

Armoring Units Polinom Port - Haifa

Location	Product used	Duration
Polinom Port Haifa, Israel	Bio enhancing armoring units	2013-2016

In Short

As part of the construction of a new port in Haifa (Polinom Port), ECONcrete[®]'s armoring units were deployed and monitored in comparison to the standard Antifer units comprising the outer breakwater of the port. ECONcrete[®]'s environmentally sensitive technology, combining a bio-enhancing concrete admix, complex surface texture and species-specific design showed outstanding results.

ECONcrete[®]'s armoring units supported double the species richness and biodiversity of invertebrates when compared to the standard Antifer units. In addition, ECONcrete[®]'s armoring units showed significantly greater fish diversity and reduction of dominance of nuisance and invasive species than standard Antifer units at the site.

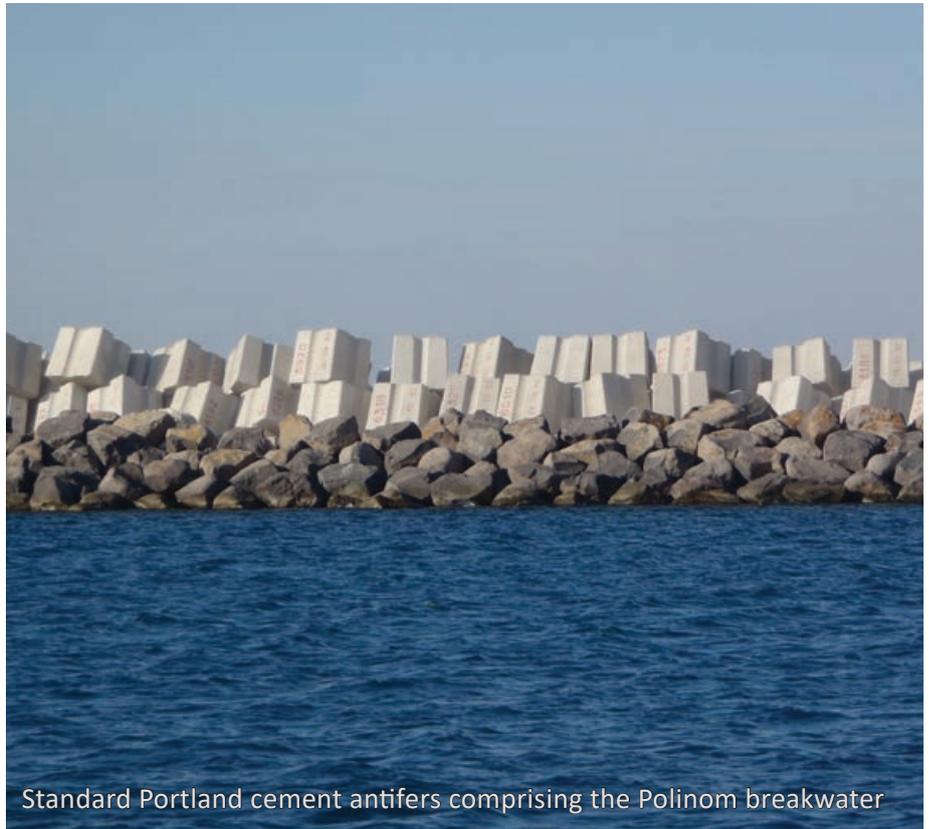


Deployment of ECONcrete armoring units

Project Description

Coastal and marine infrastructure (CMI), often imposes much stress on fauna and flora of natural habitats. Concrete based CMI, provide poor substrates in terms of biological recruitment due to the combined effects of the concrete's chemistry, featureless surface texture and high inclination compared to natural habitats. Considering the recent growth of world populations and rural development around coastlines, the effect of CMI on the natural environment is catastrophic.

In 2012, a new port named "Polinom" was constructed at the bay of Haifa, Israel. The breakwater of the Polinom is comprised of standard, featureless, cube shaped Portland cement armor units called "Antifers". The construction of the Polinom provided an opportunity to compare the biological performance of standard Portland cement Antifers to EConcrete's bio-enhanced



Standard Portland cement antifers comprising the Polinom breakwater

armoring units. Both armoring units were monitored for biological performance over a period of 24 months (2013-2015).

