21 The wrasses

Geoff Jones

DIVERSITY

Rocky-reef fish communities owe their greatest diversity in form and colour to the wrasse family (Labridae). More than 90 species have been recorded in temperate Australian waters, ranging in size from the smallest and rarest species, *Pictilabrus brauni* with a maximum size of only 9 cm, to the Western Blue Groper (*Achoerodus gouldii*) which can reach 1.75 m. Several of the larger wrasses are commonly referred to as 'groper' because of their size, even though they are not related to true gropers (family Serranidae). The wrasses that are most typical of temperate waters belong to the genus *Pseudolabrus* and five other closely related groups whose distributions are centred in Australasia. An example is the Crimson-banded Wrasse (*Notolabrus gymnogenis*), one of the most abundant rocky-reef fishes in New South Wales; the males possess characteristic bright crimson fins and may reach 48 cm.

Temperate waters also harbour a small number of species that belong to essentially tropical genera, such as *Coris* and *Halichoeres*. The brightly coloured Combfish (*Coris picta*) is common on coastal reefs of New South Wales. In addition to these resident species, individuals of tropical species such as the Moon Wrasse (*Thalassoma lunare*) can occur at Rottnest Island and the Solitary Islands when the Leeuwin and East Australian Currents carry larvae south. Although juveniles of these species can be seen over the summer months, they seldom survive their first winter.

Unlike their tropical relatives, many temperate wrasse species are found only in Australia and have relatively small geographic ranges. Only a few species, such as the Senator Wrasse (*Pictilabrus laticlavius*) and the Maori Wrasse (*Ophthalmolepis lineolatus*) can be found right across southern Australia. A small number of eastern species can also be found in New Zealand, such as the Luculentus Wrasse (*Pseudolabrus luculentus*) and the Purple Wrasse (*Notolabrus fucicola*). Perhaps the species with the widest distribution is the Inscribed Wrasse (*Notolabrus inscriptus*), which is common on temperate offshore

Crimson-banded Wrasse are common on coastal reefs near Forster, New South Wales. *Ken Hoppen*

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Combfish, a subtropical species found as far south as Cape Howe. Seal Rocks, New South Wales. *Rudie Kuiter*

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Maori Wrasse, one of the few wrasses found throughout temperate Australia. Sydney, New South Wales. *Kelvin Aitken*

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A male Purple Wrasse. *Rudie Kuiter*

islands from Lord Howe Island to Easter Island.

Within Australia, most species are restricted to either the eastern or western coasts, and in some cases, there are sister species on each side of the continent; for example, the Eastern Blue Groper (*Achoerodus viridis*) and the Western Blue Groper (see Chapter 22). Even within regions there can be distinct changes in the common species. For example, in New South Wales the Crimson-banded Wrasse predominates, but is replaced by the Blue-throated Wrasse (*Notolabrus tetricus*) in Victoria and South Australia, and the Brown-spotted Wrasse (*Notolabrus parilus*) in Western Australia. These distributions give the reefs of different regions characteristic mixtures of wrasse species. Wherever you are, there will be many wrasses and at least one wrasse species that is among the most abundant fishes on rocky reefs. The species with the smallest geographic ranges appear to be those associated with subtropical latitudes (eg, Seven-banded Wrasse, *Thalassoma septemfasciata*, which can be found in Western Australia between Rottnest Island and Coral Bay).

WHY WRASSES ARE SUCCESSFUL?

There are many reasons why wrasses have become such a dominant part of temperate-reef fish communities. They share with many other reef fishes a highly successful life history involving both a larval and an adult stage. When adults spawn they release their eggs and sperm directly into the water, usually a few metres above the reef. A fertilised egg develops quickly into a plankton-feeding larva that is capable of moving great distances. This life history pattern is successful because it allows adults to cast their offspring over a broad area, ensuring some will find suitable habitat. If a larva just passively drifted in the water currents it is likely that it would be carried a long way from its home reef. However, fish larvae are active swimmers although it is not known whether they use this swimming ability to migrate or just maintain their position in currents that move them around. Wrasse larvae are in the plankton between 20 and 50 days, after which they seek out and settle back into suitable reef habitat. At this stage they may only be 1 cm in length and undergo dramatic morphological transformations. Juveniles look very similar to the adult fish, although in some groups there is a distinctive juvenile colour phase (eg, the Half and Half Wrasse, *Hemigymnus melapterus*). Adult females produce millions of eggs and although mortality through the larval stage is extremely high, a small number usually survive to replenish reef populations throughout their range.

