

CITIZEN SCIENCE FOR SEAGRASS IN THE SOUTH WEST: THE COMMUNITY SEAGRASS INITIATIVE

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Seagrasses create important marine habitats for many species and provide benefits to coastal communities through several ecosystem services. However, the majority of those communities are unaware that seagrass exists. Citizen science can play a part in raising awareness and getting members of the public involved in marine conservation efforts. The National Marine Aquarium is spearheading a three year Heritage Lottery Funded partnered project: The Community Seagrass Initiative (CSI). The CSI provides many different opportunities for volunteers to learn new skills, get involved in marine science and contribute towards management plans for seagrass habitats in the South West of England. This short article gives an overview of the project.

SEAGRASS

Seagrass is the only group of true marine angiosperms in the world, found in all coastal systems except Antarctica, generally in shallow sunlit waters creating underwater 'meadows' or 'beds'. Seagrass meadows are among the most productive autotrophic communities in the world (Orth *et al.*, 2006). Seagrass beds have a complex root system under the sediment and shoots with leaves above, which create a 'canopy' (Fig. 1). Both the root system and the canopy are inhabited by a wide variety of species. These habitats play an important role in biodiversity enhancement and provide physical structures on relatively featureless sea beds, enhancing epifaunal diversity, biomass and primary and secondary production. Microscopic epiphytic organisms grow on seagrass blades supplying a valuable food source for epifaunal grazers e.g. crustaceans and fish (Duffy, 2006). This important habitat has been recognised for its role in many commercial fish species' life cycle, acting as a nursery (Heck *et al.*, 1989 and Matilla *et al.*, 1999). It can increase intertidal and subtidal sediment stabilisation using complex rhizome root mats, reduce turbidity through canopies (Short and Wyllie-Echeverria, 1996; Newell and Koch, 2004), as well as improve water quality through accumulation of contaminants and the release of oxygen (Francois *et al.*, 1989 and Moore 2004). More recently it has been recognised for its role in sequestering some of the largest amounts of organic carbon of any habitat on Earth. Tropical rainforest global carbon burial is measured up to 78.5 Tg C yr⁻¹, whereas seagrass systems accumulate up to 112 Tg C yr⁻¹ (McLeod *et al.*, 2011). Efforts in seagrass research are increasing as additional ecosystem services are recognised; however, seagrass systems are still in decline and measured as a loss of 7% yr⁻¹ (Waycott *et al.* 2009) due to threats such as coastal development and water quality issues. Scientific surveys and marine conservation efforts have helped some areas to recover.



FIGURE 1. Seagrass (*Zostera marina*) meadow.

In the UK, there are seagrass beds on the coast, estuaries and rias, consisting of four species; *Zostera marina*, *Zostera noltei*, *Ruppia maritima* and *Ruppia cirrhosa*. *Zostera marina* or 'Eelgrass' is a subtidal species (with a few exceptional intertidal areas) and is classed as a Biodiversity Action Plan (BAP) priority habitat and species, which supports a number of protected BAP species, such as two species of seahorses (Fig. 2). The UK is lacking in seagrass research and conservation efforts compared to some other areas of the world such as Australia and Scandinavia.



FIGURE 2. Eelgrass (*Zostera marina*) meadows provide habitats for protected species such as seahorses (*Hippocampus guttuatus*).

CITIZEN SCIENCE FOR SEAGRASS

These important subtidal habitats are 'out of sight' therefore are often 'out of mind'; however, they should be monitored to investigate any decline. Unfortunately, marine habitat monitoring is becoming less frequent due to lack of funding and professional staff. For this reason, organisations are using citizen science as a means of collecting large amounts of data from a wide geographical area. This has the benefit of raising awareness of conservation issues to the volunteers and the public involved in the project.

The Community Seagrass Initiative involves volunteers in the monitoring of the habitat and marine species, increasing knowledge and participants' scientific skills and creating an opportunity to learn about their local coastal heritage. The CSI surveys 19 seagrass beds in five regions along the 191-mile stretch of coastline from Looe in Cornwall to Weymouth in Dorset (Fig. 3). There are a variety of ways volunteers can be involved in the CSI: approximately 1,000 volunteer divers, kayakers, sailors, internet users and members of the general public have signed up so far.



FIGURE 3. Community Seagrass Initiative (CSI) project study area.