EConcrete's Approach

In the design of EConcrete's armoring units, environmental and biological considerations were taken into account alongside constructive and engineering considerations. The environmentally sensitive design defers from standard concrete armoring units on three levels; concrete chemistry, surface complexity and macro-design. These three elements combined, mimic natural marine habitats and decrease the negative effect of coastal development. The mix is specially designed for the requirements of marine flora and fauna and the surface complexity mimics the one found in natural habitats. In addition, higher level surface elements offer refuge to larger marine life similar to natural habitats.



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Conclusions

Monitoring results concluded that the ECOConcrete® armoring units had more than twice the species richness and biodiversity of invertebrates compared to standard “gray” Antifer units. The taxa assemblage seen on ECOConcrete®’s armoring units were extremely diverse including various species of oysters, sponges, Sabellidae, Serpulidae, tunicates, bryozoans and coralline algae. These communities contribute to water purification, increase habitat complexity, and attract a larger amount of native fish species. This trend was consistent throughout the entire monitoring period.

ECOConcrete® armoring units had significantly greater fish diversity compared to the standard Antifer units, including the presence of key

species completely absent from the standard Antifer units. ECOConcrete®’s armoring units had post larval stages of transient fish (Sparidae) and reduced dominance of nuisance and invasive species. In the 24 months comparative study, as many as two-thirds of the species observed on ECOConcrete® armoring units were local, with the remaining one-third of the species being considered invasive species, while on the standard antifers an opposite trend appeared, in which invasive species were significantly more dominant. By integrating environmentally sensitive technologies into the design and construction of CMI, ECOConcrete® is able to harness natural processes for ecological enhancement and reduce a structures’ ecological footprint. The

improved design of the armoring units has several implications on the marine environment; such as increased native species richness and biodiversity, reduced dominance of invasive species, water purification and more.

Apart from its clear ecological significance, biological enhancement also provides structural and socio-economic benefits. Biogenic growth of organisms like oysters, corals or barnacles provides bioprotection; acting to strengthen the structure and add to its stability and longevity. This form of bioprotection can reduce the magnitude and frequency of structural maintenance, which translates into improved ecological stability (reduced anthropogenic intervention), as well as a higher ROI (reduced maintenance costs).



Control 24 months post deployment



ECOConcrete 24 months post deployment

Future implications

Following the success of the Polinom pilot study, ECOcrete® has further improved the unit’s design for future deployments. ECOcrete®’s new

armoring units have been designed as a multi-function unit, which can be fitted with different add-on elements for targeted ecosystem enhancement.

The unit can be placed as full armor,

dispersed in-between rock armor, or left as stand-alone units (e.g., as an anchoring unit).



Fish Hubs:

Marine proof mesh for providing protected fish habitat



Oyster Hatchery Unit:

Concrete disks pre-seeded with oyster spat



Oyster Shell:

