

Science is on the side of sanctuaries

Save Our Marine Life – June 2011

Marine sanctuaries delivery in 2011

When marine scientists Graham Edgar and Neville Barrett began their monitoring of four small Tasmanian marine reserves—Maria Island, Governor Island, Ninepin Point and Tinderbox—they expected to see marine life rebound after fishing was removed.

What surprised them was the level of recovery—it was far higher than predicted. They concluded that fishing had reduced ocean life abundance to below what they had previously thought, and that their estimates of what lived there before fishing began were too low.

Edgar and Barrett's pioneering work in Tasmania's temperate waters was carried out in the 1990s. Since that time and over the past decade the scientific support base for marine sanctuaries has grown—rapidly.

So much so that in 2011, the year in which the Australian government will make far-reaching decisions about the protection of Australia's oceans, those decisions can be made in the knowledge that science is on the side of the sanctuaries.

In the coming year the Australian government will identify networks of Commonwealth marine reserves, which will include sanctuary zones, beginning in the South-west Marine Region and then moving to the North-west, North, Coral Sea and East marine regions.

The networks, including the size, shape and number of individual sanctuaries within them, should be based on the best-available science, along with a consideration of social, economic and cultural values.

This paper focuses on the science, reporting on the research of scientists studying ocean life and the need for its protection over the past decade. Their key findings, which should give the government confidence to act decisively on oceans protection, show that networks of marine sanctuaries¹:

- protect ocean life, including threatened species and critical habitats
- recover the abundance of ocean life within and beyond sanctuary boundaries
- increase the resilience of ocean life to climate change
- underpin the future of commercial and recreational fisheries and coastal communities.

Australia's ocean life is unique but it lacks protection

According to the 2010 International Census of Marine Life, Australia has the most diverse oceans in the world with 32,889 plant and animal species. Scientists believe this may be only 10-20 per cent of the species that call our oceans home.

Australia has the world's largest area of coral reefs, the largest single reef—the Great Barrier Reef—and the largest seagrass meadow in Shark Bay. We also have the third-largest area of mangroves and more than half of the world's mangrove and seagrass species.

¹ In some scientific papers the scientists report on marine reserves, while in others marine national parks and marine sanctuaries are used to refer to areas of high-level protection, areas where the removal of animals and plants and the altering of habitats are not allowed. Fishing, aquaculture, dredging, and mining are not possible in these areas, whereas swimming, boating, scuba diving and other non-extractive uses are encouraged. In this paper areas of high-level protection are referred to as marine sanctuaries. The term 'marine protected area' can apply to areas with protection ranging from high-level to general use.

Our oceans provide life support for six of the seven known species of marine turtles, 45 of the world's 78 whale and dolphin species, and 4,000 fish species—20 per cent of the global total.

Our oceans also provide us with lifestyle support. We depend on them for food and oxygen, and they provide us places to work and play.

But less than one per cent of the Coral Sea, East, South-west, North-west and North marine regions—most of our Exclusive Economic Zone—have sanctuary-level protection.

Overfishing, offshore petroleum extraction and production, introduced marine pests, land-based pollution and climate change are taking their toll. However, the lack of protection is the immediate threat facing Australia's ocean life. Without it our efforts to minimise other threats will be undermined.

Consensus among scientists

Throughout the first decade of this century the science of marine sanctuaries has been gathering pace and scientists have been united in calls for their establishment. To marine scientists the science is clear—ocean life is in trouble and sanctuaries are a vital step to its recovery.

The decade began with a consensus statement by the prestigious American Academy for the Advancement of Science in 2001, followed the next year by the Australian Marine Sciences Association, each urging governments to establish networks of marine sanctuaries. Calls like those have continued since.

Last year 245 international marine scientists outlined their rationale for very large marine sanctuaries, and during the 2010 federal election 152 Australian scientists sought support from the Labor and Coalition parties for sanctuary networks to reverse the decline of our ocean life.

Scientific consensus statements—and the unity of scientists displayed—have been influential in the recommendations that have emerged from major conferences such as the 2003 World Parks Congress in Durban and of the parties to the Convention on Biological Diversity, as well as the IUCN's World Conservation Congresses in Bangkok (2004) and Barcelona (2008).

In line with a key international deadline for oceans protection, the Australian government has committed to establishing a network of Commonwealth marine reserves, which include sanctuary zones, by the end of 2012.

More and bigger fish

The evidence continues to build in Australia and overseas that creating ocean areas free from fishing and other extractive uses leads to the recovery of ocean life.

Not just in the tropics but in the temperate waters of California, Tasmania and New Zealand, the cold waters off north-west USA and the subtropical waters of Western Australia.

In 2003, when marine scientist Benjamin Halpern reviewed 89 studies of marine sanctuaries from around the world, he discovered that fish populations and fish size all dramatically increased inside sanctuaries, and ocean life spilled over to nearby fished areas.

Six years later Halpern teamed up with Sarah Lester and other scientists to conduct a detailed analysis of peer-reviewed scientific articles on 124 marine sanctuaries. Their global synthesis found that once protected, on average the mass of animals and plants within the sanctuaries increased by 446 per cent, density increased 166 per cent, body size increased 28 per cent, and the number of species increased 21 per cent. Further, the benefits from sanctuaries in tropical and temperate waters were similar.

Even so, opponents of marine sanctuaries have claimed that such studies focus on places that are not comparable to Australia in terms of ecosystems, such as tropical ones, or the effectiveness of fisheries

management. The large rebounds in ocean life could be, they say, due to relief from severe overfishing or destructive fishing practices such as the use of cyanide or explosives.

