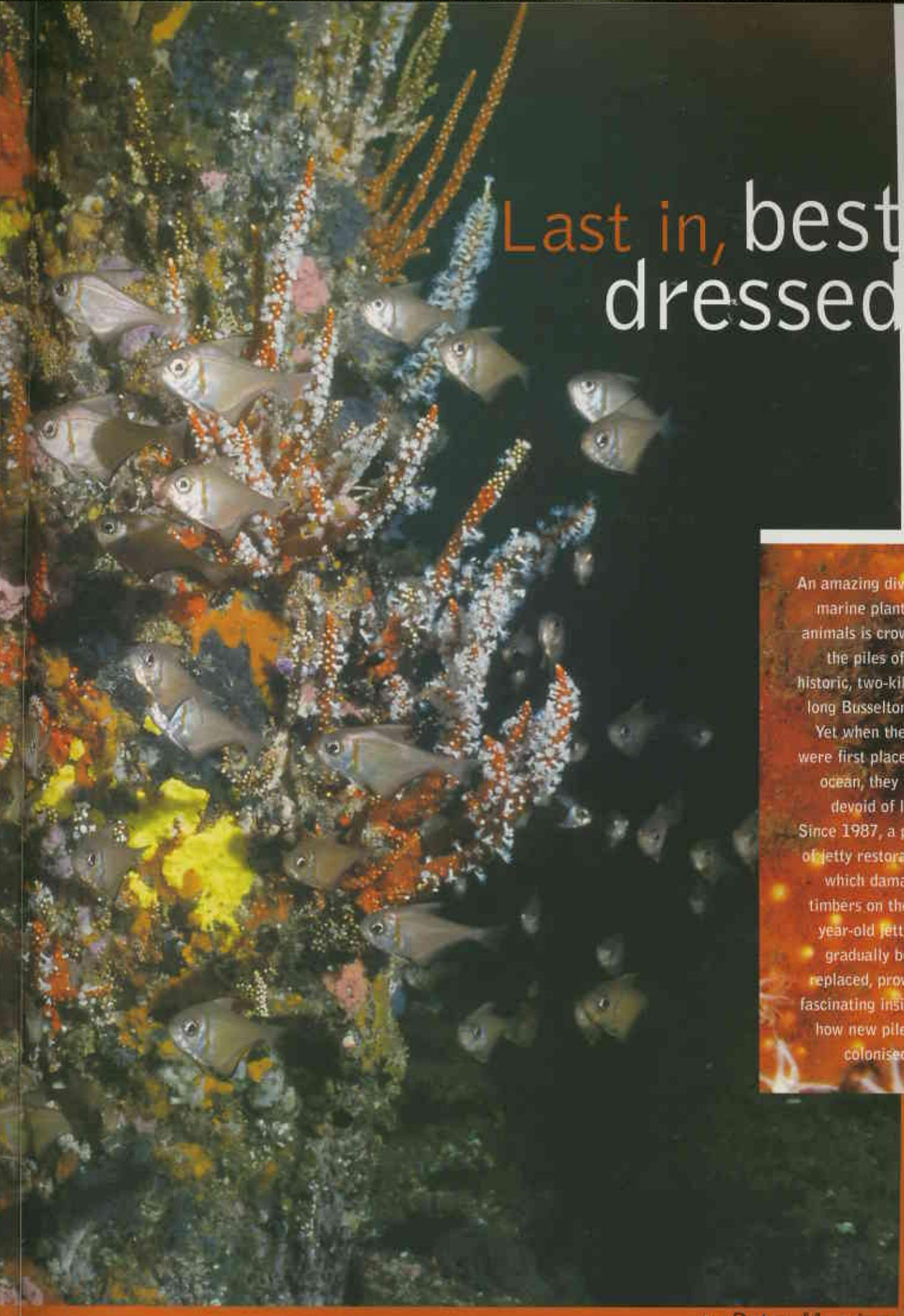


Last in, best dressed

An amazing diversity of marine plants and animals is crowded on the piles of the historic, two-kilometre-long Busselton Jetty. Yet when the piles were first placed in the ocean, they were devoid of life. Since 1987, a program of jetty restoration, in which damaged timbers on the 137-year-old jetty are gradually being replaced, provides a fascinating insight into how new piles are colonised.

