Stephen Burnell

Populations of southern right whales have climbed rapidly since hunting of the species was outlawed in 1935 by the League of Nations.

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by Bob Beale

Big things are stirring in the Southern Ocean. Indeed, they don't come any bigger than whales. And many observers are delighted that lately these huge marine mammals have been stirring Australian waters more than they have for most of this century. It is now beyond doubt that the local populations of several whale species are staging extraordinary recoveries after being hunted to the verge of extinction.

Southern right whales and humpback whales, for example, are now enjoying baby booms so large and rapid that scientists are for the first time starting to believe that a total recovery of their numbers is possible, and probably within the lifetimes of many people reading this article. If that happens, their protection will stand as one of the most significant conservation successes of the 20th century. Other species that don't so readily frequent coastal waters are notoriously difficult to observe and count, but there are early signs that some other whale populations are increasing as well in other parts of the world.

The numbers tell their own remarkable tragedy-to-triumph story. Southern right whales, for example, are thought to have numbered about 30 000 in Australian waters before a commercial whaling rush began on the species in 1830. One hundred years of slaughter is thought to have left fewer than 100 of the animals alive, perhaps with as few as 20 adult females among them.

Hunting of the species was outlawed in 1935 by the League of Nations. But virtually none were seen in Australian waters between 1900 and 1955, when a lone female was noticed with her calf in a sheltered bay near the former whaling port of Albany in Western Australia, notes Dr Stephen Burnell, a whale researcher at Sydney University.

Their numbers have since climbed rapidly, apparently after whalers from the former Soviet Union stopped secretly killing them. The latest aerial surveys and reports of sightings suggest that the population has now soared to about 1000 and is doubling every decade. That lusty growth rate would see the species approaching its original population size by about 2050.

The story of the southern right whale mirrors that of the humpbacks that migrate up and down Australia's east and west coasts each year. Commercial killing of humpbacks was banned by the International Whaling Commission in 1966. By that time the population of the western group was down from about 25 000 to about 1000, and the eastern group had contracted from more than 20 000 to less than 500, according to Peter Gill, an independent marine biologist and writer with a special interest in whales.

Again, the Soviet factory ships kept taking them – and many others from the northern hemisphere populations as well – for some years after the ban was imposed, as Soviet whaling records revealed when they were publicly released in 1994

The original global population of 125 000 humpbacks is thought to have been cut by as much as 95%. Tens of thousands of them were killed between 1949 and 1972. Since then, however, humpbacks everywhere have started to rebound in number.

Numbers in the North Atlantic have reportedly risen to between 10 000 and 12 000. The North Pacific population had fallen to below 2000, but now stands at between 5000 and 8000.

Likewise, more than 5000 humpbacks are now migrating annually along the western Australian coast and more than 3000 along the eastern coast. Their numbers are increasing at the rate of about 10% a year and they will soon reach their original population sizes if that rate of increase is sustained, notes Professor Michael Bryden of Sydney University. Bryden has been involved for many years in monitoring both species, together with former postgraduate students Miranda Brown, Stephen Burnell, Peter Corkeron and Robert Slade.

'If they are left alone and are genuinely protected there's every reason to be optimistic that will happen,' Bryden says.

The recent declaration of a marine park embracing the southern right whale breeding grounds at the head of the Great Australian Bight is a significant source for hope for that species, he believes.

For humpbacks, new legislation and codes of practice enacted by some state and federal authorities for whale-watching tour operators is raising hope that those animals will also remain relatively undisturbed in their tropical breeding grounds. But humpbacks typically make a round trip of about 9000 kilometres each year, leaving open many possibilities for disruption from human activities.

Both species benefit from the comparatively unspoilt waters in their summer feeding grounds. After calving and mating around the Australian coast in the winter, humpback and southern right whales head south to feed in sub-Antarctic and Antarctic waters, which suffer little pollution, have sparse shipping and are relatively free of competition from commercial fisheries.

By contrast, the northern right whales that migrate seasonally along the east coast of North America still number only about 300. Their recovery has been thwarted by pollution, collisions and disturbance from heavy shipping traffic and overfishing of some of the food stocks on which they depend.

Bryden cautions that recovery is not assured for the Australian species. Human activities still pose possible indirect threats through marine pollution, global warming, increasing collision risks and noise pollution from commercial and recreational shipping traffic and exploitation of Southern Ocean krill and fish stocks.

Nevertheless, thanks to the conservation measures already in place their prospects for long-term survival are far, far better at the close of the century than they were at its start.

Unique behaviour

These amazing comebacks are proving to be a boon for science. As records and observations of whale behaviour grow, more and more details of their life cycles are starting to be amassed and a much better understanding of their biology is emerging.