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Inscribed Wrasse, Bermagui, New South Wales.
Rudie Kuiter

Another reason for the success of the wrasse family must surely be their flexibility in habitat use and diet. They are known to occupy all reef-associated habitats, including kelp forests (eg, the Senator Wrasse), red and green algal-turf areas (eg, Rosy Wrasse, *Pseudolabrus psittaculus*, in Victoria), seagrass beds (eg, Brownfield's Wrasse, *Halichoeres brownfieldi*, in Western Australia), sea urchin Barrens Habitat in New South Wales (eg, Crimson-banded Wrasse) and even sandy habitats adjacent to reefs (eg, Maori Wrasse). Individual species are not necessarily confined to any one of these habitats. Juveniles of the Purple Wrasse for example settle out into the fronds of large brown algae in shallow water but as they grow they move into deeper water and become associated with open areas of reef. Larger species may be capable of moving between habitats on a much broader scale. An example is the Eastern Blue Groper, which is known to recruit as juveniles into seagrass beds within shallow estuaries and move out to exposed rocky reefs where they spend their adult life (see Chapter 22).

All temperate wrasses are carnivores, their flexible and powerful jaws mean that they are capable of consuming almost every kind of

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Blue-throated Wrasses, are important predator on temperate rocky reefs. Kangaroo Island, South Australia.
Rudie Kuiter

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A Brown-spotted Wrasse, Rottnest Island, Western Australia.
Barry Hutchins

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A Crimson-banded Wrasse eating a Blacklip Abalone. Montague Island, New South Wales. *Rudie Kuiter*

invertebrate associated with rocky reefs, from minute copepods to lobsters. Latge species can crush the shells of molluscs, including turban shells and abalone and mussels (bivalves), which affords them access to an abundant and energy-rich supply of food. Adults of most species can have quite specialised diets. For example, large Purple Wrasse specialise on different mollusc species at different locations and variation in diet can be determined by individual preferences. Despite their apparent specialisation, wrasses are also opportunists and consume almost any animal food when it is available.

All juvenile wrasses, regardless of their ultimate diets, consume small, relatively soft-bodied crustaceans, mainly copepods and amphipods. These small crustaceans are probably the most abundant animal food source on rocky reefs, living in the fronds of kelp plants or sheltering in the carpets of algae. These animals increase in abundance over summer at the same time that most juvenile wrasses settle out of the plankton into the reef environment. Amphipods tepresent such a rich source of food that many herbivorous fishes actually feed on them when they first take up residence on the reef.

A unique specialised feeding mode called 'cleaning behaviour' has atisen in the wrasse family, although it is more prevalent in tropical reef communities. Some wrasses feed entirely on skin parasites living on other fishes. Individuals of the Cleaner Wrasse (*Labroides dimidiatus*) spend their time picking over the bodies of larger fishes that visit their 'cleaning stations'. They are known to swim between the gill clefts and the mouth, removing parasites that have infested the gills. Other species, such as the Rosy Wrasse, appear to regularly clean other fishes, although it is a minor part of their diet. While individuals of these two species may clean throughout their lives, others appear to exhibit cleaning behaviour only as juveniles (eg, Comb Fish, Eastern King Wrasse, *Coris sandageri* and the Crimson Cleaner Wrasse, *Suezichthys aylingi*. Cleaning behaviour is often associated with species that have a dark line running along the body, which appears to advertise their services. In the Eastern King Wrasse and the Crimson Cleaner Wrasse individuals appear to lose the dark stripe as they grow into adults and adopt a different mode of feeding.

GROWTH AND AGE

Wrasses in southern Australia generally grow considerably faster than their tropical relatives. Even when food is in short supply, rather than starving to death, individuals simply reduce their growth rate. When food is abundant they appear to grow faster and put more energy into the production of eggs. Length of life is also extremely variable, with small species such as the Blue-throated Wrasse living only seven years in South Australia and to 11 years in Tasmania. The Purple Wrasse lives to 17 years in Tasmania, but has been aged at up to 25 years in southern New Zealand. Thus they appear to have adopted a life history capable of responding to a wide range of environmental conditions, with a tendency to grow slowet and live longer in cooler waters.