by Peter Morrison

Life on the jetty pile is indeed structured. There are differences in species composition and abundance, with water depth and with distance from shore. These differences are primarily related to non-biological effects, such as water movement by tides, turbulence caused by waves and light intensity. Biological effects, such as competition for space, also contribute, but to a lesser degree. So how do these factors influence where plants and animals live on the piles and, ultimately, the structure of the marine community?

TIDES, WAVES AND SUN

Tides cause the upper section of piles near the water's surface to be exposed for varying lengths of time. The small tides in the Busselton area have a maximum range of one metre between high and low tide. Low tide results in the animals being exposed to more extreme temperatures, while the absence of water prevents feeding and breathing. Relatively few animals can survive these harsh conditions. As a result, there is a distinct band on the pile near the surface where barnacles and mussels occur. This upper band between the high and low tide marks is called the intertidal zone, and comprises approximately a one-metre section of the pile. Animals living in the intertidal zone are capable of closing up when the tide goes out and waiting for suitable conditions to return when the rising tide covers them once again.

The advantage that the intertidal animals have is no match for the colonisation capability of other animals in the subtidal zone. The cup corals, with their stinging cells, and encrusting sponges, with their ability to smother other marine life, dominate the interface between the intertidal and the deeper subtidal area.

Waves affect the marine life of the pile in both positive and negative ways. Waves generate currents that flow around the piles, bringing food to the encrusting marine life. Being firmly attached to the piles, sedentary animals must rely on food coming to them in order to survive. Wave action also replenishes oxygen supplies and prevents excessive warming of the shallow waters, by bringing the cooler offshore waters towards shore.

Many animals, such as the soft corals and tangled tubeworms, are delicate and can be damaged or

Previous page
Main: Old pile abundant with life.
Left: New pile.
Photos – Sue Morrison
Right: New telesto coral.
Photo – Ann Storrie

Above left: Intertidal zone at the top of the jetty.
Photo – Sue Morrison

Left: New colony of cup corals.
Photo – Peter Morrison

Right: Old wives (*Enoplosus armatus*) around coral encrusted pillars.
Photo – Ann Storrie

Below right: Cup corals lose their battle for space against an orange encrusting sponge.
Photo – Peter Morrison

dislodged by wave action. Once removed from the jetty pile, they would die on the seabed. These animals are confined to the subtidal zone, where increased depth reduces the effects of waves. The Busselton area is relatively well protected from swell by Cape Naturaliste, and the seas are generally only rough during winter storms. Although the effect of Cyclone Alby (which struck in 1978) on the marine life beneath the Busselton Jetty was not recorded, it is likely that the massive waves stripped most of the soft coral and other delicate animals from the piles, particularly on the seaward-facing side.

Sunlight may seem to be an odd thing to affect marine life, but it is perhaps the most dominant non-biological factor influencing the distribution of plants and animals on the piles. Algal growth on the encrusting marine life, such as sponges, soft corals and sea squirts, leads to smothering, which prevents the animals from feeding and inhibits breathing. Encrusting marine animals are, therefore, no match for the fast-growing algal species. Most encrusting marine creatures living on offshore natural reefs inhabit areas with less light. In shallow water, the preferred habitat is the dimly lit caves or overhangs. In deeper waters, the reduction in available light reduces the ability of algae to grow, allowing animals that require minimal or no light to dominate. The upper surface of the Busselton Jetty provides shading that reduces light levels sufficiently to prevent most algal growth, enabling the encrusting marine life to flourish. But what happens when conflicts arise?

