

Darwin Plus: Overseas Territories Environment and Climate Fund

Final Report

To be completed with reference to the "Project Reporting Information Note":
(<https://dplus.darwininitiative.org.uk/resources/information-notes/>).

It is expected that this report will be a **maximum** of 20 pages in length, excluding annexes.

Darwin Plus Project Information

Project reference	DPLUS079
Project title	Improving Sustainability of Marine Management in Montserrat
Territory(ies)	Montserrat
Lead partner	Cefas
Project partner(s)	Government of Montserrat, Waitt Institute
Darwin Plus grant value	██████████
Start/end dates of project	01/04/2018 – 31/03/2023
Project Leader name	Jon Hawes
Project website/blog/social media	@CefasGovUK



1 Project Summary

The Government of Montserrat (GoM), a UK Overseas Territory (UKOT) located in the Lesser Antilles island arc in the Caribbean Sea (Figure 1), has been in the process of developing a Sustainable Oceans Policy since ~2014. GoM has been gathering data layers with a view of ensuring long-term health of Montserrat's waters through ocean zoning, protected areas and fisheries reforms. This project looked to produce high resolution data layers and marine habitat maps to support the development and management of marine protected areas, alongside the provision of training and resources to further GOM capability in Environmental Impact Assessment and a programme of educational outreach to broaden local engagement with the marine environment.

The project aimed to progress Montserrat's ability to, in future, designate Marine Protected Areas, supporting the Convention on Biological Diversity target to have 10% of the world's oceans protected by 2020, and the UK Government's desire to have the rich environmental assets of the Overseas Territories protected for the future (UK Government White Paper on the UK Overseas Territories, June 2012). Work was undertaken in Montserrat during 2016 (Waitt Institute) to develop a coarse, national benthic habitat map. This project built on this by increasing data resolution using recently acquired acoustic data (Figure 1) and undertook data collection in deeper, unexplored waters. Working with the local stakeholders, the project used state-of-the-art seabed survey equipment (which remained in Montserrat and was delivered alongside extensive training in its use and maintenance) to achieve the best possible survey results, alongside demonstrating to local stakeholders the benefits of these techniques and training them in their usage.

Training was delivered in the skills needed to produce data to populate this subtidal habitat map, helping Montserrat deliver sustainable spatial planning and management of marine resources. In addition, EIA capacity building and education on marine issues will help with improving marine conservation and deliver the UK Government's commitment to well managed and productive seas around the UKOTs. Montserrat has a large marine area and the GoM has limited capacity to monitor and manage this resource, which presents challenges in protecting biodiversity and achieving sustainable management. Limited previous work had been undertaken to characterise the subtidal marine habitats present in the shelf surrounding Montserrat, restricted by availability of suitable bathymetric data required for more detailed mapping. These data were made available by a UKHO funded survey of the western shelf area in 2017, providing opportunity to undertake the more detailed habitat mapping required for accurate marine spatial planning.

Furthermore, with significant infrastructure development planned in the near future, a gap was identified in the capacity and skillsets of GoM to undertake the necessary Environmental Impact Assessments (EIA). This project aimed to address this capacity issue with training and resource provision.

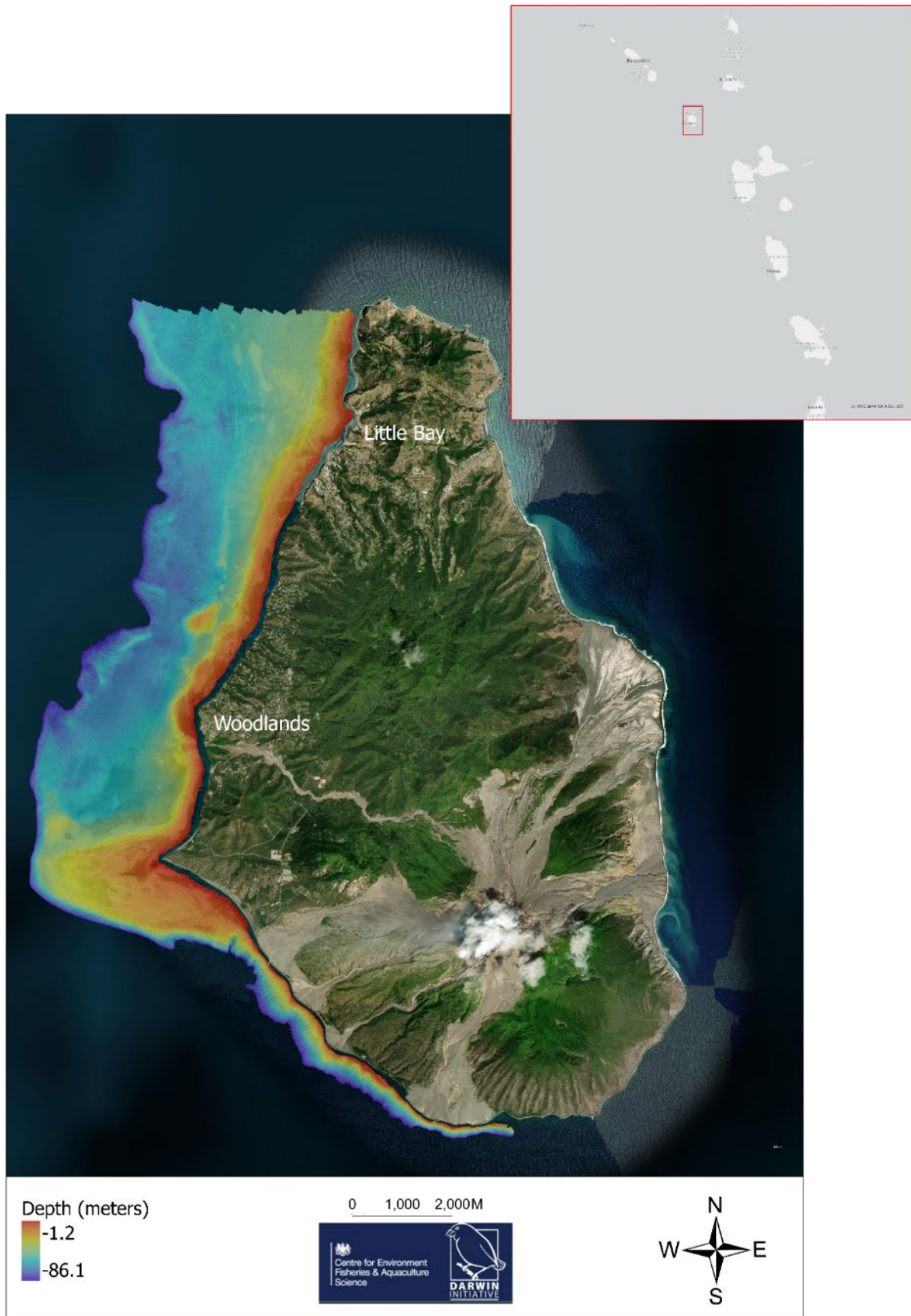


Figure 1 Overview of Montserrat and area of study for west coast database and seabed classification (UKHO bathymetric dataset)

There has been a strong commitment towards marine conservation including the development of a Sustainable Ocean Policy (SOP) in partnership with the Waitt Institute. This policy aimed to foster the sustainable, profitable and enjoyable use of ocean resources for current and future generations. In June 2017 the Government of Montserrat announced a commitment to protect 10-30% of its marine environment as a no-take marine reserve. An initial marine scientific

assessment was undertaken by the Waitt Institute, but further work is needed to strengthen the evidence base and decision making processes.

In addition to the above, an opportunity to improve engagement of Montserratians with their marine environment was identified in the form of developing education material for the Secondary School. This was considered to be a crucial component in establishing long term engagement in future marine spatial planning activities, given the highly complex and controversial nature of this activity in all small island territories. These challenges are relevant to a large number of Montserratians, specifically with regards to fishers, sand mining activities and the nascent tourism sector – alongside the wider public in consideration of in-progress national infrastructure projects. All these stakeholders have a need to be engaged with the issues raised by different sectors utilising the marine space without clear marine spatial; planning in place. These issues were identified through direct engagement with GoM personnel, who brought them to the attention of Cefas.