Diving into Science

Volunteer SCUBA divers are trained in underwater scientific surveying skills to help collect information about the seagrass beds (Fig. 4). Up to five pairs of divers sample fifteen 0.25m² quadrats over a given distance from deepest edge to shallow in each seagrass bed (Fig. 5). The attributes recorded are: seagrass density; location; fauna abundance and diversity, and presence/absence of commercial fisheries species such as the scallop (*Pecten maximus*) and BAP species such as stalked jellyfish (e.g. *Lucernariopsis campanulata*). The data and photos are analysed to investigate correlations between seasons, density, depth, location, fauna abundance and diversity. All photos taken are geotagged with GPX information from a GPS unit carried with their surface marker buoy, giving each photo a latitude and longitude (useful in case a repeat visit is needed). So far, all 19 seagrass beds have been surveyed at least 8 times over the last 2 seasons. This data is open source and can be used by other organisations to add to their database for monitoring and management efforts.



FIGURE 4. Diver surveying seagrass.

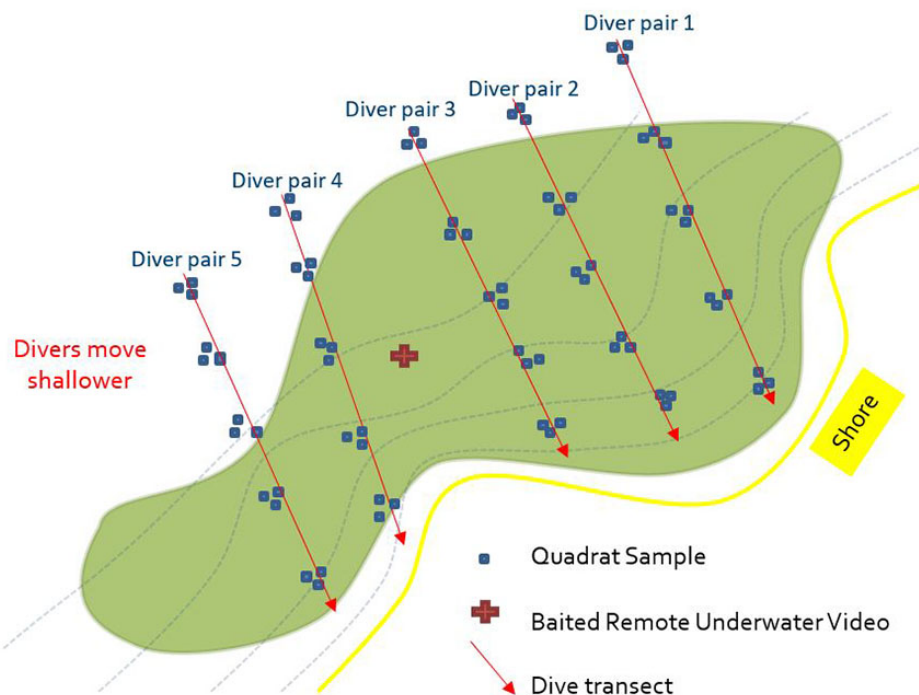


FIGURE 5. Dive survey protocol. Divers work from the deepest edge of the seagrass meadow towards the shallow edge sampling 15 quadrats. (3 replicates in 5 stations).

Sailing into Science

Sailors and boat users are trained to monitor water clarity near the seagrass beds in their local area and learn new skills to incorporate into their hobby. Taking Secchi disc depths is a simple yet extremely effective way of measuring water clarity (more information found here: <http://www.secchidisk.org/>). By collecting information about the clarity of water over seagrass beds, we can identify any areas under significant threat due to excess nutrients and pollution which can block sunlight, limiting seagrass growth.

Paddling into Science

Volunteer paddlers are trained to use an underwater towed camera 'Shark cam' (Fig. 6). By paddling along the 5 m depth contour (shown by a GPS using BlueChart®) the kayakers tow Shark cam and film/photograph the seabed to search for unknown seagrass. If found, the co-ordinate is logged and the volunteer divers investigate further.

