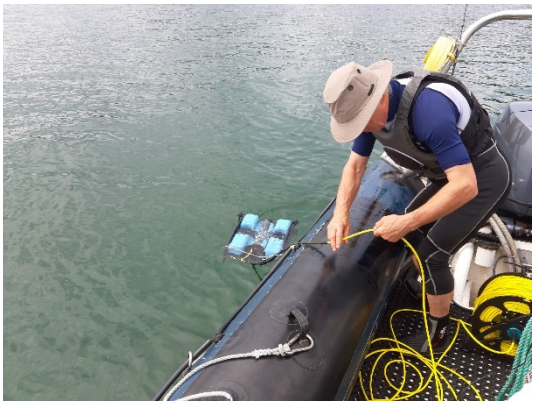
Community marine biodiversity monitoring project: Community-led ROV survey – COAST's experience and learning

The Community of Arran Seabed Trust (COAST) raised money to part fund the purchase of a Remotely Operated Vehicle (ROV) and, supported by additional funding from Scottish Natural Heritage (SNH), acquired a Blue Robotics ROV (BlueROV2) in the latter part of 2018 with the aim of community volunteers trialling use of the ROV and field testing ROV survey protocols.

Work in 2019

Two COAST volunteers, Donald McNicol and Gavin Steven, took on the task of building the ROV. In June 2019 they attended the Community Marine Monitoring Demonstration Event held at Oban and, following this, they completed the set-up of the ROV, linking it to a dedicated laptop and installing the necessary software. After testing the operation of the ROV in a test tank at the Octopus Centre (COAST's Marine Discovery Centre on Arran), the ROV has been successfully deployed during 2019 from both the shore (local pier) and boats in shallow water situations to 5m in the area of the No Take Zone within Lamlash Bay and the South Arran MPA off Whiting Bay. We have been able to capture and store footage of seabed habitats of sufficient quality to identify seabed substrata and characterising species. Our deployments included an opportunity for Donald and Gavin to work with specialists from the University of York in August 2019 who were on Arran to field test their BlueROV2 system alongside a field survey being undertaken by York MSc students on scallops and seabed biodiversity. Additional equipment features were identified and a generous offer of additional 3D printed brackets for the ROV set up was accepted.

The ROV deployments have focussed on gaining experience with the use and operation of the equipment. We have not yet gone on to undertake specific field-testing of ROV survey protocols and this is primarily due to some specific issues and constraints on its deployment that we have experienced with the ROV.



We have found that with the 10 Ah capacity battery fitted to the ROV the viable operational time for the ROV on one battery pack is around 1 hour. This may vary when used in deeper water when lighting is required and the thrusters are more intensively used. It is estimated that 1 hour of video equates to 4GB of data space.

Deployment challenges

- The main frame is made of HDPE (high density polyethylene), and is robust, but the electronic and battery enclosures are acrylic, which is a brittle material and unsuited to rough handling or any impact loading. Early on we had an issue with cracking in the acrylic electronics housing supplied with the ROV. This appeared to be some sort of stress fracture and we had to arrange for its replacement which was duly provided by the company but this issue did cause some delay.

- One of the main operational limitations we have encountered is the difficulty of reading the computer monitor screen in daylight; this is not the fault of the ROV but is a generic problem with all LED screens. This means that whilst it is feasible to deploy the ROV from a boat without a cuddy, without sufficient shading of the screen it is not practically suitable as the ROV operator is not able to see what is happening on the monitor. We have tried using different approaches to shade the computer screen in the field but they have not been successful. There is also the issue of weatherproofing the computer which is more problematical in an open boat. We do not currently have easy access to a boat with a cuddy, unless we specifically charter a boat, and this has limited how much we have been able to work with the ROV this year. OLED screens may be a better option but are more expensive and do not, on their own, address the requirement to weather-proof the computer.

- In shallow water habitats with bootlace weed *Chorda filum* we encountered a serious problem of the weed becoming wrapped up in the drive propellers, sometimes to the extent that we had to shut the ROV motors down and tow it back in on its tether.

Future work with the ROV

We are currently planning deployment of the ROV in deeper water (up to 50-60m) to undertake seabed habitat survey off Arran. We have been able to secure funding that will enable us to charter a boat with a suitable cuddy for 2-3 days of survey work. We want to use the ROV alongside a simple drop down 'pole cam' system using a GoPro and lights on the weighted pole to see how both of these will perform in our local situation and when used by community volunteers. We have been successful in securing funding from the Community Marine Monitoring Equipment Fund to be able to purchase the pole-cam equipment. This will provide useful experience for COAST volunteers in using the ROV and drop-down camera survey equipment and will enable us to field-test the survey protocols for this equipment in different habitats.

COAST's initial views on the ROV and its use for community-led survey

- The BlueROV2 is a relatively sophisticated survey tool and is versatile and surprisingly competent for such a compact device. It is claimed to be capable of diving to 100 m and has been tested (but not by us) to 130 m and there is no reason to dispute this claim. It is also highly manoeuvrable, powerful for such a small device and capable of 3 knots, which for us is more than adequate given the generally low currents around Arran.
- However, its operation is not straightforward and the various software menus are quite complex, all of which can be mastered but will take time and could lead to some "incidents" if used by anyone without training.
- As standard, the ROV has no positioning system and it is challenging to determine where it is in the water, particularly as the tether floats, and is very susceptible to windage and cannot be relied upon to be an indicator of the ROV's underwater position. We have not yet field-tested the protocols for position correction that are described in the Community Marine Monitoring Handbook but we would like to do this and report back on how this goes. Whilst it is possible to purchase additional equipment to remotely record the ROV position relative to the boat, this is not something we are considering doing at the moment. We understand that South Skye Seas Initiative have invested in underwater positioning equipment and will be interested to find out how this has worked for them.

- A significant operational limitation we have encountered is the need for a boat with a cuddy to provide shading and protection for the computer monitor, as commented on above.
- We have been able to obtain reasonable underwater habitat video but, as far as we have been able to work out, the standard camera does not have particularly good image resolution. We do not yet have experience of how effective the four underwater lights will be in illuminating the seabed in deeper situations.
- Overall, we think the Blue ROV2 is an excellent and highly competent device. It does require individuals with appropriate technical know-how to set it up and deploy it. We wonder if it is a method that is better used in relatively deep water (more than 30 m) or where we would want to specifically steer the ROV to record particular features or types of habitat, such as steep reef faces. For shallow areas other survey methods and equipment (such as simple drop-down cameras) may be easier for community groups to use and may be more adaptable to being used from different craft as well as easier to obtain location accuracy. Other camera systems such as GoPro may provide sharper image resolution.
- If other community groups are particularly interested in undertaking ROV surveys, an option may be for community groups experienced in ROV deployment to be supported to work jointly with SNH to train other groups and to look at sharing existing ROV equipment for specific surveys. Other survey approaches may be more appropriate depending on the specific habitats in questions and survey requirements. If community groups wish to purchase their own ROV equipment, cheaper and simpler ROV systems are becoming more available and may be a viable option for community purposes.