Acquisition of seabed imagery data and the production of a higher resolution subtidal habitat map was highlighted as a key means of building a basis for sustainable use of the marine environment of Montserrat. A high-resolution (2 m cell resolution) habitat map would provide the cornerstone for zonation of the marine space, allowing GoM to better understand the distribution of key sensitive habitats alongside areas of likely economic importance. This project looked to address these challenges by producing an updated subtidal habitat map and delivering key derivative environmental layers. Furthermore, seabed video equipment was delivered to GoM as part of this project, alongside extensive training (in the field and on shore) in its operation and maintenance. Workshops were delivered to allow GOM staff to develop the skills required to take seabed imagery data acquired and analyse it for epifaunal assemblage analysis and semi-supervised classification using object-based image analysis (the method used by this project to predict habitat extent).

The project looked to address the lack of experience and capacity in EIA by delivery of tailored, in person training in the EIA techniques, in the specific context of the new port development. This took form in two in country workshop sessions and a researcher exchange week at Cefas laboratory, Lowestoft.

2 Project Stakeholders/Partners

The primary stakeholder for this project was the Government of Montserrat Ministry of Agriculture, Land, Housing and the Environment. The Government of Montserrat identified staff to participate in capacity building activities and covered their staff time during training periods. GoM also liaised with teachers and the education department in order to allow the incorporation of the marine issues resource pack into the science curriculum, ensuring that teachers were available for training. The Department of Lands and Survey was the key stakeholder in output 2 (creation of the subtidal seabed map), staff in this department provided invaluable aid in project planning (marine environmental survey preparation and staffing) alongside significant work in organisation of in country workshops. The second primary stakeholder was Montserrat Secondary School (MSS) itself, who provided significant amounts of teacher time to aid the project in implementation of output 3.

Assistance in habitat map validation was kindly provided to the project by Mr Ponteen of the department of fisheries, by Scuba Montserrat and by the head of the Fishers Co-operative.

3 Project Achievements

Please see Annex 2 for the most recently approved Logframe and a summary of project progress against this.

3.1 Outputs

Output 1. Knowledge transfer and Building Capacity

Output 1 is considered to be measured by two indicators; 1.1 the delivery of three days of training workshops covering video survey techniques and ground-truth data analysis. Indicator 1.2 focussed on the “Effective decision-making through three weeks of workshops demonstrating the interpretation and review of E.I.A”. The output was split into the following activities:

Delivery of training to fulfil indicator 1. 1 was originally planned to be delivered in Year 2 (May 2019), however it was considered more appropriate to focus only on delivery of training on seabed videography during the actual ground-truthing survey in May 2019, then follow up with the second component (data analysis) in Year 3 after the data had been analysed.

The first component of indicator 1.1 (training in seabed video survey techniques) included survey planning and use of the underwater camera equipment (Annex 6.1). Personnel from three Ministry of Agriculture, Land, Housing and the Environment (MALHE) departments; Fisheries, Land and Surveys and Physical Planning received training. A maximum of four MALHE personnel were on board during one of the following survey days; 12, 13, 14 and 15 May 2019. The likely key users of the ground-truthing equipment were present on multiple days; Mrs Lavern Rogers-Ryan and Rondel Meade of the Physical Planning Unit, Chase Buffonge of the Fisheries Division, Nicole Duberry and Jovann Thornhill from the Department of Environment. Training covered all elements of a shallow water sea-bed imaging survey including planning, health and safety, equipment maintenance and mobilisation, deployment, recovery, survey data recording and quality control. The GoM personnel who took part in the training became familiar not only with the underwater video equipment, but also with the rationale and considerations required to effectively plan a subtidal habitat mapping ground truthing survey. Furthermore, ideas on how to use the camera system to address priority marine environmental questions were proposed by GoM staff. Indicating the potential use of the system and the training in the long term.

The second component (data analysis) was delivered in a two-day workshop in January 2023, owing to the extended delays to international travel caused by the Covid-19 pandemic. This workshop presented the results of the habitat mapping undertaken as part of the project, followed by a course on seabed imagery analysis and habitat mapping using supervised classification techniques. Between six and eight GoM staff attended at times over the two-day workshop. A refresher course on underwater camera set up and maintenance was also provided.



Figure 2 Photo showing part of the seabed camera equipment refresher course

Considerable interest was shown on the subsea imagery analysis by the majority of attendants, whereas a smaller subset of GoM staff (primarily those from Land and Surveys) found the predictive mapping components very informative. A list of attendees and workshop agenda can be found in Annex 6.2.



Figure 3 Photo of one of the Cefas team presenting on seabed imagery acquisition and analysis

In addition to this, Jon Hawes provided a shorter workshop presenting the subtidal habitat map and marine habitat mapping in general to a wider public audience as part of Montserrat’s national GIS day in November 2022. This presentation and associated emails are presented in Annex 6.3.

Indicator 1.2 is multifaceted, comprised of on training programme (October 2018 – see Annex 6.4), two workshops (October 2018 and 2019– see Annexes 6.5 and 6.6) and a week-long researcher exchange in the UK (See Annex 6.9). The EIA workshops were completed in year 2 with delivery of the second of two planned EIA training workshops (the first being completed in 2018). The Researcher exchange took place in August 2022 (year 5), with three researchers from the Government of Montserrat’s Environment Department and Physical Planning Unit undertaking a one-week visit to Cefas’ laboratory and site in Lowestoft. The visitors enjoyed a tour of the labs and a demonstration of Cefas’ drone (RPA) and ROV capabilities, as well as meeting with many scientific and technical experts. They participated in workshop and presentation sessions on important topics to Montserrat including aquaculture viability, marine renewable energy, marine litter, and sand mining impacts, monitoring and regulation.

EIA evaluation support was provided throughout the programme, with the delivery of guidance documents and training manuals and handouts in conjunction with the EIA workshops under Activity 1.5 (delivered in Year 3 – see Annexes 6.7 and 6.8.) and hard copies of additional desk notes and training documents delivered in January 2023



Figure 4 Cefas team with MAHLE colleagues handing over the hard copies of the EIA resource pack in January 2023

Output 2. GIS database with environmental layers and maps of benthic habitats in shelf waters

Output 2 was delivered in its entirety, after a remarkably successful ground-truth survey and excellent results from the imagery analysis and predictive mapping components. The resulting map has a good level of accuracy for a subtidal map (tested both statistically and through

stakeholder consultation) and presents a useful board level characterisation of the epibenthic habitats. During the 10-day ground-truthing survey in Q1 of Year 2 (indicator 2.1), 116 underwater video transects (of between 100m – 300m in length) were acquired across all depth bands and broad habitat types present in the survey area (Figure 5). The survey area was the extent of the UKHO 2018 acquired bathymetry dataset, clipped to the 80m depth contour.

