# Unique bryozoan reefs in Western Port, a southern temperate embayment

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## Introduction

Significant habitat-forming bryozoans are recorded from 54 sites globally (Wood et al. 2012), three of which are located in Australian waters: Coorong Lagoon and surrounding shelf waters (South Australia), Bathurst Channel (Tasmania) and in the Tasman Sea (near the New South Wales-Victorian border). Other bryozoan communities in Australia occur on the continental shelf of Bass Strait and Tasmania (James et al. 2008) and Port Phillip Heads (Unpublished data). New Zealand is a hotspot of diversity, especially in Foveaux Strait and on Three Kings Plateau (Rowden et al. 2004), and the Otago shelf (Wood and Probert 2013), where they form biogenic structures. Much of what is known about the vulnerabilty of bryozoan biogenic reefs comes from studies related to the impacts of oyster dredging in New Zealand (Cranfield et al. 1999, Wood et al. 2012; 2013).

In the Southeast Basin of Western Port, Blake et al. (2013) described isolated occurrences of a habitat described as "patches of low and high profile broken and solid reef colonised by dense bryozoans and sparse sponges", but the potential significance of this habitat was not studied further. A 2016 biotope mapping study of Western Port triggered studies that now indicate extensive bryozoan mounds that form reefs of national and potentially global significance.

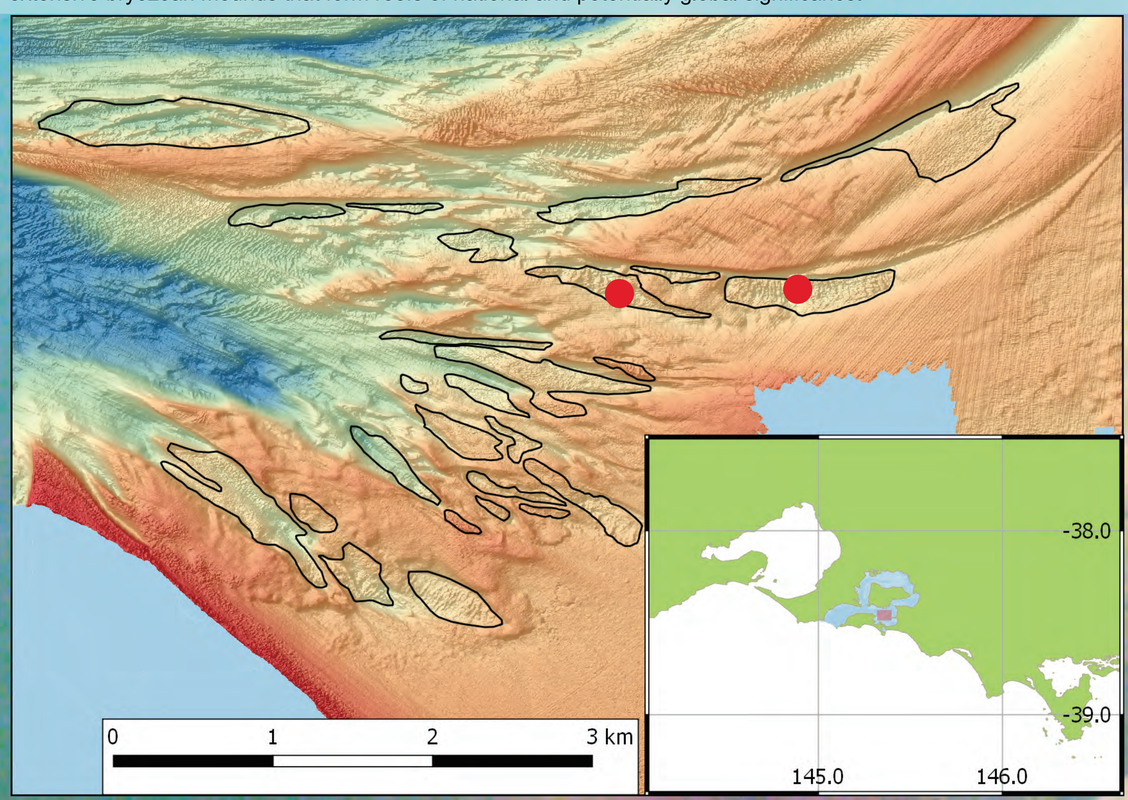


**Fig. 1.** Location of Western Port in south eastern Australia (inset) and areas (black outline) where seabed textures indicate potential bryozoan reefs. Red dots = ROV and diver survey locations.

