

**Project Partner:** [OceanWatch Australia](#)  
**Year:** 2015  
**Project Reference:** 2015061  
**WRL Technical Report:** Preliminary Testing of Oyster Shell Filled Bags (2015/20)

A new technique has been proposed to reduce intertidal riverbank erosion and encourage oyster reef restoration across Australia. This technique involves the use of seeded oyster shells in coir (coconut fibre) bags. Utilising organic materials, [the method is being trialed at a number of waterway sites in Sydney](#). This pilot project aims to reduce foreshore erosion from wind waves and boat waves. Their secondary purpose is to create fish habitat. These units have the potential to become an alternative to traditional coastal protection structures by promoting the restoration of living oyster reefs and the multitude of ecosystem services these provide.



Figure 1: Example Proposed Field Site Experiencing Bank Erosion for Oyster Shell Filled Bag Structure

OceanWatch Australia worked with Will Glamore, Ian Coghlan and Dan Howe from WRL to design and undertake preliminary two-dimensional (2D) physical modelling of generic oyster shell filled bags to better understand their expected behaviour when exposed to wave attack. These results were able to provide estimates of the typical wave and water level conditions that the proposed oyster shell filled bags may be exposed to.

Wave flume tests of this novel coastal erosion solution were undertaken at full scale (i.e. a length scale of 1:1) in the 3 m wave flume at WRL. The objectives of the physical modelling study were to assess the stability and wave attenuation of this type of coastal protection structure under a variety of water level and wave attack scenarios. Oyster shells to fill the bags were a mix of Sydney rock oyster (*Saccostrea glomerata*) and Pacific oyster (*Crassostrea gigas*) shells obtained from oyster farmers in Port Stephens (Figure 2). These empty shells were free of oyster tissue and subject to biosecurity treatment prior to transport from Port Stephens.



Figure 2: Sample Oyster Shells

Various combinations of wave height, wave period (both monochromatic and irregular) and water level conditions were tested against combinations of three oyster shell filled bag arrangements (Figure 3). For the first phase of testing, the oyster shell filled bags were not anchored to the bed and were not secured together so as to identify their behaviour and identify threshold wave heights for bag movement. Wave transmission through/over the structure was also measured to infer the likely reduction in foreshore erosion with the oyster shell filled bags in place. During the second phase, the oyster shell filled bags were anchored to the bed, secured together and their movement while tethered together was monitored.

The investigation yielded several important conclusions. The threshold wave heights at which rocking of the bags were initiated for each bag arrangement, water depth and wave period combination were documented. The rope seams and the coir bags did not break during the preliminary physical modelling program, however, the limited duration of model tests is not a true indicator of long term durability. Two key stress points were identified for monitoring of biological decay and/or fatigue failure during pilot field trials of the oyster shell filled bags. Recommendations were given as to the cross-shore position of the oyster shell bags on the inter-tidal profile to replicate conditions experienced in the 3 m wave flume. As a direct result of the presence of an oyster shell filled bag structure, some existing wave-driven foreshore erosion processes are expected to be attenuated immediately landward of the structure.





Figure 3: Oyster Shell Filled Bags Under Wave Attack in WRL's 3 m Wave Flume  
Note – Wave are Travelling from Right to Left

The project was undertaken by WRL staff Dr William Glamore, Mr Ian Coghlan and Mr Dan Howe in partnership with OceanWatch staff Mr Simon Rowe and Mr Andy Myers. For further details please contact Dr Will Glamore: [w.glamore@wrl.unsw.edu.au](mailto:w.glamore@wrl.unsw.edu.au)

**Water Research Laboratory**

School of Civil and Environmental Engineering

UNSW AUSTRALIA | 110 KING ST MANLY VALE NSW 2093 AUSTRALIA

T +61 (2) 8071 9800 | F +61 (2) 9949 4188 | ABN 57 195 873 179 | [www.wrl.unsw.edu.au](http://www.wrl.unsw.edu.au) | Quality System Certified to AS/NZS ISO 9001