

Fish habitats are in a state of steady decline worldwide. Much of the damage is caused by human activity, primarily through poor water quality and coastal development. Along the east coast of Australia, hard vertical relief habitats such as oyster reefs and sub-tidal coral and rocky reefs have been severely impacted. Structurally complex substrate provides critical habitat for fish, particularly during their vulnerable juvenile life stages. Through providing refuge from predation, structurally complex substrate increases juvenile survival rates and boosts fish populations, including many iconic recreational species.

# Fish Habitat Restoration

## HABITAT REEF MODULES



### Hard, Vertical Fish Habitat Substrate

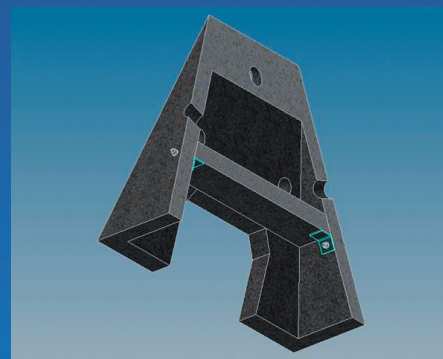
Research has identified that the provision of structurally complex vertical relief substrate is one of the most cost-effective and practical techniques to facilitate fish habitat restoration activities. Over the past 18 months, fisheries ecologists at Catchment Solutions in collaboration with fish biologists, divers and anglers have designed two different fish Habitat Reef modules to provide hard vertical relief substrate and improve the fishing experience for recreational anglers. Both the 'Pyramid' and 'Ledge and Cave' designs incorporate maximum habitat complexity through the provision of caves, ledges and refuge holes. Critically, these features provide the favoured habitat for many iconic recreational species such as barramundi, mangrove jack, jewfish and fingermark.



Prototype 'Pyramid' reef module showing surface roughness and juvenile fish habitat

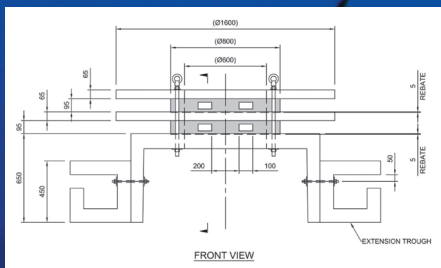
### Improved Settlement Surfaces

The fish Habitat Reef modules also incorporate the latest findings from research of improved invertebrate settlement surfaces from around the world. Design features critical to optimising the settlement of encrusting marine organisms such as oysters and corals include high surface area, roughened external surfaces, small grooves throughout the roughened surfaces, and vertical and horizontal complexity in the form of underhangs and ledges. The calcium bicarbonate used in the concrete is also biologically suited to promoting and facilitating coral settlement and growth.



Pyramid Habitat Reef cross-section





### Increase Fish Populations

In addition to providing optimal settlement surfaces, the modules have been designed to provide habitat and refuge for both adult and juvenile coastal and marine fish species. This has been achieved through the provision of two separated chambers in both designs. A cave hollow at the bottom for large, apex predators and a second chamber above designed specifically to provide refuge to small-bodied and juvenile fish. Providing refuge for juveniles increases their chance of survival to maturity and contributing to future generations, in turn, helping to maximise fisheries productivity. The provision of habitat for juvenile fish separates these modules from other designs used around the world.

### Improved Recreational Fishing Opportunities

The fish Habitat Reefs can be deployed at strategic locations to attract target species and improve the recreational fishing experience for anglers. Uses include:

- Deployment at the base of fishing platforms,
- Utilisation as fish-friendly moorings for buoys, markers and vessels,
- Improve fish habitat condition at impacted sites,
- Artificial reef projects,
- Offset projects, and
- Relieving pressure on natural reef ecosystems.



Prototype 'Ledge and Cave' Habitat Reef module

### RPEQ Designed and Engineered

The Habitat Reef modules have been designed and engineered with deployment and longevity in mind. A large footprint increases stability and reduces subsidence, they incorporate sufficient weight to withstand floods, yet are light enough to be deployed via a barge-mounted crane and also incorporate fixed lifting points to facilitate precise deployment. The Habitat Reef modules have been certified by a Registered Professional Engineer of Queensland (RPEQ) for deployment and stability.



Photo by Bart Mackenzie

### Flexibility in Deployment Configuration

The modular design of the Habitat Reefs allow for great flexibility in their arrangement. It is anticipated that for maximum benefit, several 'Pyramid' habitat modules can be positioned around one of the 'Ledge and Cave' habitat modules, creating a set. Then, a number of sets can be arranged in close proximity to maximize complexity and fish attraction.

**If you are interested in fish habitat restoration or would like further information on the Habitat Reef modules, please contact...**



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