

Port Phillip Bay Golden Kelp Restoration Project

Frequently Asked Questions

What is the Project?

The Port Phillip Bay Golden Kelp Restoration Project (the Project) aims to trial and develop techniques to address the loss of Golden Kelp (*Ecklonia radiata*) and other macroalgae that form kelp forest habitats in Port Phillip Bay.

The pilot project will be undertaken at Jawbone and Ricketts Point Marine Sanctuaries and will focus on reducing urchin abundance through culling in 4 hectares, restoring 1 hectare of Golden Kelp, and protecting existing Golden Kelp and macroalgae habitats. Monitoring to track success of activities will also be carried out throughout the two-year project period (until December 2024).

Who's involved?

The Project brings together Victoria's leading organisations working with kelp and urchin research, management and restoration, and is a partnership between The University of Melbourne, The Nature Conservancy, Deakin University and Parks Victoria. The project is funded by the Victorian Government's Department of Energy, Environment and Climate Action.

What is a kelp forest?

Kelp forests are formed when species such as Golden Kelp (*Ecklonia radiata*) and Giant Kelp (*Macrocystis pyrifera*) form a canopy alongside other macroalgae. Golden Kelp forests can be found along the entire Great Southern Reef, which covers 8,000km of Australia's coastline, while Giant Kelp is predominantly limited to southeast Australia. Kelp forests dominated by Golden Kelp have experienced significant declines in Port Phillip Bay over the past few decades.



Why are we restoring kelp forest habitats?

Up until the 1980s, kelp and macroalgae habitat were widespread on the rocky reefs of Port Phillip Bay [1]. Since that time, these habitats have declined primarily due to increased abundance of, and overgrazing by, the native purple sea urchin (*Heliocidaris erythrogramma*) and changes in water quality [1].

Kelp forests provide food and shelter for lots of fish and other marine life like abalone, lobsters and cuttlefish.

Why are native urchins a problem for kelp and other macroalgae?

The purple urchin is native to Port Phillip Bay and is a natural part of a healthy kelp forest and macroalgae habitat. Urchins feed on macroalgae (including kelp) and when they occur in high abundances, they eat too much algae and prevent it from regenerating. This leads to the formation of 'urchin barrens' which are devoid of macroalgae and the high number of other animals usually found in kelp forests and macroalgae habitat.

Urchin densities of around 2/m² are considered desirable for a healthy macroalgal system [2], but in some parts of Port Phillip Bay, urchin densities are as high as 60/m² [3] with more than 100 million urchins estimated to be in the bay and at least 60% of the reefs in Port Phillip Bay now impacted by urchin overgrazing [4].



An urchin barren in Port Phillip Bay © Scott Breschkin/TNC

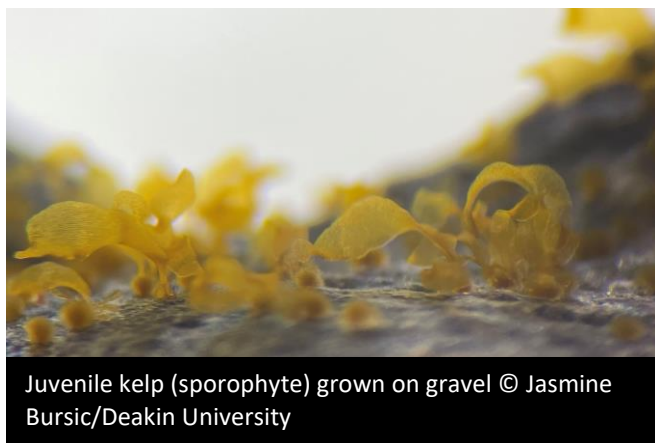
How do you restore Golden Kelp forests?

1. Reducing urchin numbers through culling is the proven first key step towards restoration and macroalgal regrowth in sea urchin barrens. As such, urchins will be culled in situ

down to healthy population levels of 2/m² [4], in 4 hectares of barrens across Jawbone and Ricketts Point Marine Sanctuaries.