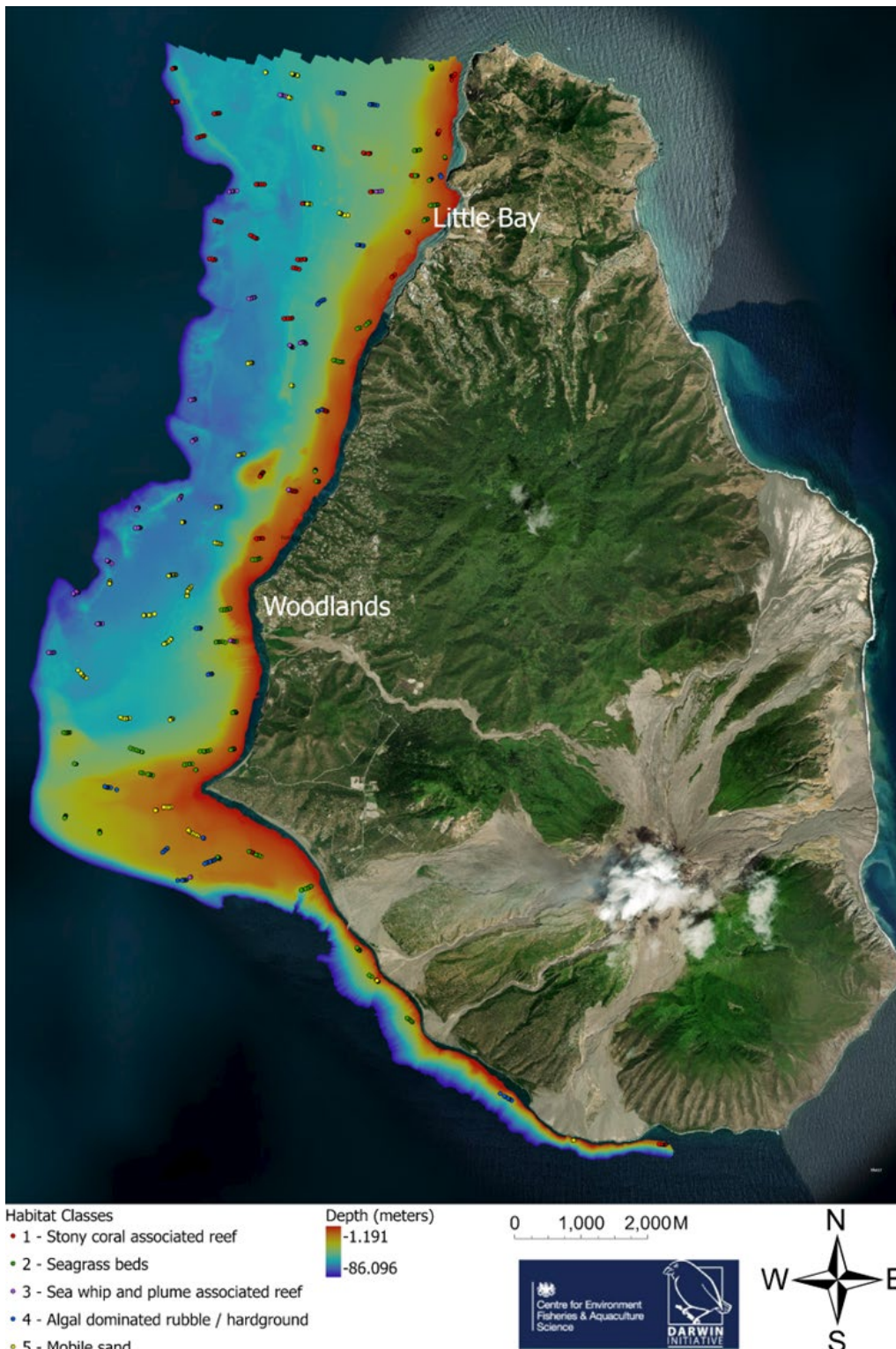


Figure 5 Overview of Montserrat and area of study for west coast database and seabed classification (UKHO bathymetric dataset) and 2019 achieved seabed imagery (groundtruth) locations.

In all 1,004 high resolution seabed images were selected for analysis, wherein they were sent to an external contractor (Envision Ltd) with extensive experience in Caribbean epifaunal identification. Through a process of cell frequency analysis (Figure 6) achieved using the

BIIGLE¹ online annotation platform, taxa were identified consistent with the CATAMI² morpho-taxic classification- a system built for consistent identification of epifauna from remote acquired seabed imagery.

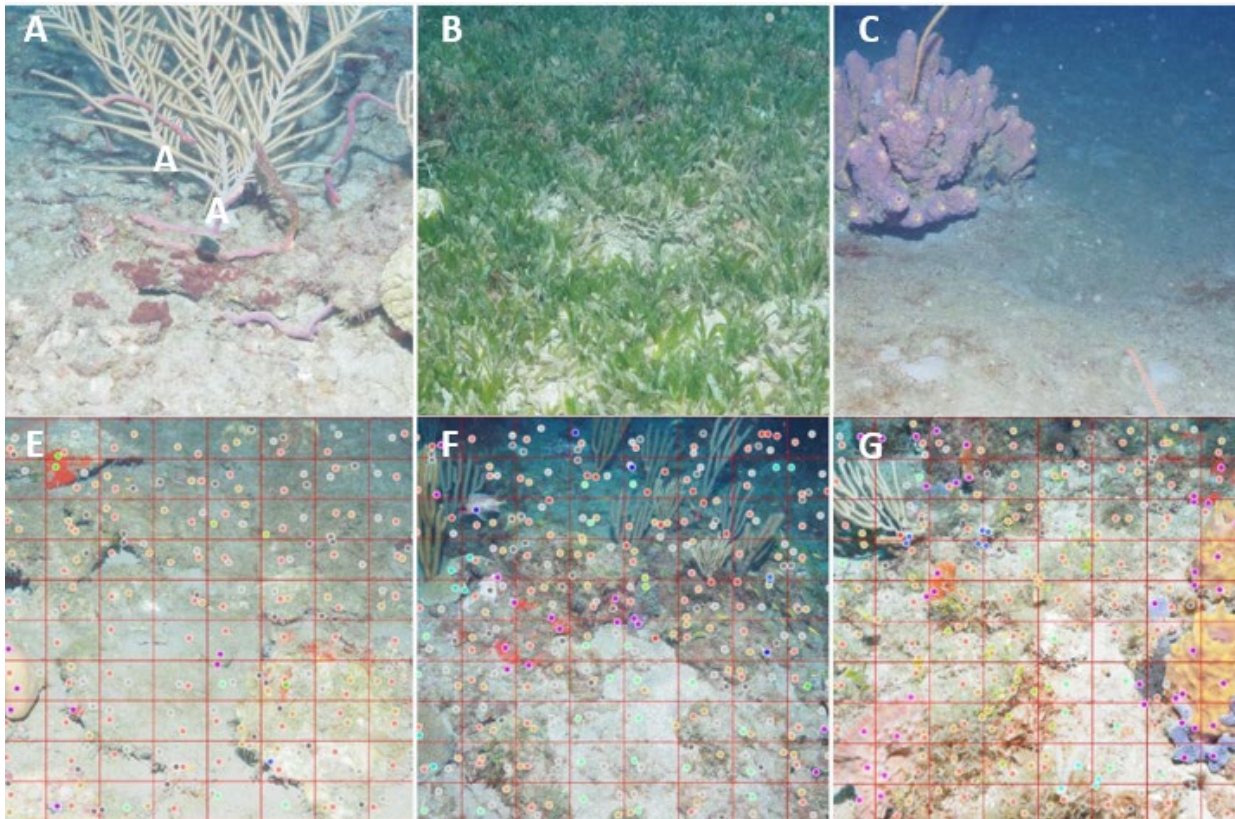


Figure 6 Showing raw still images acquired from the 2019 groundtruthing survey (A-C) alongside examples of images annotation for cell frequency using the BIIGLE Platform (E-G)

The imagery annotation resulted in a matrix of percentage cover information for all fauna and flora (according to the CATMI morpho-taxic tree) and substrate from each 1,004 images. These data were then truncated and aggregated / across all spatially adjacent images of the same broad habitat classification within their respective transects. This was done as a single still image cannot constitute a reliable sample, owing to the very small seabed area sampled by each image.

A shapefile describing the preliminary classification of the images, derived from live annotations of each survey station, was provided to GoM partners (see Annex 6.1) to fulfil indicator 2.2. Additional data layers were derived from bathymetry and backscatter data layers (evidence provided in Annex 6.10) which was then used to assist in the final seabed characterisation. An initial object based image analysis (OBIA) segmentation of these data layers (known as “predictors”) was then performed using Trimble eCognition 10 (see Annex 6.10) in Q3 year 2. This process groups pixels into objects of homologous properties. The analysed ground-truthing imagery data was received in Q4 Year 2 (See Annex 6.10), and quality controlled to ensure accuracy and consistency of faunal identification and enumeration.

Work during Year 3 (Activity 2.3) focussed on multivariate assemblage analyses of the epifaunal biotic data (percentage cover) as derived from the seabed imagery analysis, and predictive mapping of habitats derived from these assemblages Annex 6.11. Aggregated

¹ Langenkämper, D., Zurowietz, M., Schoening, T., & Nattkemper, T. W. (2017). BIIGLE 2.0 - Browsing and Annotating Large Marine Image Collections. *Frontiers in Marine Science*, 4(March), 1–10. <https://doi.org/10.3389/fmars.2017.00083>

² Hill, N., Althaus, F., Rees, T., Jordan, A., Industries, P., Colquhoun, J., Sch, C., Case, M., Scott, F., Edgar, G., Legorreta, R. F., Fromont, J., Museum, W. A., Przeslawski, R., Hayes, K., Marzinelli, Z., Friedman, A., Toohey, L., Hibberd, T., ... Centre, P. S. (2014). CATAMI classification scheme for scoring marine biota and substrata in underwater imagery. December, 1–24.

sample data were transformed into a Hellinger dissimilarity matrix, whereupon k-means classification was performed using the Vegan package in the R Studio statistical environment. This multivariate assemblage analysis indicated the presence of five mappable habitat classes in the study area.

