes of weakness. Types of gnamma other than the pan and pit are also recognised.

A pit-gnamma. Photo Ian Bayly

Flooded gnammas in Western Australia provide habitat for a limited number of plants and a wide variety of invertebrate animals. In 1990, I sampled 36 flooded gnammas distributed between 17 different granite outcrops in Western Australia and recorded almost 90 species of invertebrate. Many of these animals are less than 2 mm long and are observable with the naked eye only with some difficulty - a hand-lens helps. A bright red

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EDITORIAL

Greetings everyone!

This winter edition of Western Wildlife contains a number of articles with a 'wet' theme. Good rains will have filled the gnammas, creeks and wetlands, and provided abundant feeding grounds for water birds and aquatic animals. Frogs will be having a great season! Unfortunately, so will pests and diseases, and land managers need to take care to encourage the good fungi and discourage the bad.

Wetland management is a very specialised skill, and one article raises concern about fire actually burning peatland soil. Drains, those artificial creeklines, need management too if they are to function efficiently, and Emma discusses how some ecological functioning can be brought back to them.

But when we planned this issue, we never dreamt that some people could be having too much of a good thing ..... our deepest sympathy to everyone in northern areas who have watched their land go under water twice in eight weeks ..... and the second time with the crop in place ..... You have our good wishes for the best possible remainder of the year. If there is anything we can help with, please get in touch.

On a more pleasant note, several *Land for Wildlifers* have reported interesting events on their properties - it seems that there is still some fascinating wildlife around, even relatively close to the city. Remember, we may be able to identify things from a clear photo.

Welcome to Anne Rick, the new *Land for Wildlife* Officer based at Newdegate, we hope you will enjoy working with us.

Penny Hussey

Kent - Lake Grace - Kulin - Kondinin

Land for Wildlife now has a Field Officer working specifically in these Shires. Anne Rick (neé Coates) is a botanist and one half of a family farm partnership – well qualified to help with both vegetation management and revegetation.
She can be contacted at the Newdegate Telecentre, phone 9871 1792.
Why not give her a ring to say Hi!?

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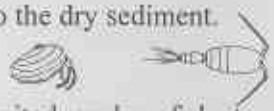
copepod (a micro-crustacean about 1.5 mm long) is one of the most common animals in these rock pools.

However, there is no difficulty in observing some of these animals. Among the crustaceans, the delicate, whitish fairy shrimps reach lengths of up to 15 mm, and the darker clam shrimps (primitive crustaceans with a bivalve jacket or carapace resembling a small mussel) may be 10-20 mm long. It is not uncommon to see copulating pairs of clam shrimps swimming around in a gnamma. Among the insects, diving beetles, back-swimmers and water-boatmen are all readily observable. Most of these insects are predators feeding on crustaceans.

On the vertebrate side of things, the tadpoles of some frogs may occur in gnammas, but the main breeding sites of frogs such as *Crinia pseudinsignifera* and *Pseudophryne guentheri* are the run-off waters below the main region of gnammas.

Where are all the animals when the gnamma is dry? Most of them, the "stayers", are still there but in the form of microscopic resting eggs. These minute eggs are capable of withstanding desiccation and high temperatures during the dry summer period. With the arrival of winter rains, development of these resting eggs proceeds rapidly and the adult form of the animal may be attained in as little time as 2 weeks. All of the crustaceans - the fairy shrimps, the clam shrimps, the copepods and the ostracods (a second group of crustaceans, smaller than clam shrimps, with a bivalve jacket) - are stayers, tolerating the dry period in the form of microscopic resting eggs embedded in the sediment or dust at the bottom of the gnamma. A second group on invertebrates (insects) are the "flyers". These avoid the dry period altogether by flying to permanent waters before the rock-pools dry up. Another group of insects (the midges), although capable of flight in the adult form, survive the dry period in the form of dormant larvae buried in the dry bottom sediments. Some of these larvae may become active immediately after the addition of water to the dry sediment.



A limited number of plants grow on the sediments accumulated at the bottom of gnammas. First are the quillworts, *Isoetes*, which are small sized descendants of the larger, ancient clubmosses. Several species of *Isoetes* occur in Western Australia including six endemics. A second common plant is the mud-mat, *Glossostigma*, which is readily recognised by its spoon-shaped leaves. This small flowering plant may occur in gnammas alone or interspersed with *Isoetes*. Six species (including three endemics) of *Glossostigma* have been recorded from Australian gnammas. Several species of *Myriophyllum* (water milfoil) occur in Australian gnammas and two or three species endemic to Western Australia have extremely limited distributions. One Western Australian species of *Myriophyllum* is known from only three gnammas!

Ian Bayly is a freshwater biologist, an Honorary Research Associate with Monash University, Melbourne and a Victorian Land for Wildlifer.