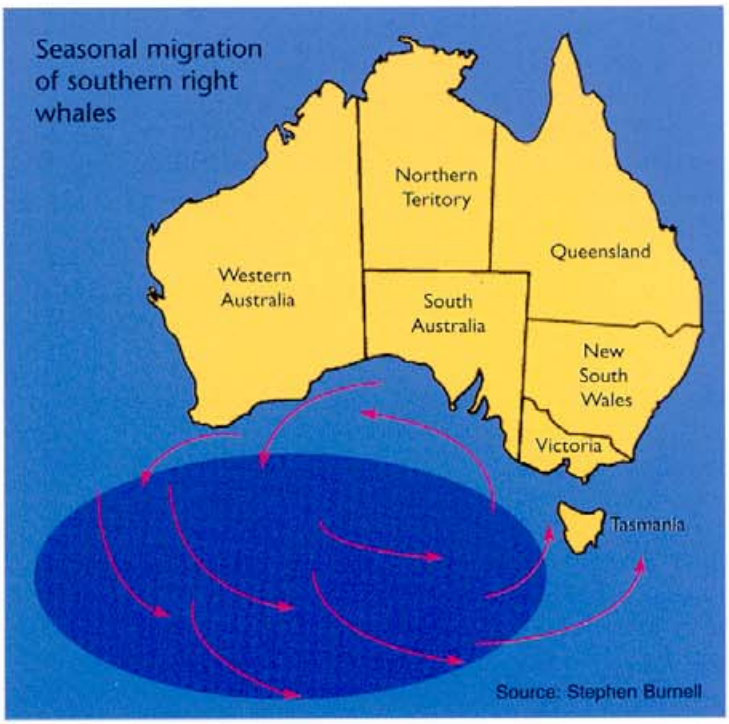
Burnell has now been able to photograph and identify more than 400 different southern right whales by recording the distinctive white callosites on their heads, which form unique patterns on each individual.

Working with a former Sydney University computer engineering student David Shanahan, Burnell uses a computer-assisted recognition system to quickly match those callosities with his photographic records, a process similar to the one police computers use to match and identify fingerprints.

Other researchers have been likewise photographing individual humpbacks – many of which can be identified by characteristic fin shapes and body markings – and recording the extraordinary songs they sing on their migrations.

Since both species breed close to shore, where observation is relatively easy and predictable, their reproductive behaviour is one of the first facets of their lives that is becoming better understood. But many important details remain unknown.

Stephen Burnell



Above: A summary view of the predicted seasonal migration of right whales. The darker blue area represents likely feeding grounds.

Left: After calving and mating around the Australian coast in the winter, humpback and southern right whales head south to feed in sub-Antarctic and Antarctic waters.

Below: A humpback whale in Antarctic waters, south of Western Australia. Humpbacks somehow locate scattered krill swarms in vast areas of icy ocean during the productive Antarctic summer.

Peter Gill

It is increasingly clear, though, that a key reason for their recovery lies in the ardent interest most whales and dolphins have in sex. Much of what has been known until now about whale and dolphin sexual behaviour is based on observations of captive animals, and so may not be fully representative of such behaviour in the wild.

Whales are thought to have little or no sense of smell – their nostrils have evolved to become the well-known blowholes on top their heads – so sound, sight and physical displays are important components of their social behaviour. Whales may interact by chasing, rubbing and nuzzling each other, or by releasing streams of bubbles, calling, slapping the water surface with their flippers or tails and even making spectacular breaching leaps into the air.

Burnell's nine years of field observations mean that he has now been able to witness many southern right whale courtships and matings.

Both male and female southern right whales seem to be prepared to mate as often and as promiscuously as possible, he says. Females do not seem especially choosy about which males they mate with, suggesting that the business end of natural selection in this case takes place among what must be billions of sperm introduced by multiple males into her reproductive tract.

He has seen female right whales apparently willingly copulate with each member of large group of males, with no sign of the coercion that male dolphin and dugong groups sometimes exert on females.

'On one occasion I saw 13 whales in a group and only one of them was female,' he says. 'She was rolling around and repetitively mating with all the males for hours on end. She seemed to be making no effort to get away.'

The extraordinarily large genitals of the male southern right whale strongly suggest that they depend on being able to produce and deliver prodigious amounts of sperm as often as possible.

Bryden believes a large and socially dominant adult male southern right whale might copulate literally hundreds of times each season. By comparing data with other observers, Burnell has confirmed that some males are prepared to travel far and wide in search of sexual opportunities. They have been recorded separately at sites thousands of kilometres apart around the Australian coast in the one breeding season, seeking out mating opportunities with the much more sedentary females, who tend to return to the same sheltered bays and inlets each winter.

For humpbacks, a very different social etiquette has been observed. The acrobatics of this species make them favourites for whale-watching – seeing 50 tonnes of whale come steaming vertically out of the sea and crash back down in a spectacular spray of foam is unforgettable – but such activity is unlikely to be merely for show.