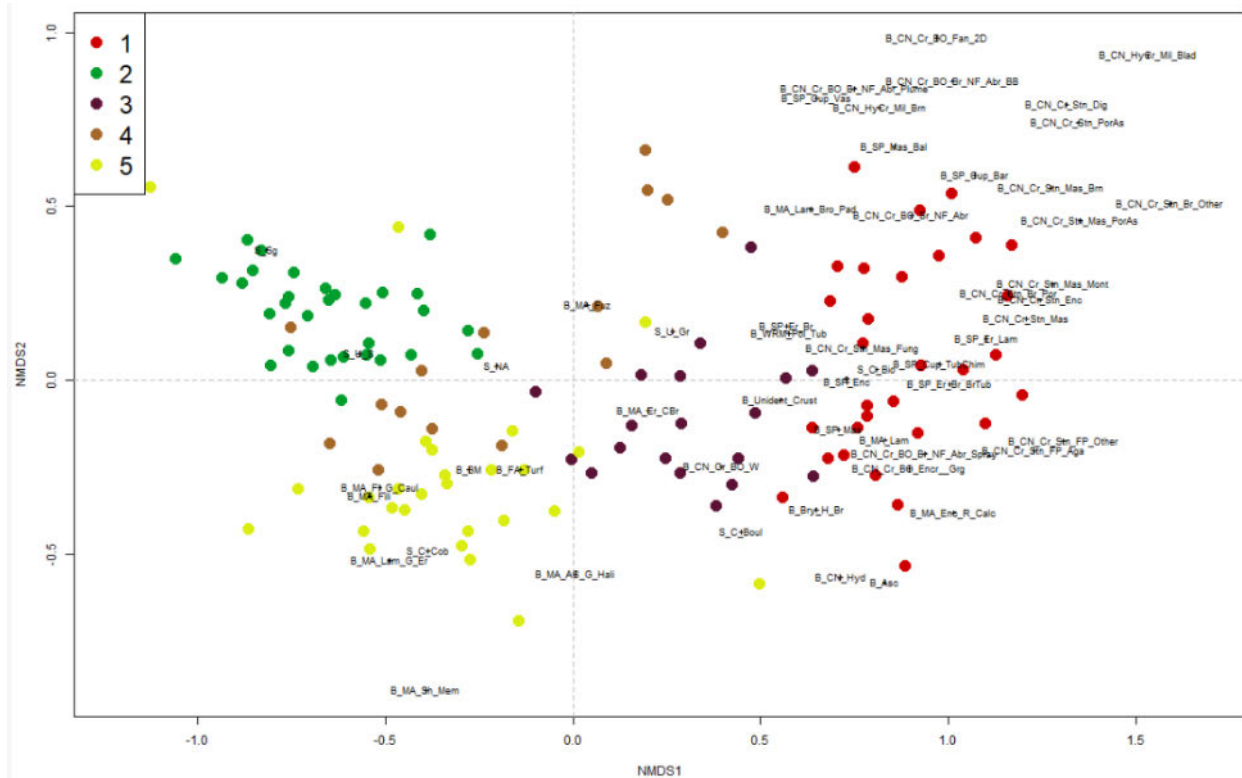


Figure 7 Non-metric multidimensional scaling (nMDS) ordination of the multivariate analysis, presenting the dissimilarities of the samples (classified using k-means) in no metric space

Predictive habitat mapping was undertaken by applying a process of semi-supervised classification to the final segmentation. This was achieved through creation of a training subset (co-locating the classified seabed images with corresponding objects) containing class information alongside mean and standard deviation values for each of the predictor data layers (bathymetry, backscatter and derivatives). This training dataset was then used to train a predictive model, which in turn was to classify the remaining objects. The resulting final predictive seabed classification can be seen in Figure 8. A full breakdown of the mapping methodology, class accuracy and error rates, alongside predictor importance can be seen in Annex 6.11, and via the online Arc Story Map report (See publications section – Annex 4). The preliminary characterisation was delivered to GoM on 24/12/2020 (see email evidence in Annex 6.12) as required by Activity 2.5.

A Microsoft Teams meeting to explore the feasibility of combining the ground-truth data acquired during this project with that collected by the Waitt Institute was held on 29/10/2020 (see email evidence in Annex 6.11.3). This was attended by Andy Estep (Waitt Institute) and Jon Hawes (Cefas), and the result of which was the provision of further information from Waitt on the epibenthic classification of their ground truth images. This fulfils Activity 2.4.

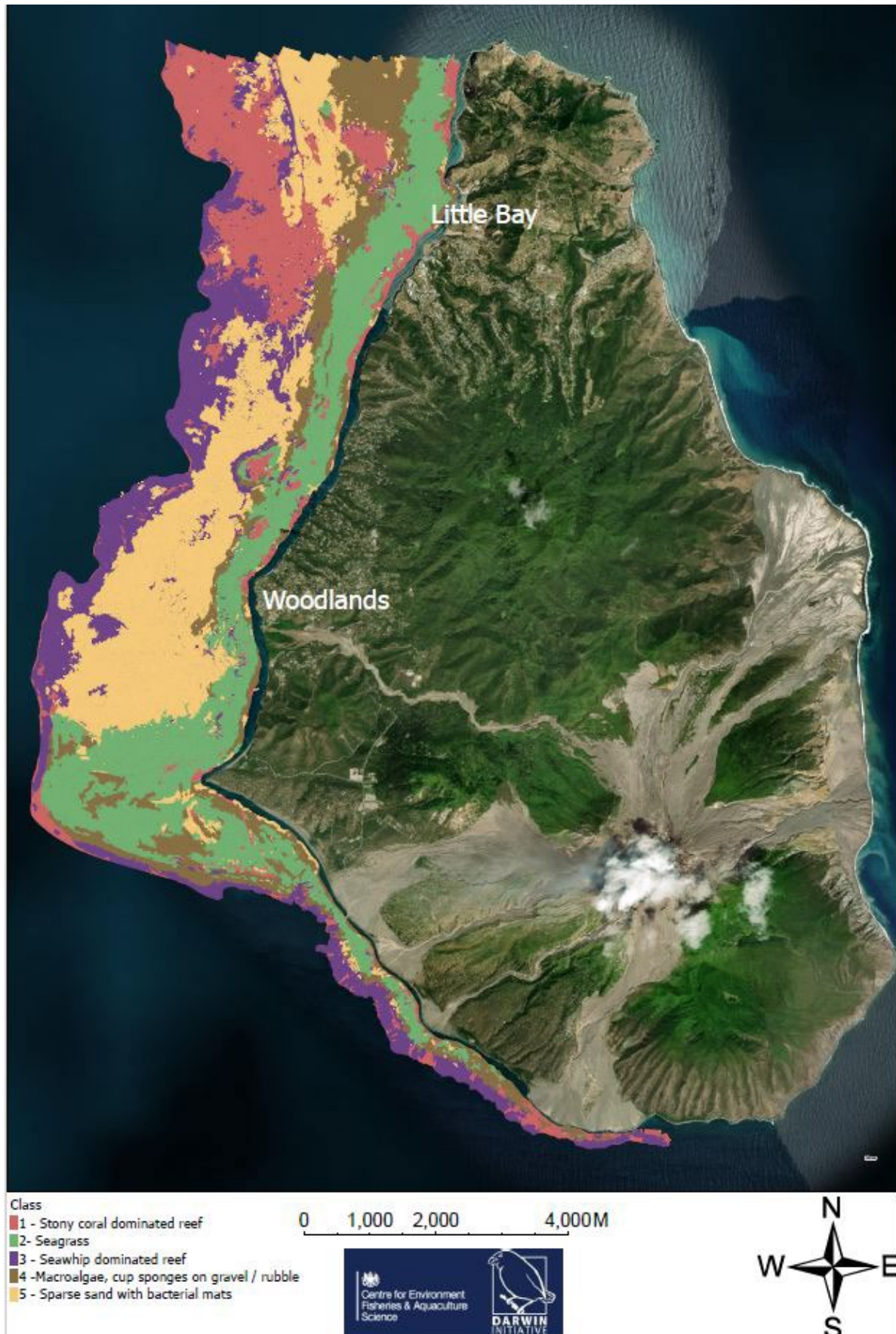


Figure 8 Final predictive seabed characterisation (i.e. subtidal habitat map) of the western coastal shelf sea of Montserrat

Following the hiatus of the programme resulting from the Covid-19 pandemic, the in-person review and stakeholder interaction with the preliminary habitat map was postponed to Q3 2022. This initial review took place in an online interactive format. An Arc GIS Online map was created for remote sharing and interrogation of layers, followed by presentation of the online

map through a remote workshop for discussion of the characterisation on the 16th November 2022, in line with Montserrat GIS day 2022 (Annex 6.3 for evidence). Participation in this workshop included local NGOs and Gov. Montserrat personnel.