COMPETITION

When a resource is in limited supply, such as space on a jetty pile, the occupants must compete, coexist or perish. Competition can result in one animal growing over the top of another, as is seen with the orange encrusting sponge that smothers barnacles and cup corals. The sponge is able to out-compete most other animals, which are eventually overgrown and perish. The same orange sponge grows on the soft corals, but the two species are able to coexist. Competition for space is readily seen during the colonisation of new piles on the Busselton Jetty.

Barnacles and mussels growing directly on the bare wood dominate the top metre of the jetty pile at the sea surface (the intertidal zone). Just below this zone is a band of solitary hard corals. They are tightly packed together and use their stinging cells to prevent newcomers from establishing. Between the band of hard coral and the seabed is a diverse, densely-packed community of

Left: Giant barnacles add to the relief of the pile.
Photo – Ann Storrie

Below: Blue-spotted goatfish and western king wrasse at the base of a pile.
Photo – Sue Morrison

soft corals, sponges, bryozoans, sea squirts, worms and the myriad of mobile animals that live on them. The bottom metre of the piles, just above the seabed, is generally devoid of encrusting marine life, due to the effects of sand blasting caused by wave action during winter storms.

How does this community structure come about? What is seen on the well-colonised piles is not a result of 'first in, best dressed'. This climax community, divided into distinct zones and dominated by soft corals, sponges and sea squirts, is a result of a lengthy colonisation process and competition for space. But which animals colonise first, and how long does it take for the piles to reach the climax community stage? The ongoing restoration of the Busselton Jetty has provided the perfect record for answering these questions because the piles of varying ages give us a time series.

NEWCOMERS

Consider a new pile as a barren landscape. It is a hard surface, in an environment dominated by soft sand and open water, inhospitable to encrusting marine life. Encrusting marine life cannot just walk along the seabed or swim over to colonise bare surfaces such as new piles. To overcome their lack of mobility, most of these animals reproduce by means of planktonic larvae. These larvae are carried on the prevailing currents, then settle on the piles and begin to develop and grow. It is likely that most newcomers that settle on the piles are progeny of the encrusting marine life on adjacent piles. However, different larvae have different preferences. Some newcomers like the bare wood, some do not like the CCA (copper-chromium-arsenic) treatment applied to the piles,

Right: New orange tubular bryozoan colony—one of the first species to grow on the bare wood.
Photo – Sue Morrison

Far right: Purple barnacles take up spaces not occupied by bryozoans.
Photo – Peter Morrison

Below right: Blue-throated sea squirts begin as an individual but expand into colonies.
Photo – Sue Morrison

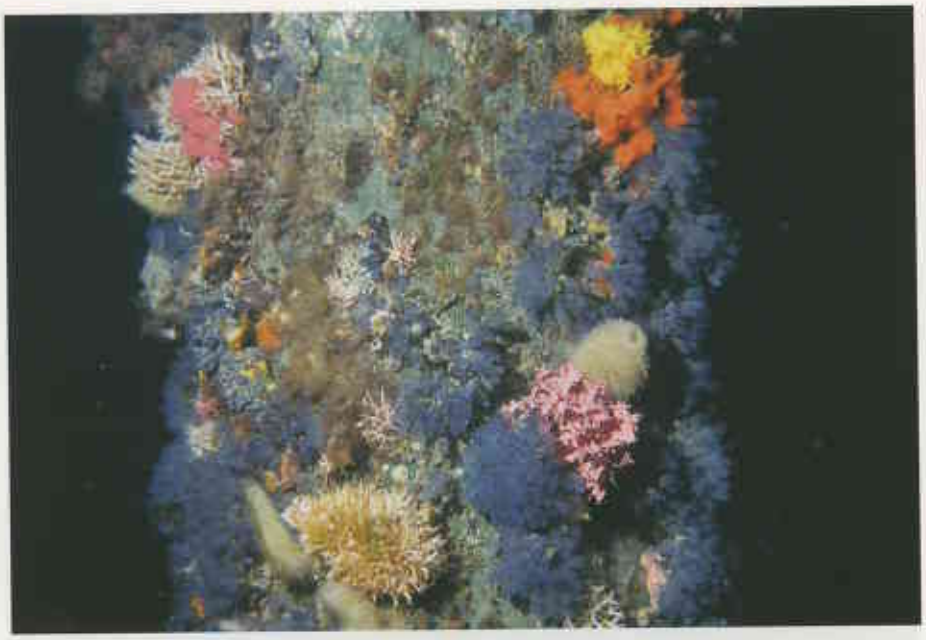
Bottom right: Orange-throated sea squirts.
Photo – Peter Morrison