REPRODUCTION

Wrasses have perfected one of the most bizarre patterns of reproduction in the animal kingdom. Individuals in most species begin life as females and change sex to become males later in life. Associated with this sex change is a bewildering array of colour changes and behaviours. This life history pattern, called 'protogynous hermaphroditism', can be found in othet fishes (eg, true gropers), but it is

among the wrasses that the greatest diversity of sex change patterns can be observed. The most obvious change associated with the change from female to male in most species is a change in colouration and usually, the male is more colourful than the female. Dramatic colour changes do not come with sex change in all species. For example, males and females of the Black-spotted Wrasse (*Austrolabrus maculatus*) are extremely difficult to distinguish. In most other species, however, there are distinctive male and female body markings. Sex change in some of these 'sexually dimorphic' species (eg, the Western King Wrasse, *Coris auricularis*) is always associated with the external change in colour from female to male.

However, this is just the beginning of the diversity in patterns of reproduction. Sex change can become so complex that there is little relationship between the colour phase and the sex of an individual. Although females never exhibit male coloutation, the reverse is not true. In some species, a small number of individuals may be born as males, but through their early life adopt female colouration (eg, Brownfield's Wrasse). In others, a small number of females change sex very early in life but retain the female colouration (eg, Brown-spotted Wrasse). In both these species, when fish change from female to male, they change to the normal male colouration. This means that there are two kinds of males — males that look like females and males that look like males. These two kinds of males exhibit different modes of reproduction. Male-coloured males are usually large, aggressive individuals that defend territories from other males. They tend to actively court females and usually spawn with a single female. In a typical 'pair' spawning run, the female and male swim rapidly upwards, with the abdomens pressed together, and release eggs and sperm into the water above the reef. Female-coloured males, however, tend to exploit the behaviour of the larger males. Using their female disguise they can enter spawning areas, approach pair-spawning fish and join in pair-spawning runs. This behaviour is called 'streaking' for obvious reasons. Females never pair-spawn with female-coloured males. However, groups of female-coloured males are known to harass females into spawning, particularly in species that have a large number of small males. Bands of males adopting this spawning mode are known as 'sneakers'.

The related mysteries of why fish change sex from female to male and why this diversity of patterns in sex change has arisen have not been solved. There is no genetic difference between males and females in these fishes, as there is in many other animals. Also, there are very few morphological differences apart from colour between males and females. Male and female gonads are simply paired structures that either produce eggs or sperm and appear to be able to change from producing one type of gamete to the other with relative ease. However, this does not explain why they change sex. The answer appears to relate to the mating system. In most species a small number of large males dominate the rest and spawn with many different females. A large male has a higher reproductive success than a female of the same size because he can mate with many females, and small males do not get to breed at all except via the subversive tactics described above. A small female has a higher reproductive success than a similar-sized male. You can see then that over a lifetime, if an individual can be female when small and change into a male when it is capable of breeding with many females, it will ultimately produce more offspring than individuals that remain as either females or males. In the course of evolution, this asymmetry in the reproductive potential of males and females has meant that sex change has

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Combfish cleaning White Ears at a 'cleaning station'. Montague Island, New South Wales. *Rudie Kuiter*

replaced the pattern of reproduction we might consider normal. Although sex change from male to female is also known in some fishes, it occurs in a much more restricted set of circumstances.

But why then do some species have small, female-coloured males? The answer appears to be because in some environments, large males cannot completely exclude all small males from spawning. While it is always an advantage to be male rather than female when large, some individuals can achieve equivalent reproductive success to females when they are small,by adopting the various sneaker–streaker behaviours that I have described. In some species, such as the Purple Wrasse, all fish are born as females, but most sex change occurs *before females reach sexual maturity*. These species have essentially returned to a 'normal' system in which individuals spend all of their reproductive life as either males or females (a situation referred to as 'secondary gonochorism'). In Purple Wrasses, females may spawn with 20 or more males who aggregate at high-current areas on the reef.

CONCLUDING REMARKS

So few temperate wrasse species have been studied in detail that much of the diversity in ecology and life history remains to be described. The role played by wrasses as consumers of invertebrates on rocky reefs is likely to be extremely important. An increase in the abundance and average sizes of wrasses inside Marine Protected Areas is testimony to the impact that fishing is having on this group. The indirect effect of the exploitation of wrasses on invertebrate communities has yet to be determined. Populations of recreationally and commercially important species, such as the large and long-lived blue gropers and the Baldchin Groper (*Choerodon rubescens*), have been severely depleted in the past. At present, management strategies, such as Marine Protected Areas, bans on harvesting and minimum size limits, may maintain populations at current levels. However, these unique fishes should be closely monitored so that we can respond to future pressures and ensure their conservation in the long term.