Further stakeholder engagement (fishers and wider population) took place during the final visit - with meetings held with MAHLE personnel, Dr Thomas Christopher from the MVO, Mr Sheldon Carty (the head of the Fishers Co-Op) and with Emmy Aston from Scuba Montserrat. This fulfilled Activity 2.5. The accuracy of the map as compared with local stakeholder knowledge was assessed qualitatively during these sessions, with feedback indicating that the seagrass extents and nearshore coral reefs was largely in line with expectations – however the extent of Class 1 predicted in the NW of the surveyed area is likely erroneous. Dr Christopher indicated that the long north south orientated “ridge like” features observed in the bathymetry as mapped are in fact likely to be volcanic linear dyke features – perhaps a swarm of such. However more research would be required to confirm this thesis.

The final predictive map, all raw and analysed still image positional data alongside bathymetry, backscatter and six derivative layers have been delivered as a geodatabase, alongside being published on the Cefas Data Hub (fulfilling indicator 2.3).

Output 3. Increase awareness on marine issues affecting Montserrat

After an initial premeeting with MSS the education work package lead (Jo Smith) and colleague Charlotte Jennings met with staff at MSS to propose the inclusion of a marine resource pack within the Geography curriculum. The team also communicated separately with Ms Wade (Aqua Montserrat) to gain a better understanding of how the project could benefit the local community Evidence for the initial pre-meeting can be found in Annual Report 1 and in the below email:



Invitation to Exhibit
at Fish 'n Fins STEAM

Further engagement was then undertaken when education work package staff then attended the St Patricks Day parade in March 2019. In partnership with MATLHE and the Waitt Institute, they constructed an outreach stand (evidenced by Figure 5 and Figure 6) which enabled children to undertake activities relating to the marine environment. This was followed by spending time in Montserrat Secondary School (MSS), collaborating with a local community interest company, Aqua Montserrat, and discussing GoM priorities for education with Mr Stephen Mendes from the Department for Environment.



Figure 9 The project stand at the 2019 St Patricks Day Parade



Figure 10 The project stand at the 2019 St Patrick's Day Parade

Following guidance from the geography teacher a draft version of the resource pack was developed in 2019 including the following topics: Corals, Mangroves, Tourism, Waves, Surveying, Mapping, Wetlands, and island comparisons. See Annex 6.13.1 for excerpts from the draft resource pack. Several resources have also been sourced to support the delivery of this resource pack.

In-country outreach events and several in-person stakeholder meetings were planned for March 2020 to progress the draft resource pack (Activity 3.5). Unfortunately, this visit was cancelled due to Covid-19 travel restrictions. Communication with stakeholders on the pack was therefore planned remotely. However, due to the nationwide lockdown and working restrictions in Montserrat and the UK during 2020, some aspects of this work proved difficult. Consultation was planned to be undertaken remotely with representatives from the Montserrat Secondary School during Year 3 (2021). Unfortunately, due to the sudden death of a key member of the School personnel, this was also not possible. Due to ongoing restrictions, the 2021 St Patrick's day festival did not take place also. Communications were re-established with MSS during Q4 of Year 3 (March 2022), and a new representative (Ms Triscia Meade) was appointed.

Further progress towards delivery of the resource pack was made during the March 2022 in-country visit when the project team was able to meet with a representative of AquaMontserrat to plan future project activities, and visited the Montserrat Secondary School 4th form geography class and presented on marine planning and held a question and answer session with the class (a copy of the school presentation, trip agenda and is provided in Annex 6.13). Following an in-person workshop in June 2022 (Joanne Smith) with the school representative the resource pack was finalised and printed for delivery (Annex 6.14), and a significant amount of educational material and equipment was delivered to MSS. Furthermore, a "Fly Through" of the bathymetric dataset was created for pupils at MSS to view the bathymetry and seabed photography used and acquired in output 2. This was done using Esri's Arc Scene software (ArcGIS Pro 2.9.5) and uploaded to Esri's ArcGIS Online platform for free viewing globally (no software licence required). Evidence of this work is present in the publications section of this report (Annex 4).

The full resource pack and educational resources were delivered to the school in January 2023 and a full explanation on how to implement the pack within the current curriculum was explained (see Figure 7 and annex 6.13.2). In addition to this, a representative from the habitat mapping work package delivered a presentation to year 11 pupils explaining the outcomes of the recent mapping surveys off the coast of Montserrat. An excellent response from these pupils was evidenced by some very astute questions put forward at the end of the presentation, such as "how can subtidal habitat mapping help mitigate the impact of climate change?" and "Area there any plans to map the eastern coast?".



Figure 11 Cefas educational team led handing over resource pack and educational resources to the head teacher of Montserrat Secondary School in January 2023

Further efforts to increase awareness of the marine resources of Montserrat and spotlight the work MAHLE are doing (in conjunction with this project) took the form of several radio interviews conducted by MALHE and project staff – such as in 2018 following the first EAI workshop, 2019 following the seabed survey and in January 2023 with Minister Buffonge on the “MALHE Vibes” broadcast (see Annex 4 for link to video and Annex 6.14).

All activities as part of this output were considered to be delivered in full, expecting activity 3.4 – where due to Covid-19 and the change of MSS representative, the workshop detailing the teaching resources (held in June 2022) was with only one of the two geography teachers.

A submission to the Environment Minister regarding the curriculum inclusion was made least twice over the course of the project, latest being in Feb 2022 before and Rachel Mulholland met with the Minister during the march 2022 visit.

3.2 Outcome

The original outcome of the project was defined as:

Enhanced in-country capability and ability to protect biodiversity and manage the marine environment for sustainable use of its marine resources by March 2023.

The four SMART Indicators agreed upon to measure and verify the outcome have all been met, with some small caveats. Primarily, the west coast database (subtidal habitat map- indicator 0.1) has been published (see Annex 4). However the habit map extended to 80m depth as opposed to 100m – this was due to unforeseen limitations in ground-truth data maximum depth (owing to stronger water currents than predicted). The map has begun to be considered and reviewed in the context of proposed (MAHLE led) projects (See Annex 6.15).

Significant capacity has been built within MAHLE with regards to EIA skills and resources (indicator 0.2), as detailed by the workshop reports (Annexes 6.4-6.6), attendance lists (Annex 6.7), EIA resource pack (Annex 6.8) and this project report, alongside the researcher exchange with further increased GoM staff understanding of coastal process, RPA survey techniques and specific marine issue advice (such as considering impacts of vessel traffic in the near-shore of the western coast). Specific assistance was given on certain issues regarding the EIA of the Port Development.

Further capacity was delivered to GoM (MAHLE staff) in the form of seabed video (Drop Down Video –“DDV”) acquisition equipment and training on shallow water environmental survey techniques, imagery analysis and habitat mapping techniques (indicator 0.3). The DDV equipment proved to be reliable and relatively straightforward to operate from any vessel

platform. The extensive training delivered to MAHLE staff (principally Lands and Survey and Fisheries) in 2019 was supplemented by a hands-on refresher course delivered in 2023, where an independent training deployment of the system by MAHLE staff was observed on the jetty at Little Bay.



Figure 12 Deployment of the underwater camera system by GoM staff during 2023 refresher training session

Whilst the COVID-19 pandemic has somewhat impacted the capacity of GoM to undertake / prioritise further marine environmental monitoring survey activities using the delivered equipment and training thus far, this remains a priority for Lands and Survey and could be undertaken in the context of the Port Development. Furthermore, departmental and national interest in extending the subtidal habitat mapping to the eastern shore is considerable, but likely reliant on external project funding or partnerships (for staff time and vessel costs).

