



ECOSTRUCTURE

Climate Change Adaptation through
Ecologically Sensitive Coastal Infrastructure

Newsletter No. 3 | December 2019

Researchers position a rib adjacent to a seawall for the installation of vertical rockpool units.

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Happy Holidays!

2019 has been an extremely busy year for all of us on the Ecostructure project. As we approach a new decade, we're looking back at everything we accomplished over the year and what research activities we have planned next. From the seashore to the lab, we've been testing how coastal communities can adapt to climate change by making our shores more biodiversity-friendly.

This year has seen Ecostructure researchers back in the field installing eco-engineering enhancements, in the lab testing the genetic markers that may be helping invasive species to thrive in changing coastal conditions, and behind the screen analysing data and designing prototypes.

We've been featured by the BBC, discussed in a Tedx Talk, and have participated in a variety of public events promoting ecologically-friendly adaptation measures through engaging activities. We hope you enjoy this summary of 2019 and we look forward to what 2020 will bring!

Wishing you many happy returns,

The Ecostructure Team





Above, Ecostructure researchers take a moment to smile during an eco-engineering installation on a seawall in Ireland. Below, Ecostructure's bespoke 3-D topographic tiles await installation, and researchers test replicates of an invasive species in the Bangor University quarantine lab.



Field & Lab

Eco-engineering Fieldwork

Ecostructure researchers have been busy installing numerous eco-engineering enhancements around Ireland & Wales to test their ability to boost biodiversity on artificial coastal structures. Using the data collected from traditional, drone, and LiDAR surveys conducted in 2018, we've designed 3 bespoke 3-D topography tiles with different rock formations and shapes. Their surface is based on natural rock formations that the team identified as supporting the most diverse assemblages of species. Based on digital models of these surfaces, the engineering team at UCD created 3-D printed moulds and cast around 200 units for experimentation using a custom concrete mix. These have been deployed and are being monitored to assess results.

Genetics Labwork

The Bangor/Aberystwyth team recently conducted an experimental evolution study in the quarantine room at Bangor University. The team subjected replicates of the invasive tunicate *D. vexillum* to a simulated marine heatwave to assess how this invasive species responds to stressful environments. Marine heatwaves are expected to become more prevalent under climate change, so Ecostructure is looking into the potential for this invasive species to thrive and continue spreading in such conditions. Experimenting with samples of different populations in the lab will help our researchers find the genetic mechanism responsible for successful adaptation and survival in stressful environments.

Festival of Discovery



Events

04.19 Steering Committee & Project Meeting

Ecostructure partners and Steering Group members met at Bangor University to present work to date, highlighting the extensive progress made since the project's inception. Steering Committee members provided insightful feedback and guidance that partners will incorporate into their forthcoming initiatives.

During breakout sessions, partners exchanged ideas across work packages to aid future work. Cross-disciplinary perspectives go a long way to ensure Ecostructure is synergistic, extending the project's salience and overall ability to research and communicate eco-engineering solutions that benefit coastal environments and communities.

06.19 Festival of Discovery

The Festival of Discovery in Anglesey, Wales was a whirlwind of science communication activities. Ecostructure researcher Dr. Peter Lawrence came equipped with VR goggles to take participants on a journey along rock shores. Viewers were treated to drone footage he filmed of various sea defences, and even video of what life is like from a seashore snail's perspective. You can find these on our YouTube channel.

Other activities included modelling with clay where creatures live and how they can colonise structures when facilitated by eco-engineering enhancements; learning about mapping and scanning rockpools, sea walls, and breakwaters; and discovering how researchers capture data using drones and lasers – bringing the coast back into the lab.

Flying over the exhibit was a view of the evolution of drone technology, from early models to today's newest. An interactive sandbox was set up including a number of 3-D printed and painted rocky shore species: these creatures helped visitors learn about shoreline topography and biodiversity.

Ecostructure researchers personally engaged with over 580 visitors, including 21 members of the public sector, 448 members of the public, 43 researchers, and 71 coastal stakeholders.

Modelling

To improve our understanding of how larvae disperse in the nearshore zone, Ecostructure's biophysical modellers have been working on improving dispersal models for the Irish Sea. The team has developed a suite of hydrodynamic and larval tracking models, which can be applied at various temporal and spatial scales, to simulate how non-native species may spread specifically in the Irish Sea. This work will help us determine how manmade structures (such as marinas) may act as stepping-stones for marine invasive species.

Monitoring

Ongoing field monitoring is being conducted across our tile, rock pool, and vertipool experiment sites in Ireland & Wales. Artecology Vertipools have been deployed at 8 sites across Ireland in a big experiment to see how they perform under different environmental contexts. In our drill-cored rock pools in Wales, it appears that pools drilled on the sheltered side of a breakwater are providing useful nursery habitat for juvenile snails.

Conferences

06-11.01	International Temperate Reefs Symposium Dr. Ally Evans, Dr. Pippa Moore, Dr. Tasman Crowe, Dr. Paul Brooks
5-7.06	Irish Sea Maritime Forum Biennial Conference Dr. Joe Ironside
12.08	European Society for Evolutionary Biology Dr. Melanie Prentice
3-4.09	Imaging the Environment Dr Peter Lawrence
17-19.09	Marine Evidence Wales Dr. Ally Evans, Dr. Melanie Prentice, Dr. Peter Lawrence & Dr. Sophie Ward
21.09	Planet Ocean Workshop Sonya Agnew
23-25.09	International Marine Connectivity (iMarCo) Dr. Sophie Ward, Dr. Peter Robins
24-26.09	Coastal Management Conference 2019 Md Salauddin
7-11.10	CIESM Congress Dr. Veronica Farrugia Drakard



Holes drilled into the sheltered side of breakwaters may be providing nursery habitat for intertidal snails, like this dogwhelk.