## Methods

Three surveys (1 ROV, 2 diver) aimed to characterise the bryozoan biogenic mounds at sites selected on the basis of textures identified in multibeam bathymetry. ROV surveys imaged the structural components of the mounds and surrounding sediments and diver photographs documented bryozoan species, colony morphology and co-occuring species. On all surveys, an echosounder with side-scan capabilities recorded bathymetric structure. The*BioBase* system of cloud-based automated echosounder data processing was used to investigate scope for recreational fishers to contribute to further research in a citizen science program.

## Results

Distinctive seabed textures indicative of bryozoan habitat occupy an area of approximately 3,139 $m^2$ (Fig. 1).

Echosounder recordings confirmed the existence of mound structures that are arranged in a linear north–south orientation (Fig. 2) in water depths of 5–8 m. Individual mounds are up to ~6 $m^2$ in area with a vertical relief of some 1–2 m.

Over significant areas, bryozoan biogenic mounds form contiguous, dense biogenic reef covering (Fig. 2). Other smaller mounds are singular and interspersed by silty mud. The bryozoan colonies are not isolates, but are rather elements of a biogenic reef system, coined the Western Port Bryozoan Reefs. Imagery surveys confirmed a range of sessile and mobile invertebrate macrofauna associated with the reef, indicating that faunal diversity is likely to be significantly elevated compared to the surrounding environment. The bryozoan biogenic reefs are composed of three dominant species (Fig. 3):

| | | | |
|---|---|---|---|
| *Triphyllozoan umbonatum* | Fenestrate folded sheets | yellow-orange | Colonies form large mounds >1 $m^2$ with vertical relief over 1 m. |
| *Triphyllozoan moniliferum* | Fenestrate tightly folded sheets, fluted | white | Colonies form large mounds >1 $m^2$ with vertical relief over 1 m |
| *Celleporaria foliata* | Non-fenestrate branching plates | mauve-orange | Colonies form small mounds, or sheets interspersed on mounds |

The total number of species associated with the Western Port Bryozoan Reefs is expected to be higher as bryozoan biogenic habitat is known to house a number of species associations, some of which may be cryptic. Most colonies have living tissue extending from the sediment interface to the to apex of the mounds. For other colonies, apparently dead skeletal matrix was observed, with living tissue restricted to smaller parts of the mound. Preliminary investigations indicate that the broyozoan mounds are not anchored to a hard substrate beneath the surrounding unconsolidated muds. Rather, a working hypothesis is that while there may have once been a hard settlement substrate to seed the bryozoan colonies, the mounds are today epibenthic on silty mud, stable under their own mass. The area is characterised by relatively low tidal movements but is subject to wind waves and high turbidity. It is expected that sediment deposition and scouring are among the key factors controlling reef maintenance.

This area in Western Port is named in fisher lore and literature as "The Corals" and GPS coordinates are published for productive fishing sites. The area is known to attract species targeted by recreational fishers, particularly snapper and gummy shark.

It is not uncommon to observe large numbers of recreational fishers anchored in the area during peak fishing seasons.

## Significance and Vulnerability

This discovery has confirmed that The Western Port Bryozoan Reefs represent a new biotope for the state of Victoria.

We conclude that this biotope has not been observed in any other location covered in extensive underwater imagery in the state.

We are also able to conclude that the Western Port Reefs are a fundamentally different biotope to the published habitat-forming bryozoans found elsewhere in southern Australia. There is also considerable evidence to suggest that these reefs are unqiue to Australia and are globally significant.

The ecological importance of other bryozoan biogenic habitats is well documented and clearly supports the need to consider appropriate protection. Physical damage of bryozoan structures can result in localised extinction of these features that may not regenerate (Cranfield et al. 2003). There is no commercial fishing in Western Port but other threatening processes in Western Port that could impinge on the ecological values of the reefs include anchor damage from recreational fishers, sediment smothering and scouring, dredging and spoil handling, litter and other pollutants.