Whilst engagement with MSS on implementation of ocean literacy topics curriculum (indicator 0.4) was slightly hampered by the Covid-19 pandemic (a risk not predicted, however an assumption was added in year 2 to mitigate this) and the change of teaching representatives, overall an excellent level of final engagement with ocean literacy topics was achieved and MSS students demonstrated interest and significant insight in the marine environmental research undertaken throughout this project.

3.3 Monitoring of assumptions

Several original project assumptions were tested throughout the course of the project:

- *“Weather conditions suitable for survey activities to be undertaken during time in country.”* – this proved to be correct and a complete ground-truthing data set was acquired in May 2019.
- *“Training and knowledge exchange will give GoM staff skills and confidence needed”.* This has been shown to also be correct, given the response to indicator 0.2 and 0.3— where GoM staff have undertaken their own EIA evaluation of the port development, and shown to be able to maintain operate and analyse data acquired from the seabed camera equipment supplied. One minor concern in this regard is the weight of the DDV system frame, which may deter it from being used in small scale monitoring operations.
- *“Local staff are able to participate in knowledge exchange events.”;* This was proved to be correct by the attendance of GoM staff to no fewer than six workshops (across the three outputs).

- “Local staff are able to participate in researcher exchange”. This was also proved correct by the attendance of three GoM staff at a week-long researcher exchange at the Cefas Laboratory in Lowestoft in August 2022.
- “Local teachers are able to participate in consultation meetings”. This was proved correct by the initial consultation meeting during the Year 1 visit, by the draft finalisation meeting in March 2022, and the single participant workshop in June 2022.

An additional assumption was included in the project in Annual Report 2:

- “Travel and working restrictions from Covid-19 will not be extended to a point where year 3 visits are not able to proceed as planned.” This assumption proved to be false, and no visits were possible in year 3

Alongside a further assumption which was added to the project in Annual Report 3:

- “Travel and working restrictions from Covid-19 will not be extended to a point where year 4 visits are not able to proceed as planned.” This assumption proved correct.

Due to the impact of Covid-19 and the ongoing travel restrictions, some project activities, including in-country visits, were unable to proceed according to the original timetable specified in the Log Frame. Change requests were submitted, and approved, to extend the duration of the project by 2 years and to move all in-country visits planned for Year 3 into project Year 4, then additionally into Project Year 5. Towards the end of the Year 4 we were able to start undertaking in-country meetings and travel again, allowing the March 2022 EIA and education visit, the June 2022 education finalisation workshop and the researcher exchange (August 2022) to take place. In Year 5 all remaining activities were able to take place as restrictions were further relaxed, in line with our updated project timetable

Due to the unique nature of the current Covid-19 situation, we do not believe this could have been mitigated for.

The assumptions listed in the log frame (and above) were reviewed half-yearly and these remained valid. There were also risks to the project delivery which were captured in an internal risk register document (for example, staff turnover at Cefas resulted in 2 PI changes during the extended course of the project. The risk register has not been provided with this report; however, it is available on request.

4 Project support to environmental and/or climate outcomes in the UKOTs

The impact statement written at the outset of this project was as follows:

To provide the Montserrat government with the necessary skills and tools for effective management of marine biodiversity.

The multi-faceted approach to addressing this impact statement, through three complementary yet distinct outcomes, has been effective in delivering this impact. A holistic package of training, scientific study and educational outreach delivered by this project has improved the capacity of GoM to manage the marine environment.

Provision of EIA training workshops and the EIA training pack has strengthened management tools to inform the sustainable development of Montserrat, allowing informed decisions to be made on development projects (specially the new port development) which adequately consider and mitigate for any impacts on Montserrat’s marine biodiversity.

The education resource pack and outreach activities have increased awareness of marine issues affecting Montserrat and provided much needed snapshots of Montserrat’s biodiversity to the wider public. This increased knowledge and awareness will help to highlight the importance of biodiversity conservation. Through targeting this resource pack at secondary school children, this impact will last for years to come and influence future generations.

Provision of the underwater camera system and training in its use will enable GoM to monitor the seabed more effectively than departments are currently able to. The system can be operated at depths which are of higher risk to divers and for longer periods which enables wider

monitoring of the marine environment. Two activities which represent areas of environmental concern are the port development in Little Bay and the positioning of fish traps by the island's fishers, activities that are essential for sustainable development of Montserrat's economy. Use of the camera equipment will enable greater monitoring capability in areas of concern and provide evidence to initiate mitigation measures where necessary. This evidence-based approach to monitoring and management of the marine environment of Montserrat has been limited until now. This will contribute to biodiversity conservation through sustainable management as well as contributing to human development and wellbeing through aiding in the management of marine uses essential to Montserrat's economy and individual livelihoods. Montserrat is developing a Sustainable Oceans Policy and associated evidence data layers to ensure the long-term health of Montserrat's waters through ocean zoning, establishing Marine Protected Areas (MPAs) and fisheries reforms.

This project has produced high resolution data layers and marine habitat maps to support the development future zonation activities and are likely to assist in the use of sustainable management practices through EIA review. The creation of MPAs in Montserrat will support the United Nations target to have 30% of the world's oceans protected by 2030, and the UK Government's desire to have the rich environmental assets of the Overseas Territories protected for the future.

5 OPTIONAL: Gender equality

The lead Montserratian contacts for all three outputs are female, alongside nearly half of the delegates trained in use of the seabed camera equipment and habitat mapping techniques.

6 Sustainability and Legacy

As an Executive Agency of Defra, Cefas complies with UK Government requirements to make all data available for re-use. Cefas has an internal data management system which publishes data directly on its Open Access Cefas Data Hub (<https://data.cefas.co.uk>) From there the data are distributed to UK Data Archive Centres (DAC) for marine data by the Marine Environmental Data and Information Network (MEDIN). Cefas itself is a DAC for fisheries data. All data supplied to DACs is often picked up by global data centres such as GBIF, thereby increasing the visibility of the data. All data from this project will be shared with the GoM, the education packs will be shared with schools, and the EIA resource packs will be handed over to GoM. This will allow for the data collected and the knowledge gained during the project to be maintained after the end of the project and resource packs will also allow for new GoM staff to have access to training materials in the future.

Working closely with local stakeholders, we have also ensured personal and professional relationships will be maintained beyond the end of the project, with ongoing collaborative proposals already written (Aquaculture and shoreline flood mitigation project – concept note submitted to CBF).

The habitat mapping outputs will serve as a reliable resource for marine spatial planning going forward and will be easily updated on a regular basis by GoM staff (having received training in the methodology of predictive map creation). These outputs have provided a basis for sustainable management and the education of future generations beyond the duration of the project itself. In all project areas it is considered that a strong foundation has been set to provide lasting change over the final project year and beyond. The subsea camera equipment provided has already been proved to be well maintained and robust, working seamlessly after 4 years.

All resources delivered to GoM will remain in the territory, and regular communication with Cefas staff as regarding maintenance and operation of the equipment will be provided.

7 Lessons learned

Overall communications and engagement with the majority of partners and stakeholders went smoothly, with MAHLE colleagues remaining thoroughly embedded in the project throughout its duration. The lessons taken from all years of the project were mainly related to communication between project partners.

The timeliness of communication was raised as an issue affecting the project initially. This was greatly reduced towards the end of Year 1 and throughout Year 2 through making use of alternate methods of communication such as mobile phone chat groups and WhatsApp messaging.

The Waitt Institute were a regional partner, whose involvement was front loaded to the start of the project given their recent extensive 2016 -2018 work in broad-scale seabed characterisation. Involvement with the Waitt institute centred on ground-truth survey planning and review of acoustic data for output 2, alongside discussions on how to integrate their ground truth sampling with that of this project. Communications with the Waitt institute were at times sporadic, however a very useful meeting was held in 2021 which looked at ground truth data integration.

Local stakeholders (other than GoM staff and MSS) were AquaMontserrat, who were involved in the first two years of the project under output 3 (as a wider platform for public outreach). engagement with AquaMontserrat unfortunately reduced in the latter part of the project, in part due to the necessity to move aspects of project delivery to remote/online methods due to the impact of the Covid-19 pandemic. Due to the Covid-19 travel restrictions, all meetings and communication with partners in Year 3 and a large part of Year 4 took place online. This was more challenging than in-person, in-country meetings for project planning as it is harder to collaborate and brainstorm as well as develop and build on relationships with project partners when not able to meet face-to-face. Communication can also be restricted by time differences, availability, and issues with unreliable technology or internet connections. All partners have worked hard throughout the year to facilitate project communication and build working relationships remotely.