while others prefer to grow on the remains of other marine creatures. These preferences affect the timing and rate of colonisation by the encrusting marine life.

Divers who happen upon a pile that is less than two years old will, at first, think it is devoid of life and probably swim by in search of something more interesting. In fact, closer inspection will reveal flat, brownish-orange patches—the beginnings of the orange tubular bryozoan (*Schizoporella subsinuata*). This bryozoan is one of the first animal species to colonise the piles, and is equally happy growing on untreated or treated piles. At around the same time, purple barnacles (*Tetraclitella purpurascens*) begin to attach and grow, until their small conical bodies dominate surfaces of the pile not already occupied by bryozoans. Shortly after the bryozoans and barnacles have become established, blue-throated sea squirts (*Clavelina moluccensis*) and orange-throated sea squirts (*Stomozoa australiensis*) begin their colonisation. These species start off as an individual sea squirt and, over the first few years of colonisation, develop into circular masses of several hundred animals.

SURFACE GROWTH

After three or four years, the growth on the surface of the pile is beginning to hide the bare wood and give it a roughened appearance. The greenish colour of the treated timber has faded due to leaching, and the blue-throated sea squirts provide a bluish tinge. During the next few years, there is an influx of small cup corals (*Culicia hoffmeisteri*). Like the blue-



throated sea squirts, they start off as individuals, but then divide and fan outward in branching lines to cover the pile in densely-packed colonies. At the same time, giant barnacles (*Austromegabalanus nigrescens*) and blue mussels (*Mytilus planulatus*) attach to the pile. These animals are larger than most of the earlier pioneering species, and add to the relief of the pile surface. A fine white filamentous growth can be seen at this time, which, over the next few years, forms the delicate orange or yellow ball-like colonies of tangled tubeworms (*Filograna implexa*). Perforated leaf-like growths of the lace coral bryozoan (*Triphyllozoon moniliferum*) form between the ever-growing colonies of sea squirts and tangled tubeworms. In time, this flattened shape will grow and project outward to form a colony resembling a frilly Christmas tree ornament. Another coloniser of the remaining spaces is the rose sponge (*Dendrilla rosea*). This sponge grows slowly but is not out-competed for space, nor does it dominate neighbouring species.

Unlike the rose sponge, the orange encrusting sponge (*Hemimycale* sp.) colonises and begins to spread like a carpet over other species. The stinging cells of the cup corals, which deter most other species from getting too close, are no match for the encrusting orange sponge. The subtidal barnacles also succumb to the marauding sponge. However, all is not lost for the cup corals and barnacles, as those in and adjacent to the intertidal zone, closer to the sea surface, are spared.

SEVEN YEARS ON . . .

The colonisation of the pile continues, with the growth of various colonial species and the addition of many more or less conspicuous species such as mobile marine animals. Flatworms, crabs, shrimps, sea slugs, snails, urchins, sea stars and small fish find sufficient food and shelter to become permanent members of the developing community. The pile, now approximately seven years old, has such an attractive colour and texture that some divers stop and take notice. However, a member of the pile community is still missing—one that is extremely attractive to divers and underwater viewers alike—the telesto soft coral (*Carijoa* sp.).