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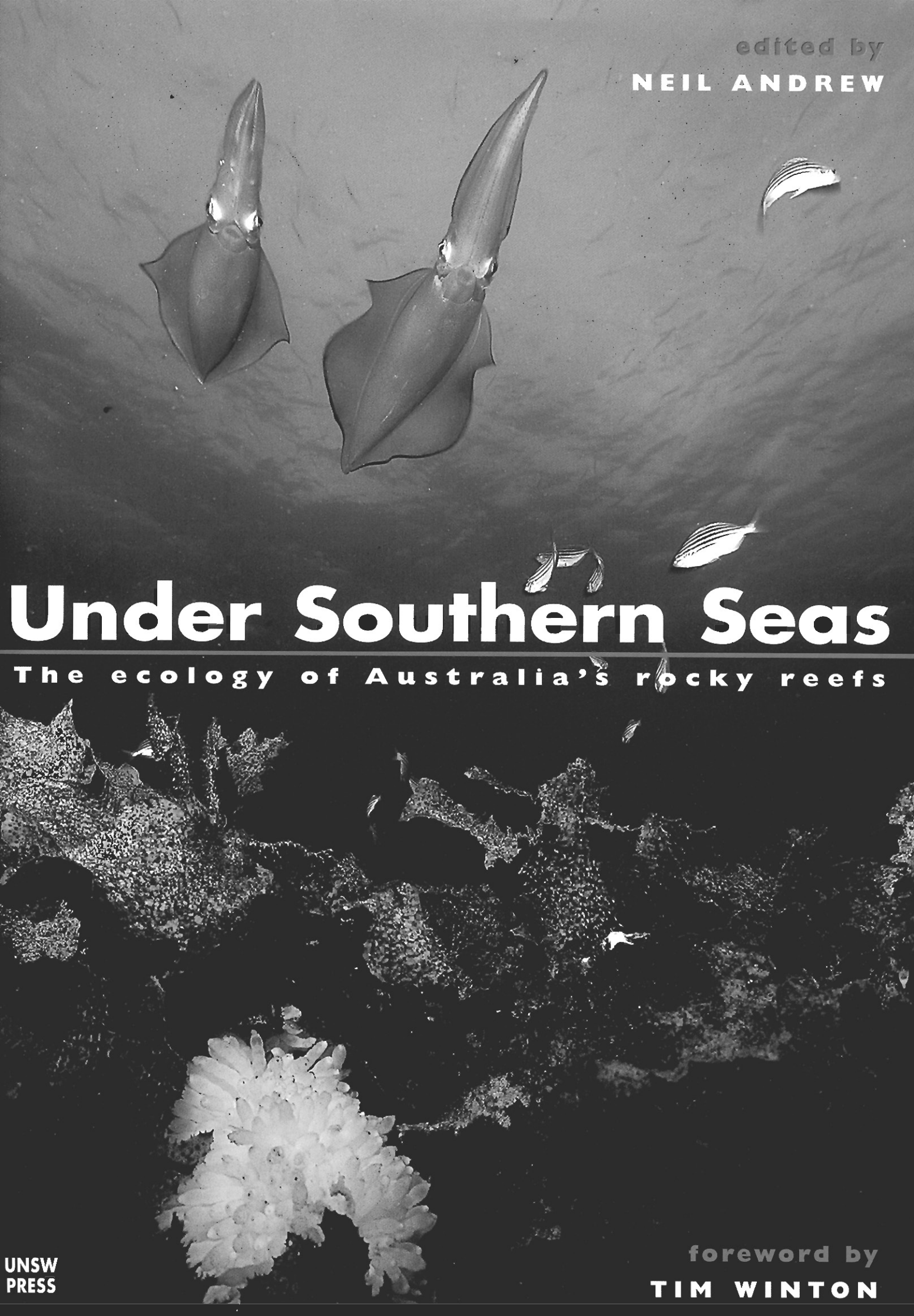
Male Western King Wrasse are common on reefs in Western Australia. Rottnest Island. *Barry Hutchins*



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NEIL ANDREW

Under Southern Seas

The ecology of Australia's rocky reefs

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TIM WINTON

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