2. Juvenile kelp will be grown on twine and gravel in a laboratory at Deakin University, Queenscliff using reproductive tissue from healthy adult populations in Port Phillip Bay.
3. Kelp grown on twine and gravel will be outplanted by divers into urchin barrens in marine sanctuaries, where urchin numbers have been reduced. As they grow, the kelps will naturally attach themselves to the reef substrate and they will continue to grow and ultimately reproduce to help form a new canopy.

Monitoring is a critical aspect of any restoration project. We will monitor before, during and after culling and restoration to track the success of these activities. We have developed a robust monitoring plan which will inform future restoration efforts and allow comparison to areas where no culling or restoration occurs.



Juvenile kelp (sporophyte) grown on gravel © Jasmine Bursic/Deakin University

How were the sites selected?

To select restoration sites, we considered the current and historic extent of both kelp forest and macroalgal habitats and existing urchin barrens at Jawbone and Ricketts Point Marine Sanctuaries. Video surveys were conducted to map the extent of existing habitats which was considered in conjunction with historic data. Restoration is more likely to succeed in close proximity to remnant kelp patches, so the restoration sites are located in barren areas nearby remnant kelp and macroalgae habitat. Urchin numbers will be culled to allow for restoration and passive recovery in these barrens and to prevent the further loss of existing kelp and macroalgae habitats.

Why are we intervening in marine sanctuaries?

Victoria's network of marine parks were established in 2002 to protect representative and important marine habitats across the state. We need to prevent the loss of important habitats such as kelp forests and macroalgae for these parks to achieve

their important purpose: to support biodiversity. Intervention is required to help restore the values of these sanctuaries.

Will it work?

The Project will involve the first trials in Port Phillip Bay to restore Golden Kelp using novel techniques to demonstrate proof of concept at sites that need urgent help, and to research and develop the best techniques to continue restoration work at a larger scale. While restoration can be challenging, without intervention, further loss of Golden Kelp forests and macroalgae habitat will continue in the bay. In smaller scale trials and experiments in Port Phillip Bay, macroalgae has recovered where urchin numbers have been reduced, at Jawbone Marine Sanctuary for example. The restoration methods being trialled have also been successful in other comparable locations (e.g., Tasmania).

Are there other ways to restore kelp without culling a native species?

This management decision has been informed by extensive research into this issue over the last 15 years. While Port Phillip Bay has no doubt seen the loss of top order predators due to fishing pressure and changes in water quality over the past few decades, research indicates that culling urchins to restore the foundation of the ecosystem by bringing back habitats like kelp forest and macroalgae is currently the best option for a first step towards ecosystem recovery.

Can I get involved?

In the early stages we need to engage with skilled professionals to undertake in-water restoration and urchin control activities. We hope to be able to offer opportunities for the community and citizen scientists to get involved with the Project and we have applied for some additional funding to undertake some exciting activities with the community in the future. The Project team will also regularly engage with the community to provide updates on progress and our findings.

References

- [1] Carnell, P. E and Keough, M. J. 2019. Reconstructing historical marine populations reveals major decline of a kelp forest ecosystem in Australia. *Estuaries and Coasts* 42 (765-778).
- [2] Eger, A. M., Layton, C., McHugh, T. A, Gleason, M., and Eddy, N. 2022. Kelp restoration guidebook: lessons learned from kelp projects around the world. The Nature Conservancy, Arlington, VA, USA.
- [3] Ling, S. D, Kriegisch, N, Woolley, B. and Reeves, S. E. 2019. Density-dependent feedbacks, hysteresis, and demography of overgrazing sea urchins. *Ecology* 100(2).
- [4] Johnson, C. R et al. 2015. The reef ecosystem evaluation framework: managing for resilience in temperate environments. Seagrass and reefs. Final report for Department of Environment, Land, Water and Planning, Victoria, Australia.

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