

Scaling-up marine restoration efforts in Australia

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Australians have a profound love for coastal and marine environments. Whilst iconic destinations such as the Great Barrier Reef, The Twelve Apostles and Rottnest Island annually attract millions of international visitors, Australians on weekends and over the summer holidays flock towards lesser-known, family destinations such as Lakes Entrance, Nambucca Heads or Albany. Over 85% of Australians live within 50 km of the coast, and all major population centres above 200,000 people (except Canberra) are located adjacent to a major embayment or estuary.

Indeed, estuaries have been the focus of human settlement in Australia, particularly since European settlement, and they have underpinned much of our social and economic wealth and prosperity. For example, Southern Australia's once extensive oyster reefs (e.g. *Ostrea angasi*) were harvested in huge quantities in the late 1800s to create lime for mortar used in roads and buildings; throughout the 1800s to 1900s, local seafood was the major source of protein for our increasing city populations and the calm waters of major estuaries such as Botany Bay, Swan River, Gulf St Vincent, Albany and Port Phillip were extensively used as shipping ports to connect the states of the new Federation and export Australia's resources across the globe.

This intensive use has come at a cost. Some 29% of Australian estuaries are considered to be 'extensively modified' or 'modified' – particularly those in the east, south-east and south-west (NLWRA 2002). Additional nearshore marine habitats (notably once extensive oyster reefs and mussel beds) are functionally extinct throughout most of Australia, and most Australians are unaware this loss has even occurred (Beck *et al.* 2011; Alleway & Connell 2015). These declines follow the global norm and come as no surprise. What is surprising then, is that despite Australia's global reputation as a leader in marine science, natural resource management and national landcare initiatives, restoration of marine environments has been largely 'off the radar' in terms of the national agenda. This is not to say that nothing is happening in marine restoration. There are multiple community groups and researchers

across Australia engaged in monitoring and working to repair 'their' local patch of coast. People who know and value 'their place' drive these local efforts, recognizing what has been lost and committing to do something about it.

These projects rarely, however, reach the size required to improve ecosystem services at the landscape scale. Whilst over the last 10 years, when other nations such as the US, Canada and the UK have forged ahead and embraced the need for restoration at a larger scale, Australia's efforts have been typically small and there is a general absence of policy and programmes to support these efforts.

So what needs to occur to galvanize public and private support for large-scale marine restoration efforts? Below are five key elements that we believe need increased attention in order to increase the scale of marine restoration to levels that are ecologically, socially and economically meaningful.

Communicate the Business Case for Marine Restoration

Documenting the amount of habitat lost is the first step in the process of framing the amount of restoration that may be possible, and some of this work is well underway in Australia with global, national- and state-specific reviews (e.g. Beck *et al.* 2011; Creighton 2013; Alleway & Connell 2015). It is also important to quantify what this loss means to coastal communities and coastal economies in terms of the lost ecosystem services that would have been provided by these habitats. A good example of this is oyster habitat where quantification of multiple services has recently been advanced, services such as filtration, denitrification, shoreline protection and fish production.

A further step is to determine the value of marine restoration to job creation, financial return and social well-being in timeframes that are favourable for medium-to-long-term investments.

Build Awareness, Capacity and Confidence that Key Degraded Coastal and Marine Habitats can be Repaired

Whilst Australia cannot turn back the clock and recreate the coastal and marine conditions that existed prior to European settlement, building a coastal restoration movement is, in our view, within reach. Why has not this happened already? First, there is the problem of shifting baselines – most coastal residents of Australia's southern cities and towns take the condition of today's bays and estuaries to be the norm. But we can change that. Ecological histories for many of Australia's bays and estuaries can be widely communicated after reconstruction from historical records of once abundant oyster reefs (e.g. Hamer *et al.* 2013; Alleway & Connell 2015) and from the stories of both indigenous groups and the older generation of sport and commercial fishers who remember a more abundant sea. Secondly, we need to go beyond the science. We know that restoration projects can motivate a wide range of stakeholders – including recreational fishers, community groups, school children, traditional owners and the media – and they will be crucial for building support and momentum for marine restoration (Schrack *et al.* 2012).

Develop the Policy Framework

At present, there are few guidelines, policies or programmes focusing on in-water habitat restoration in Australia. Coastcare is an extension of the landcare movement on the coast, comprises 2000 groups of community volunteers around the country, is active in coast restoration space but largely focuses on dune/beach works. Marine habitat restoration has largely been excluded from terrestrial restoration funding programs typically delivered through the natural resource management (NRM) agencies. With no single state or federal government agency responsible for the marine estate (such as the US National Oceans and Atmosphere Administration, but see the newly created NSW Government Marine Estate Agency <http://www.marine.nsw.gov.au/>), community groups and estuarine environments continue to suffer from lack of leadership and coordination required to oversee large-scale restoration. Yet this can change. We know from experience in the US that government funding and supportive policy can leverage substantial private funding for large-scale marine restoration. There are early indications the same could be true in Australia (e.g. Fitzsimons *et al.* 2015), but stronger policy and funding levers will be needed here to fully realize this. At the local level, councils and building regulators can mandate the use of more natural 'eco-engineered' materials for new coastal developments and state environmental agencies can coordinate community and 'friends-of' marine groups into regional networks capable of responding to marine restoration at the landscape scale.

Build Skills and Experience in Restoration Practitioners

Scaling restoration activities beyond small-scale, short-term projects to larger spatial and temporal scales requires a broad range of skills and experiences, including engineering, modelling, community engagement, risk and safety, fundraising, communication and project

management. Current restoration projects can support the development of new projects by documenting, monitoring and sharing what works in the Australian context, what does not work and why. Such information can be disseminated by establishing practitioner networks focused on individual habitats, but this will also require multidisciplinary support from national associations and societies (e.g. Society of Ecological Restoration Australasia, Australian Marine Science Association) to prevent knowledge 'silos' from forming. As more medium- and large-scale projects are developed, lessons learnt can be applied to other regions and valuable knowledge will be accrued.

Australia can also learn from the wealth of existing international projects and develop from these a range of resources (e.g. risk analysis, best practice restoration principles and community engagement protocols) suited to the Australian environment. Forging partnerships with more mature international marine restoration groups such as *Restore America's Estuaries* would help to expedite local practitioner learning.

Seek to Learn from Terrestrial Restoration Initiatives

Building relationships with the existing terrestrial restoration sector and learning from both their successes and mistakes will be critical to scaling marine restoration efforts and building positive and collaborative relationships. New efforts in marine environments can benefit existing terrestrial work by helping to promote key messages around environmental restoration as an effective environmental management option and in strengthening public support for on-ground action.

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