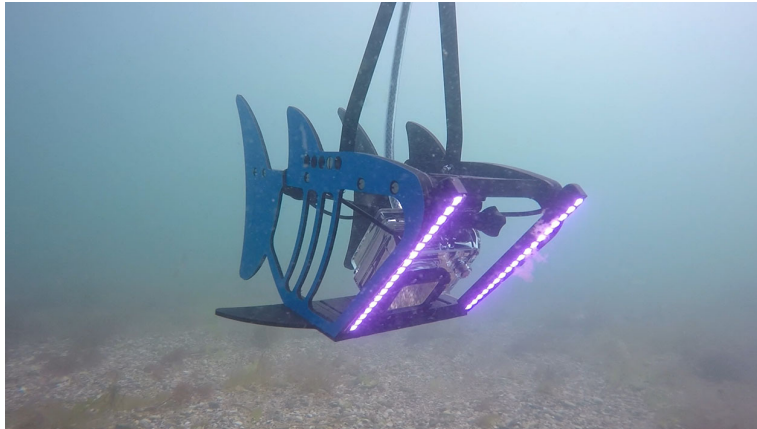


FIGURE 6. The 'Shark cam' towed camera.

This was a success in Torbay in 2016 when an unmapped area of patchy seagrass was found near Paignton Harbour. Photos from the dive surveys were mapped using QGIS (Fig. 7). The Devon and Severn Inshore Fisheries Conservation Authority were notified and included this area in their bi-annual drop-down-video surveys – to measure seagrass bed extent and density.

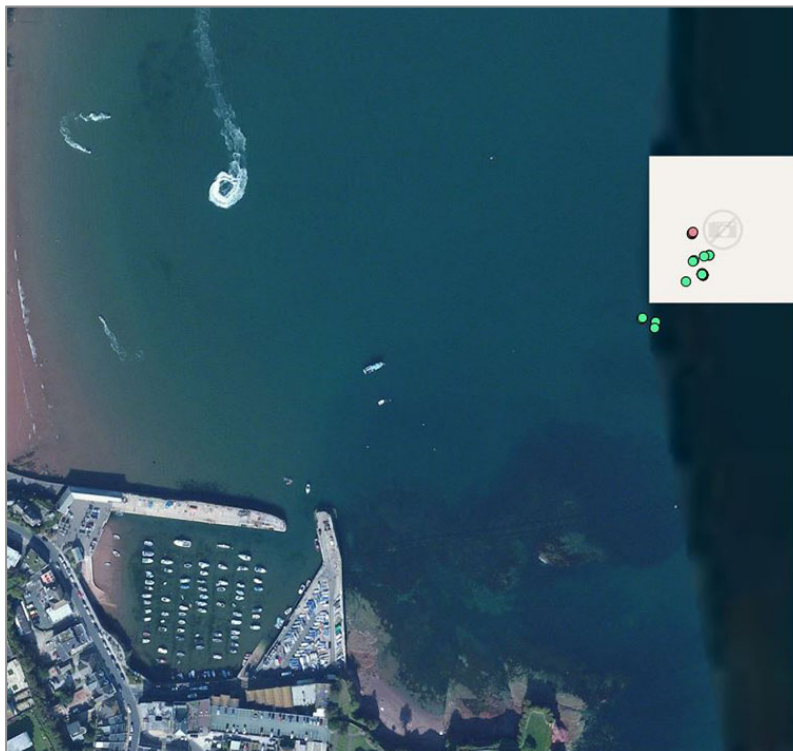


FIGURE 7. Patchy areas of Seagrass (represented by coloured circles) near Fiary Cove, Paignton.

Seagrass cultivation

The CSI is trialling the cultivation of *Zostera marina* plants and seeds for potential use in aquaria and to possibly help restore damaged seagrass beds. This has been trialled elsewhere in the world but only twice in the UK. It is notoriously difficult to achieve success from seed to mature plant. Two tank systems have been set up to trial a variety of methods and treatments in the National Marine Aquarium, Plymouth and Living Coasts, Torquay (Fig.8). There are many other features of the project, for more information see: <http://www.csi-seagrass.co.uk/>



FIGURE 8. *Zostera marina* cultivation tanks.

As the project approaches its official end in December 2017, project officers are working with project partners and volunteers to leave a legacy and find ways for the work to continue. Plans for further cultivation research and monitoring provides hope that these initiatives can have longevity.

FURTHER INFORMATION

For more information on the project see: <http://www.csi-seagrass.co.uk/>

For educational videos see: <https://vimeo.com/search?q=community+seagrass+initiative>

Social media: <https://www.facebook.com/CommunitySeagrassInitiative/>
<https://twitter.com/CSISegrass>

For secchi disc sampling see: <http://www.secchidisk.org/>

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