Telesto coral is one of the last conspicuous encrusting marine organisms to colonise the piles. Tiny individual polyps begin to appear, growing from a tangled mass of cream or orange branches that are rooted into the pile. Once it is established, the telesto colony grows rapidly into finger-like projections adorned with numerous snowflake-like polyps and a

Top left: Intermediate stage of pile, lacking the attractive telesto soft coral.
Photo – Sue Morrison

Above left: Lace coral bryozoans form colonies resembling Christmas tree ornaments.
Photo – Ann Storrie

Left: Mobile marine animals, such as this pink sea star, feed on the encrusting invertebrates.
Photo – Sue Morrison

veneer of orange encrusting sponge on the stems. The telesto colonies branch and grow, and within a few years this species is the dominant member of the pile community. It is not known for sure why it takes so long for the telesto corals to develop, when the artificial reef made by scuttling the former HMAS *Swan* had well-developed colonies within two years. It may be that telesto corals are fussy about the surface on which they grow, finding metal and natural reef preferable to wood. Perhaps the CCA treatment on the timbers inhibits their development, with colonisation only possible when the chemical has leached out or is covered by other less sensitive marine life. An interesting study awaits an eager young scientist's efforts.

The jetty pile community, once established, attracts the attention of all who view it, be it while diving or snorkelling, by gazing through the windows of an underwater observatory, or even while looking at still or video images taken by photographers. The marine life adorning the piles of the Busselton Jetty is part of a dynamic community. Nothing is static and there are always changes taking place. Some animals are eaten or die, others are knocked off, and the unoccupied space is quickly taken up by neighbouring colonies or colonised by new species. The only constant in the marine community of the jetty is change.

Above right: Sea cucumbers feed at night on the jetty pile.
Photo – Sue Morrison

Right: The telesto coral is a dominant member of the mature jetty pile community.
Photo – Ann Storrie

Peter Morrison is the Executive Marine Scientist at Sinclair Knight Merz. He has co-authored a book on the marine life of the Busselton Jetty with Ann Storrie and Sue Morrison due to be published by the Department of Conservation and Land Management next year. Peter can be contacted on (08) 9268 4586.

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LANDSCOPE

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The first stage of a long-distance mountain bike trail, that will ultimately lead from Mundaring to Albany, is now open. See page 49.

Discover the underwater wilderness of the Geographe Bay, Leeuwin-Naturaliste, Hardy Inlet area, a potential marine conservation reserve, on page 18.

Little was known about the distribution of the dalgyte, or bilby, in the south-west forests until scientist Ian Abbott interviewed old timers. Turn to page 28.

Older piles of the Busselton Jetty are crowded with marine life, but it was not always so. How do marine animals gradually colonise the piles? See page 34.

The Stirling Range National Park experiences many extremes of weather, from snow falls to bushfires. Find out why on page 10.

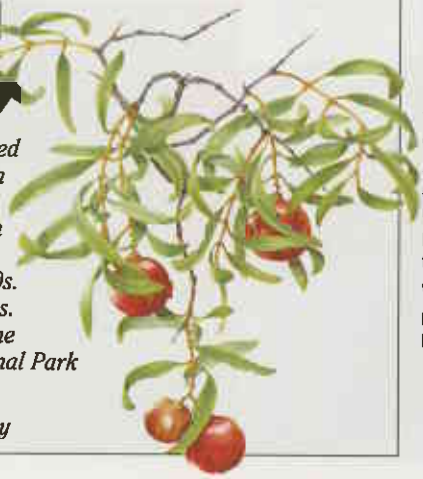
FEATURES

REGULARS

COVER

Quandong (Santalum acuminatum) *is one of the most widespread plants in Australia. This small, upright tree is most easily recognised by its bright red fruits, which are edible and also contain a nutritious nut. It belongs to the same genus as the famous sandalwood, which was one of Western Australia's major exports in the late 1800s and early 1900s. Members of this genus are root parasites. Quandong grows in dense stands in some areas within the Woodman Point Regional Park (see story on page 42).*

Cover illustration by Philippa Nikulinsky



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