Male humpbacks seem to be far more aggressive towards each other than their southern right whale counterparts. While there have been suggestions that their famous song may be a form of display of sexual or social status, their sometimes fierce physical combat leaves little doubt that they are typically competitive mammals. For this species at least, that conclusion flies in the face of the so-called New Age view of whales as enlightened gentle giants.

Many non-breeding females do not bother to make the full migration to warmer waters every winter. Gill says genetic studies of northern and southern humpbacks have shown that up to 70% of the migrating animals are males.

A migrating female is often accompanied by a male, known as the principal escort. He will drive off other males that approach too closely and their clashes can do serious damage. Forceful charges, shoving, bumping and tail-lashing can leave the rival combatants bruised and bloodied – an encounter with the encrustations of barnacles on their skin must be a bit like being scraped with a cheese-grater.

One study of the reproductive anatomy of the baleen whales – the name for the 10 or so species that feed by gulping vast quantities of seawater and straining out small fish and crustaceans – revealed that the genitals of the male humpbacks are much smaller than those of the southern rights. The study was based on measurements recorded in scientific journals and in whaling station records.

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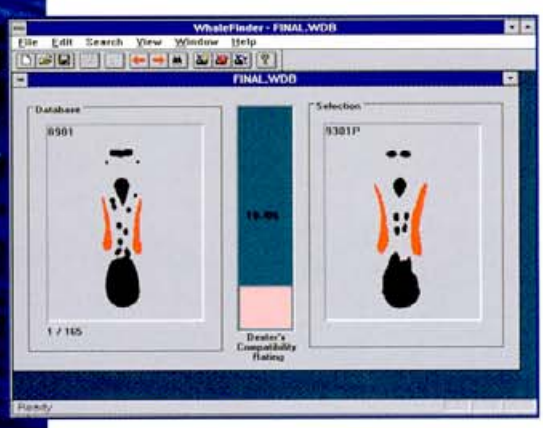

Stephen Burnell has identified more than 400 southern right whales by recording the distinctive white callosites on their heads. A computer-assisted recognition system is used to quickly match those callosities with photographic records.

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Peter Gill

Right whales and humpback whales have evolved different reproductive strategies.

Left: The southern right whale relies on promiscuity and intense sperm competition. Adult males are well-equipped for the task with testes weighing almost a tonne and a penis of 2.5 metres.

Below left: When competing for mates in tropical breeding waters, groups of male humpback whales engage in physical battles which may last for hours. The victor wins the right to accompany the female for mating.

Abstract: Whale species are staging extraordinary recoveries after being hunted to the verge of extinction. Southern right whales may approach their original population of 30 000 in Australian waters by 2050. Populations of humpback whales are expanding in the North Atlantic, North Pacific and off Western Australia. The relatively clean and remote southern feeding grounds of Southern Hemisphere whale populations are aiding the recovery. As whale numbers increase, their reproductive behaviour is becoming better understood. Promiscuity and intensive sperm competition appears to be the reproductive strategy of the southern right whale. In contrast, male humpbacks fight aggressively to monopolise the females. Occasional sightings are made of blue whales in southern waters, but there is no firm evidence of a rise in their numbers since whaling ceased.

Keywords: whales, northern right whale, southern right whale, humpback whale, wildlife conservation, populations, migration, identification, reproductive behaviour, reproductive organs.

In combined weight, an adult male southern right whale's testes weigh an average of almost a tonne. Its penis, at 2.5 metres, is thought to be the largest in the animal world (whale genitals are retained internally in the abdominal cavity, with the penis normally retracted in a bent S-shape until it becomes erect).

A humpback male's penis is 1.3 metres long, but its testes have a combined average weight of only 38 kilograms, or more than 20 times less than those of the southern right. These are thought to be highly significant anatomical traits in terms of understanding the different reproductive strategies of the two species. The observations may even help shed light on why ancestral human males evolved a relatively large penis and testes compared with those of most of the closely related apes.

Evolutionary theory suggests that males will compete to father as many offspring as possible. They can do so by monopolising females and keeping other males away, or by mating with females that have already mated with other males and displacing their sperm.

'In species where males compete primarily through sperm competition, females commonly copulate with more than one male, male-male interactions are not highly aggressive, and males have relatively large testes and long penises,' the study noted.

'In species where males compete primarily by monopolising females and preventing other males from copulating with them, females commonly copulate with only one male, male-male interactions are often highly aggressive, and males have relatively small testes and shorter penises.'

So all the evidence so far suggests that reproductive success for male southern right whales is determined by intense sperm competition, while male humpbacks have taken the monopoly route.

In turn, those differing breeding strategies have helped to shape the whales' anatomy and social lives in ways every bit as important as their other adaptations to life in the sea.

Either way, we can be thankful that both seem to be highly successful and that if their numbers continue to recover we can expect to learn much more about these big and mysterious mammals of the sea.

More about whales

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