This discovery was precipitated by a government project to implement a new marine biotope classification scheme and reclassify ground-truthing data. The existence and significance of this biotope, which is within a short distance of a major city and shipping port, may very well have remained unknown, and potentially lost, highlighting the need for experienced marine ecologists to be involved in habitat mapping.

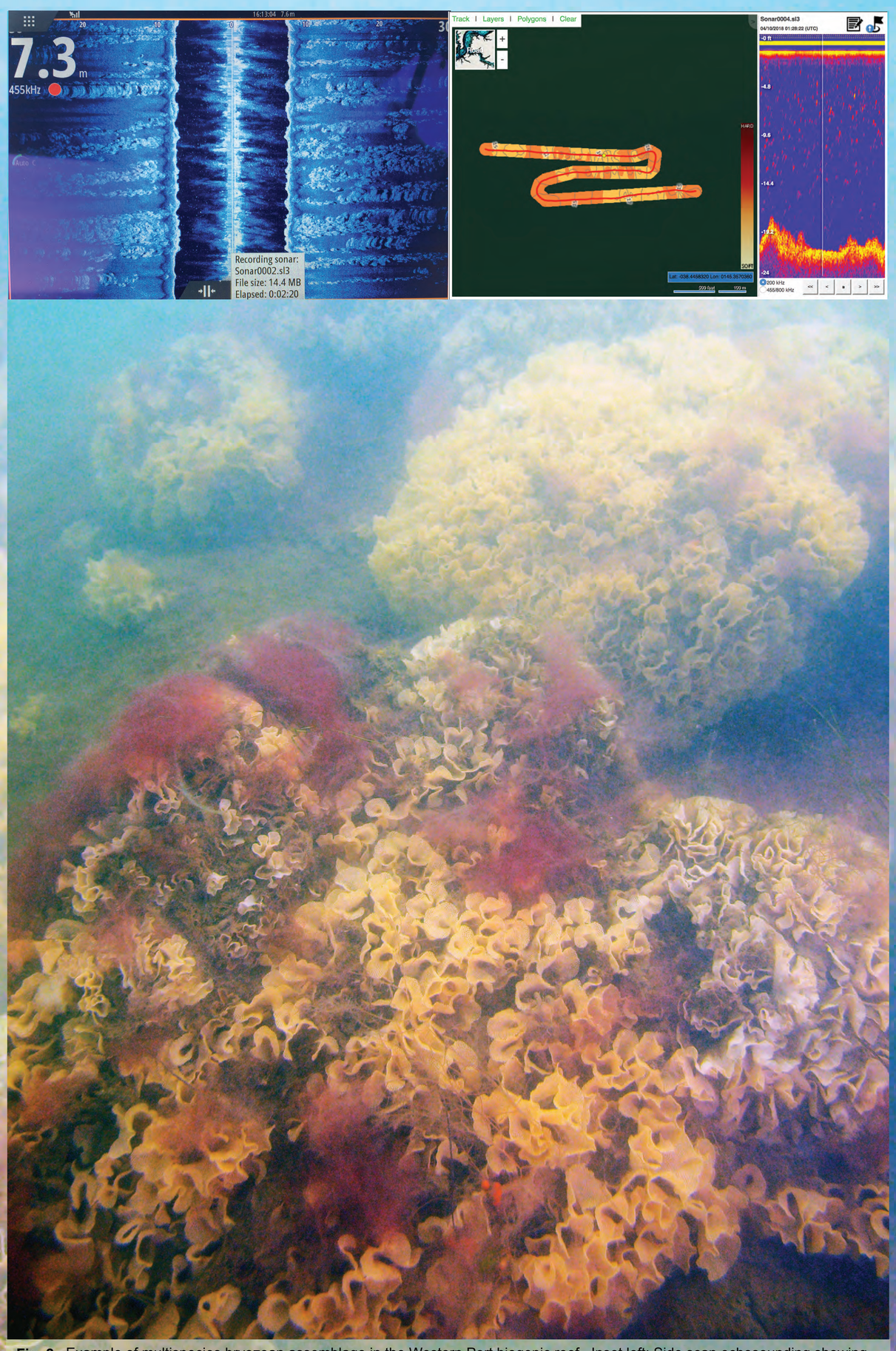


**Fig. 2.** Example of multispecies bryozoan assemblage in the Western Port biogenic reef. Inset left: Side scan echosounding showing texture of striated north-south orientated mounds. Inset right: seabed hardness and depth along track and downscan echogram produced by the *BioBase* sonar processing routines being investigated for a citizen science monitoring project.