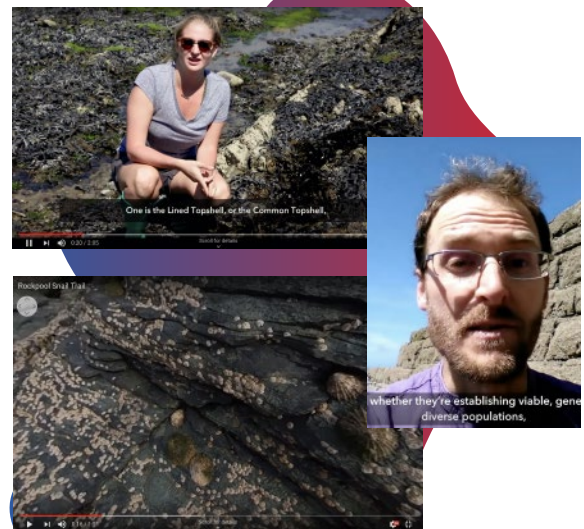
Public Engagement

01 Researcher Videos

In January we released both English and Welsh videos of Ecostructure researchers out sampling for native and invasive species. These videos feature discussions with Dr. Joe Ironside and Dr. Melanie Prentice on how intertidal species may be using hard structures along the coast to expand their ranges.

Dr. Peter Lawrence also produced a number of immersive 360-degree videos with drones to show life along rocky shores, from the surfaces of sea walls to the complex habitat of a seashore snail.

Finally, the UCD team made a brilliant time-lapse video showing just how much work goes into the installation of the eco-engineering tiles being tested in Ireland and Wales.



Above, Dr. Melanie Prentice and Dr. Joe Ironside speak to camera about changing species distributions, while Peter Lawrence takes viewers on a tour of life as a seashore snail.

02 Engagement Materials

To increase the accessibility of information about our research, we have been producing visual materials to attract myriad audiences. Public information boards were designed and installed various sites in Ireland and Wales to explain why we've added artificial rock pools, tiles, and wall-mounted units to coastal structures, how they may increase biodiversity, and how the public can get involved.

We also released a fact sheet on the Carpet Sea Squirt, a non-native species which is the subject of the project's genetics research. The fact sheet is accompanied by a crossword for adults and secondary school students alike to test their knowledge.



Ecostructure in the Media

08.19 BBC News

In August, our eco-engineering activities were filmed by the BBC in Borth, Wales. Dr. Pippa Moore was interviewed discussing how these tiles originate in 3-D printing labs and are installed on sea walls and other coastal structures to support ailing coastal biodiversity. The video and accompanying news article featured several of the team installing tiles along a breakwater.



Dr. Pippa Moore attaching an Ecostructure tile to a breakwater in Wales, filmed by BBC News.

10.19 TedxAberystwyth

Dr. Pippa Moore of Aberystwyth University presented her work in the Ecostructure project at the TedxAberystwyth event held in October. Dr. Moore is part of the team investigating the effects of climate change, coastal engineering, and non-native species on rocky shores and coastal structures. In her talk, Dr. Moore spoke about the work Ecostructure is doing to make coastal engineering better for intertidal life. Video coming soon!



10.19 Financial Times

Ecostructure was referenced in an October Financial Times article about eco-friendly concrete materials and their potential for application on marine construction. Ecostructure researcher Dr. Ally Evans was quoted discussing how the low biodiversity found on concrete coastal structures can be enhanced by increasing the surface complexity of concrete, which is typically smoothed into a surface to which only tough, weedy species can survive.

Spread the Word

We're always looking to share our research on eco-engineering solutions that address coastal adaptation challenges to climate change. Contact our Project Manager Liz Humphreys at elh20@aber.ac.uk if you're interested in Ecostructure's research or want to discuss it in your media outlet.



Project Coordinator Dr. Joe Ironside looks for seashore snails in Wales.

What's Next?

The **UCD engineering team** has recently designed Ecostructure Wall Pools – rock pool units that can be used to test specific ecological questions about how to promote biodiversity on sea walls. These will be deployed and tested in an experiment at Milford Haven in Spring 2020.

Coralline algae transplant experiments have also been ongoing in Wales and we're excited to see whether they are successful. Coralline algae is a group of important foundation species that can influence the rest of the biological community. It's often missing from artificial structures, as its spores are unable to travel far to colonise new areas. We've epoxied fragments of coralline algae into drill-cored rock pools to see if they will survive and make the artificial rock pool communities more like natural rock pools.

Dr. Ally Evans has manufactured some pilot "letterbox crevices" to be tested in Wales. She has been surveying crevice habitats to inform the dimensions of these new units. Future aquarium trials will refine the units by studying species-specific preferences, such as what size crevices blennies or rocky shore crabs might prefer.

Finally, we'll be rolling out our new Citizen Science Observatory, where you'll be able to map information and record observations of changing sealife. We can't wait to share with you more of our research in 2020!



Ecostructure is committed to giving meaningful consideration to the well-being of current and future generations across all its functions thus contributing to the Well-being of Future Generations Act (Wales) 2015 (WFGA) and the United Nations Sustainable Development Goals (UNSDGs).

We hope you enjoy the holidays.

See you in 2020!