Further lessons on knowledge transfer techniques were learnt in Year 1 and Year 2. The feedback from participants of the EIA workshop in Year 1 included suggestions to use more local case studies and examples, using more group discussions and interactive sessions, and increasing engagement prior to the workshop to identify workshop topics more collaboratively. We took all this feedback into consideration while planning the second EIA workshop this year. We engaged with several staff members from MATLHE to discuss and agree the specific topics to be covered and the level of detail wanted for each topic. We also amended the workshop agenda to include more group discussion opportunities and interactive sessions and we also used a local Montserrat development project EIA for the case studies. The participants of the workshop this year were positive about the changes made and expressed in their feedback the benefit of the interactive sessions and local examples.

With regard to the training workshops, we also took a lesson away from Year 1 to amend the training evaluation form to include a section which was to be completed before the workshop started. This new section asked participants to rate their current level of knowledge on the subjects to be covered before the workshop and they were then asked to revisit this after the workshop and indicate their new level of knowledge. This allowed a better assessment of knowledge gained by participants as a result of the training itself compared to the previous form which only asked them to reflect on this at the end of the workshop.

7.1 Monitoring and evaluation

Monitoring and evaluation was the responsibility of Cefas, several revisions to Logframe were made during the extended life of the project.

- Year 1: update of Logframe to include SMART indicators – resulted in making outcome indicators measurable and time bound.
- Year 1 – Year 2: Rollover of ██████████ from FY 2018/2019 to FY2019/2020 due to GoM taking receipt of The RMPS Vessel “Heliconia Star”. This allowed the project to use this vessel for the ground truthing survey, rather than charter a third party vessel. This improved safety and reduced costs for this component overall, but required a delay due to timing of RMPS training and Cefas staff availability.
- Year 2: A change request was submitted and granted to move £████████ from Year 2 into Year 3 to move one of the visits into Year 3 and, therefore, enable us to undertake the same number of in-country visits over the lifetime of the project. This was in response to the passing of a key member of the educational output staff.
- Year 2: Another change request was also submitted and granted during Year 2 to move £████████ from Year 2 into Year 3 to allow the researcher exchange visit to take place in Q1 Year 3 instead of Q4 Year 2. This was due to a slight delay in obtaining agreement between partners on the individual GoM staff members to participate in this aspect of the project and then agreeing dates for the researcher exchange visit which were suitable for all participants and for the hosts.
- Year 3 – Logframe changed to provide an additional year to indicator time frames (2022 to 2023) – due to Covid-19 pandemic all international travel ceased, this was unforeseen and an essential modification.

Making the choice to request a modification which redistributed funds from vessel charter to equipment purchase increased the impact of the project compared to the original application, but future projects of this type should consider purchase of equipment at the scoping stage as well as provision for vessel charter. It may not be feasible or necessary to purchase equipment for OT stakeholders in all instances but where possible this will provide instant capacity increase and targeted training will provide a complimentary increase in capability. The M&E system proved valuable in directing the achievement of impact in the project, and the system flexible enough to accommodate major financial and delivery timeframe alterations.

7.2 Actions taken in response to Annual Report reviews

Response to Year 1 comment:

“Please comment on whether the delays in the survey will affect the timeline of the project’s activities and their completion by the end of YR 3.”

The underwater video ground-truthing survey was successfully undertaken during May 2019. GoM partners facilitated unrestricted access to the RMPS patrol vessel *MV Heliconia Star* for two weeks and approval to remain for extended time in maritime exclusion zones (see Annex 4). The survey engaged 10 staff across three GoM departments (Physical Planning Unit, Fisheries Department & Land and Surveys) (see Project Half Year Report 2). Following acquisition of the imagery data a tender for analysis was agreed with an ecological consultancy with the results of this being delivered in March 2020. This will result in outputs 2.3 and 2.4 being carried out in Q1 2020-21 rather than Q4 2019-20. The delay will have no impact on the overall delivery of a seabed characterisation map and associated GIS products to GoM by the end of the project.

Responses to Year 2 comments:

Please comment on the involvement of the Waitt Institute, since this organisation is the main project partner.

The involvement of the Waitt Institute was mainly weighted towards the beginning and end of the project with their key input being in the initial review of multibeam echosounder data and the design of the video characterisation survey (activity 2.1, year 1), the combination of final survey data (activity 2.4, year 3), and the publication of an academic paper based on the data (activity 2.6, year 3). As such, Cefas had limited communication with the Waitt Institute through year 2 of the project. When work commenced on the development of the seabed

characterisation data layers in Year 3 Cefas contacted Andy Estep at the Waitt Institute to agree the plan for delivery of this work and for the combination of the Cefas survey data with the Waitt Institute survey data. The combination of ground truth data was not considered appropriate by both parties after discussion about the nature of imagery analysis used to inform the Waitt Institute seabed classes used in the initial map.

Please submit evidence of the data analysis for the underwater survey. The data in Annex 9 is a snapshot of the database, not evidence of the analysis.

This comment required clarification. Analysis of the data acquired from the seabed survey is conducted in two parts. Preliminary analysis involved the enumeration of identifiable biota and substrate percentages, this is the translation of raw seabed imagery into a database (a sample / biota matrix) which can be used in assemblage analysis. As such, we consider provision of a database snapshot to be evidence of preliminary analysis. Further to this, multivariate analysis to determine definable epibiotic assemblages and their composition (secondary analysis) has now been undertaken in Year 3, and evidence of this is presented in Annex 6.2.

Please revise Outcome Indicators 0.3 and 0.4 to ensure that they are SMART.

This was discussed with Darwin and we submitted a change request during Year 3 to amend the wording of Outcome Indicators 0.3 and 0.4. This request was approved, and this is reflected in the Logical Framework wording in Annexes 1 and 2.

Responses to Year 3 comments:

Q1 *Please submit evidence as separate files.* A1 Noted. We have provided evidence documents to this report as separate files rather than embedded in the document.

Q2 *Please remember to remove the blue guidance text in the template before submitting reports to avoid confusion.*

A2 Noted. We have double checked that all blue guidance text has been removed from the report prior to submission.

8 Darwin Identity

Throughout the delivery of all project activities, especially those in-country, there was considerable effort paid to the promotion of the Darwin Identity. This included set Darwin Initiative overview slides in presentations, use of the Darwin Initiative logo on all slides and on the equipment delivered. All external publications mentioned the Darwin initiative as the funder (in the case of radio interviews or public outreach stands) or displayed the logo (in the case of online reporting). All online publication of the project and its activities have included links to the Darwin and Defra social media and/or web pages and acknowledgement of the project funding. For example, see Annex 6 for project social media posts.

9 Impact of COVID-19 on project delivery

The main impact Covid-19 on the project has been the ongoing travel restrictions. Nearly all project activities, including in-country visits and stakeholder engagement and events, have been unable to proceed this year as planned. Work has been undertaken remotely where possible (for example some online engagement on the draft educational resource pack and discussions on habitat map layers). A change request was submitted, and approved, to extend the project duration by 1 year and move all remaining in-country visits into year 5.

Towards the end of year 4 we were able to start undertaking in-country meetings and travel again and it is hoped that we can now pick up and organise the remaining activities in year 5 as restrictions are further relaxed. We are unsure yet when restriction-free travel and large

gatherings may be able to resume and are continuing to monitor the situation closely and update our activity planning accordingly.

Due to the lifting of travel restrictions in both Montserrat and the UK (specifically Cefas' internal travel policy during the pandemic) in 2022, we were able to deliver in country work as planned in the updated project implementation timetable in year 5. If this is the case, we should be able to complete all remaining activities as planned by the end of the year.

Cefas has updated its health and safety and travel plans due to Covid-19 to include additional risk assessments and sign off levels. Additionally, individual travel plan documents are produced for every overseas visit, and these include emergency protocols, first aid plans, key contacts, etc. (the travel plan document for the March 2022 in-country visit can be provided on request).