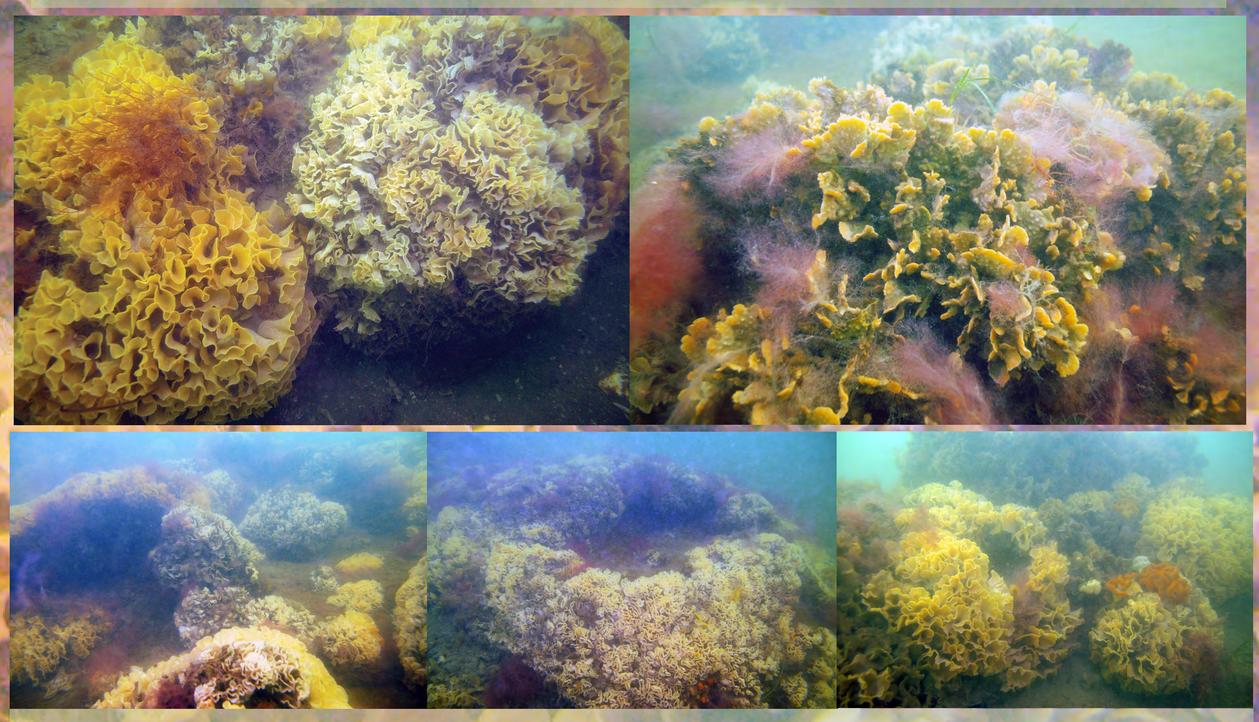

**Fig. 3.** Top panel - dominant species of the Western Port Bryozoan Reefs described to date, left to right: *Triphyllozoan umbonatum* *T. moniliferum* (both fenestrate forms) and *Celleporaria foliata* (non-fenestrate). Bottom panel - examples of reef features.

## Research Directions

Studies will now be initiated to:

1. Fully document the diversity of bryozoans and co-occurring species.
2. Accurately quantify the extent of biogenic reefs.
3. Investigate the processes of settlement, growth and recolonisation potential.
4. Investigate threatening processes, with a focus on the relationships between growth rates and sedimentation.
5. Determine ecosystem function and conservation values.
6. Establish appropriate protection for the reefs, engaging a range of stakeholders.
7. Investigate a citizen science project using data from recreational echosounders to map and monitor the reefs.

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