Peter Fairweather from Flinders University tested these claims at the time he, Colin Buxton and Jacqueline Robinson were preparing their 2010 review of marine park science in NSW.

He examined the data, excluded those places that did not resemble Australian conditions and found that the results in Australia, New Zealand and Canada were just as strong as those from the global synthesis. In fact, the increase in biomass was 975 per cent (double the global average), while the results on increased size, density and richness were comparable.

Examples of ocean life recovery in sanctuaries compared with adjacent fished areas can be found across Australia including:

- the size and number of coral trout doubling in sanctuary zones in the Great Barrier Reef Marine Park
- significant increases in the size and abundance of red morwong in sanctuary zones of Jervis Bay Marine Park
- densities of spiny lobster 34 times higher in Rottnest Island sanctuary zones, and higher lobster size and egg production, while numbers of Western Australian dhufish and breaksea cod were 5-10 and three times greater respectively
- the number and size of mud crabs greater at the Solitary Islands Marine Park in New South Wales and Moreton Bay Marine Park in Queensland, with some crabs moving from sanctuary zones into fished areas, and in some cases fishers often targeting zone boundaries.

Changes are never immediate after the creation of sanctuaries but according to Benjamin Halpern and Robert Warner in 2002, significant increases in biomass, density and diversity can occur within 1-3 years. In their 2003 review, Fiona Gell and Callum Roberts found that some fish populations doubled within two to five years.

Others may take much longer. Graham Edgar, Neville Barrett and Rick Stuart-Smith found in 2009 that even after almost two decades, ocean life continues its dramatic recovery in Tasmania's sanctuaries.

Spilling beyond the boundaries and benefiting fisheries

The science shows that marine sanctuaries encourage the recovery of ocean life within reserves and there is growing evidence that those increasing populations may spill over boundaries and into fished areas.

Commercial and recreational fishers discovered the spillover phenomenon soon after sanctuaries were established. They now often target fish along the boundaries of marine sanctuaries, such as at Leigh Marine Reserve in New Zealand and Ricketts Point Marine Sanctuary in Port Phillip Bay, Victoria.

Scientists can now support this anecdotal evidence with empirical data.

Fiona Gell and Callum Roberts found that fisheries have benefited from the spillover of juveniles, eggs and larvae. Tagging experiments showed that crabs in the Sea of Japan, lobsters in Newfoundland and New Zealand, bream in New Zealand and reef fish in Kenya moved from protected areas into fished areas.

Benjamin Halpern, Steven Gaines and Robert Warner demonstrated that spillover has the potential to match the loss of catch from fisheries displaced by the creation of marine sanctuaries.

However, there are no guarantees of spillover. When it does occur, it will vary with species, habitats and the size of the protected area. In the process it will broaden ocean life recovery and possibly help stabilise commercial and recreational fisheries.

Building resilience to climate change

Like a canary in a coalmine, the oceans are sounding a warning about climate change. Increasing water temperatures, rising sea levels, increased storm activity and increased runoff, changing currents and increased ocean acidity are all signs that our ocean life faces an uncertain future. In Tasmania fish distributions are shifting due to climate change, according to Peter Last and others.

To increase ocean life resilience to climate change, its conservation is critical according to the 2009 report card on climate change and ocean life by Alistair Hobday and others. Ove Hoegh-Guldberg and John Bruno believe that the removal of local stresses is also key, while Elizabeth McLeod and her co-authors consider networks of sanctuaries can be designed to build their resilience.

Designing for protection and recovery

The main purpose of marine sanctuaries is to protect and recover ocean life. Their number, size and location are critical in determining how well they achieve that purpose, as well as influential on the other benefits that flow from the sanctuaries.

In 2009 more than 50 Australian scientists signed on to a detailed set of criteria for the planning and design of marine protected areas, the first time such an independent statement of this kind has been prepared in Australia.

According to these criteria and the writings of other scientists, larger sanctuaries are better than smaller sanctuaries and should include the full range of habitats in an area as well as spawning, feeding and high-density areas for ocean life.

Simple shapes help minimise edge effects, and ensuring they are not too far apart will encourage larval dispersal and connectivity. Integration with other management systems such as fisheries will also minimise threats from outside the sanctuary boundaries.

Graham Edgar, Neville Barrett and Rick Stuart-Smith insist that networks must include areas that are currently heavily fished.

Their 2009 study revisited the area of Edgar and Barrett's groundbreaking studies in the 1990s, as well as 10 recently declared reserves ranging from the Houtman-Abrolhos Islands in Western Australia to Lord Howe Island in New South Wales.

The results of their field work showed that in the location of recently declared sanctuary zones there had been a bias away from fished areas, likely due to pressure from fishing interests.

This they believe potentially compromises the value of the zones and jeopardises the aims of 'safeguarding all regional habitat types, protecting threatened habitats and species, and providing appropriate reference benchmarks for assessing impacts of fishing'.

Our governments can act with confidence

To recover Australia's ocean life it is critical for our governments to establish marine sanctuaries in our oceans. Polling indicates that a network of large marine sanctuaries will receive support from most Australians.

A Department of Environment, Climate Change and Water survey of 2000 people in New South Wales found 85 per cent agreed that some areas of the oceans should be given such protection. A 2010 Essential Research poll of 4000 Australians found that 75 per cent of those polled and who fished at least once a year supported having some ocean areas free of fishing and mining.