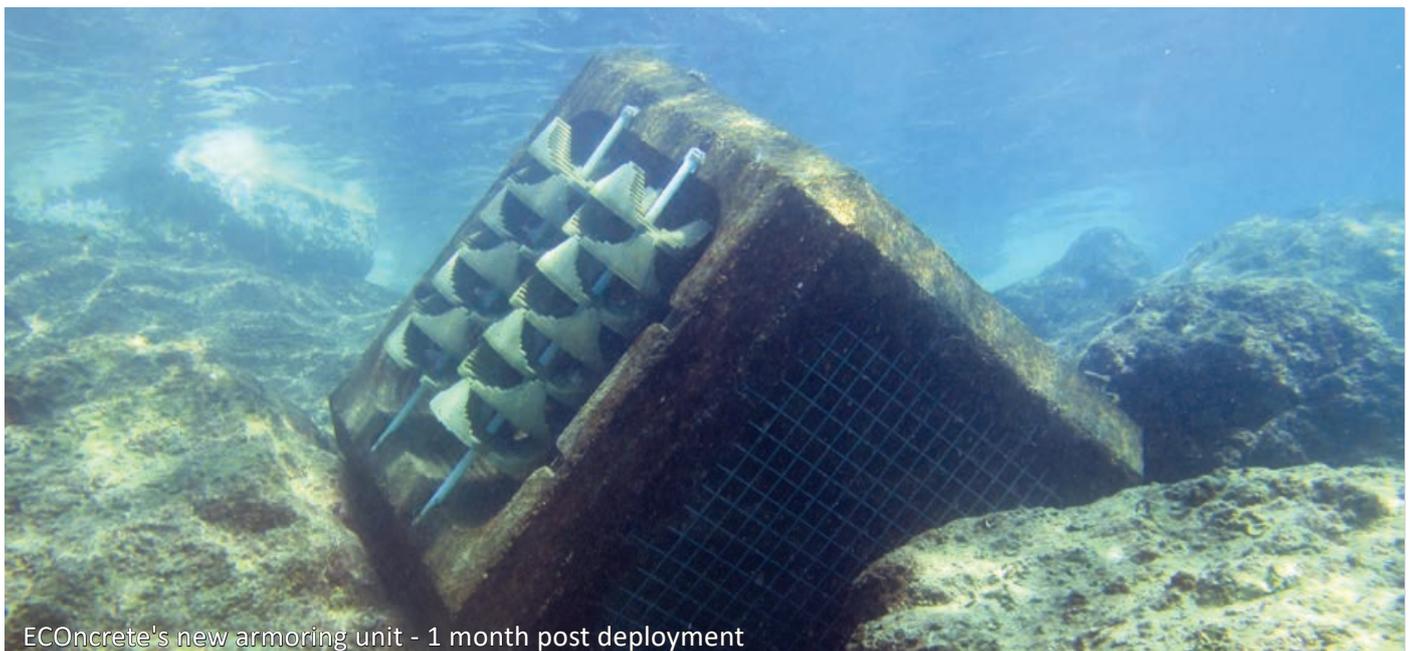
Marine proof mesh with pre-seeded oyster shell



Tidal Planter:

Gravel and soil filled for growth of intertidal vegetation

ECOcrete® armoring units were selected as the key constructive elements in a large scale federally funded project that won the rebuild by design competition. The project called “Living Breakwaters” proposed by SCAPE Team, is now undergoing detailed design.



ECOcrete's new armoring unit - 1 month post deployment

ECONcrete[®] Company Profile

ECONcrete[®] offers a suite of environmentally sensitive concrete solutions designed to encourage biological productivity on urban and coastal marine infrastructure, such as coastal and riverine erosion control structures, urban waterfront developments, marina's and ports. ECONcrete[®] provides; bio-enhanced concrete admixtures suited for different aquatic environments; custom forms & form liners for creating complex textures and science based design features; as well as a unique line of precast ECONcrete[®] elements. All of ECONcrete[®] products serve to elevate the functionality of local ecosystems, while providing the structural performance required of urban, coastal, and marine infrastructure.

To date, ECONcrete[®]'s innovative technologies have been implemented towards the design and fabrication

of precast seawalls, armoring units, tide pools, marine mattresses, terrestrial bio-active wall tiles, and on-site casting. ECONcrete[®]'s extensive and continuous R&D efforts, coupled with expert environmental and technical consulting allows for the creation of unique solutions for the development of all types of urban, coastal and marine infrastructure projects.

ECONcrete[®] personnel have the capability and expertise to tailor products and designs based not only on the project's specific needs, but also for optimal ecological performance in different marine environments. As such, ECONcrete[®] provides complete project services, from initial planning and site assessment, through detailed design and product fabrication and supply, as well as installation procedures and post installation monitoring.

ECONcrete[®] Services

PR services

- Assistance with and development of project ecological collaterals
- Community outreach and education
- Publications (scientific/popular)

Project Specific Product Development

- Product Customization following structural and biological requirements
- Schematic design and full product specifications

Consulting and Design

- Preliminary environmental assessment
- Conceptual design for ecological enhancement
- Support in working with regulators and permit facilitation

Supply of Materials and Products

- Precast units
- Form and form liners
- Admixtures

Installation supervision

- Guidance and installation coordination with contractors
- Quality assurance of fabricated units, and site placing

Post Installation Monitoring

- Biological monitoring of flora and fauna
- Scientific project reports