10 Finance and administration

10.1 Project expenditure

Project spend (indicative) since last Annual Report	2022/23 Grant (£)	2022/23 Total actual Darwin Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs	██████	██████	██████	More staff time required for presenting and training at workshop held in Aug 2022 at Cefas.
Consultancy costs	██████	██████	██████	
Overhead Costs	██████	██████	██████	As above.
Travel and subsistence	██████	██████	██████	Travel costs estimated over five years ago. Travel within budget with less than 10% variation.
Operating Costs	██████	██████	██████	
Capital items	██████	██████	██████	
Others	██████	██████	██████	Cost of printing the education pack for Montserrat Secondary School was less than originally anticipated
TOTAL	██████	██████		

Staff employed (Name and position)	Cost (£)
Rachel Mulholland, PI and EIA Work Package Lead	██████
William (Jon) Hawes, Habitat Mapping Work Package Lead	██████
Joanne Smith, Education Work Package Lead	██████
Kerry l'Anson, Project Manager	██████
Other Staff – supporting work package work.	██████
TOTAL	██████

Other items – description	Other items – cost (£)
Consumables	██████
Subcontractors	██████
IT & Communications	██████

TOTAL		
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10.2 Additional funds or in-kind contributions secured

Source of funding for project lifetime	Total (£)
Waitt Institute contributed habitat mapping data and staff and travel value at £61,940	
Government of Montserrat provided staff time and a venue for the workshops	
UKHO provided bathymetric data	
Cefas is providing match funding towards the costs of the project	
TOTAL	

10.3 Value for Money

Yes. The project achieved every single deliverable despite the impact of Covid for in excess of two years. The duration was extended by two years to account for Covid thus making it a five-year instead of a three-year project. Despite the increase in duration with the associated increase in staff time required to keep the project momentum going, continue virtual meetings with Project Partners and the administrative costs associated with keeping the project “live” and providing several variation requests to Darwin during Covid, the entire project has come in on budget with only a slight overspend.

The project itself has been incredibly well-received by the Government of Montserrat who are delighted with the outcomes and are very keen to pursue this work into the future. The project reporting demonstrates how well received the project has been, along with showing that all deliverables have been achieved. The financial reporting also demonstrates this.

Some workshops were held virtually, instead of in person. This was due to Covid travel restrictions, but certainly proved to be beneficial financially as there were no travel or subsistence (T&S) costs incurred. The cost of T&S has increased dramatically since the original application was made in 2017 (largely due to the impact of Covid and the war between Russia and Ukraine). By having virtual meetings and workshops where possible enabled the project team to still attend in person meetings and workshops (despite the increased travel costs) where being in person was essential (for example, training in the use of underwater mapping equipment, visiting the proposed new harbour site, meeting teachers and school children at Montserrat Secondary School etc).

Carrying equipment (such as the underwater camera) to Montserrat as “excess baggage” rather than using a courier also saved costs. Holding some workshops (in country) in October, when the hurricane season is still active, also saved costs as flights and hotels in the Caribbean are cheaper during this time. All travel was completed in economy class with best value fares selected. All other expenditure followed Cefas policy to stay below FCO Worldwide Subsistence Rates.

11 OPTIONAL: Outstanding achievements of your project during the (300-400 words maximum). This section may be used for publicity purposes

I agree for the Darwin Secretariat to publish the content of this section (please leave this line in to indicate your agreement to use any material you provide here)

N/A

Annex 1 Project’s full current logframe as presented in the application form (unless changes have been agreed)

Please insert your project’s logframe (if your project has a logframe), including indicators, means of verification and assumptions. N.B. if your application’s logframe is presented in a different format in your application, please transpose into the below template. Please feel free to contact BCF-reports@niras.com if you have any questions regarding this.

Project summary	SMART Indicators	Means of verification	Important Assumptions
Impact: To provide the Montserrat government with the necessary skills and tools for effective management of marine biodiversity.			
<p>Outcome: Enhanced in-country capability and ability to protect biodiversity and manage the marine environment for sustainable use of its marine resources by March 2023.</p>	<p>0.1 A west coast database of coastal and offshore seabed environments will be published before March 2023, increasing habitat knowledge in waters exceeding 100 m compared to baseline.</p> <p>0.2 Delivery of a Montserrat-specific EIA training pack and assessment procedures will give Government of Montserrat (GoM) staff the skills to review EIAs and future confidence to challenge or support development.</p> <p>0.3 Delivery of equipment and training will give GoM staff the skills to implement marine underwater camera surveys and maintain a monitoring programme of mapped seabed environments by the end of the project.</p> <p>0.4 GoM has committed to the implementation of ocean literacy topics within the secondary school curriculum from September 2023.</p>	<p>0.1 Statement from stakeholders that the seabed classification, with increased area coverage (km²) and resolution compared to baseline, is beginning to be used by GoM for targeted feature management by March 2023.</p> <p>0.2.</p> <ul style="list-style-type: none"> • Workshop reports detailing course content, list of attendees and attendee feedback demonstrating knowledge transfer. • Final project report detailing all engagement throughout project and assessment from GoM and Cefas staff on expected and realised increases in knowledge of EIA procedures. • Montserrat specific EIA training pack and desk-based procedures have been delivered and GoM have committed to integrating approaches into their procedures by March 2023. <p>0.3 Training of two staff undertaken during survey and followed by techniques and analysis workshops for</p>	<p>0.1 Weather allows data collection.</p> <p>0.2 & 0.3 Training and knowledge exchange will give GoM staff skills and confidence needed.</p>

		<p>six staff by March 2023, training checklist and competency evaluation for GoM staff to be completed signed by Cefas staff. Camera equipment provided following survey in 2019 to ensure capacity for monitoring is maintained, a list of independent deployments by GoM staff will be provided in March 2023.</p> <p>0.4 Statement from Secondary School staff/Minister for Education.</p>	
<p>Output 1</p> <p>Undertake knowledge transfer and build capacity through workshops and training with a minimum of 10 GoM staff from different departments for the duration of the project.</p>	<p>1.1 Three days of training workshops delivered to a minimum of two GoM staff during May 2019 on video survey techniques and analysis of ground truthing data to produce classified seabed maps. Vessel crew will also gain understanding of the required processes for survey.</p> <p>1.2 Effective decision-making through three weeks of workshops demonstrating the interpretation and review of E.I.A:</p> <ul style="list-style-type: none"> • By the end of project year 2 (April 2020), at least six individuals total from the relevant departments will have received training via two separate workshops held in Montserrat and will have developed the skills and confidence to review EIAs within their own departments. • By the end of project year 5 (March 2023) two individuals total from the relevant departments will have received intense one-on-one training via two separate training sessions in Montserrat and a one 	<p>1.1 Training agenda and attendees list; testimonial from Royal Montserrat Police Force (vessel operator) and GoM staff present on survey by June 2019. Survey reports with GoM staff contribution.</p> <p>1.2 Training agendas and attendee lists; workshop reports; training pack (provided electronically to identified EIA leads); training pack and Desk-based procedures and policies (provided electronically to relevant departments)</p>	<p>Local staff are able to participate in knowledge exchange events.</p> <p>Local staff are able to participate in researcher exchange and are able to obtain necessary seagoing and medical qualifications.</p>

	<p>week training programme in the UK as part of a researcher exchange. These individuals will have developed the skills and confidence to take the lead on reviewing EIAs within their departments and oversee future staff training.</p> <ul style="list-style-type: none"> By the end of project year 5 (March 2023) an EIA training pack and series of desk-based procedures/policies will have been produced to assist Montserrat with ongoing training and management of the EIA review process after the end of the project. The identified EIA leads in the relevant departments will have been trained in the use of these resources. 		
<p>Output 2</p> <p>Create and provide a GIS Database with environmental layers and maps of marine benthic environments in Western shelf waters by quarter three, 2022.</p>	<p>2.1 Completion of 14 day underwater video characterisation survey of area of interest with 60 stations successfully sampled.</p> <p>2.2 All survey data made available to GoM as soon as possible following survey and analysis stages prior to public-access provision in GIS format via Cefas Datahub by quarter three, 2022.</p> <p>2.3 A minimum of five data layers will be provided in the database.</p>	<p>2.1 Successful delivery of survey evidenced by daily progress reports, testimonial from Royal Montserrat Police Force (vessel operator) and GoM staff present on survey by June 2019.</p> <p>2.2 Acknowledgment of data receipt from GoM for data layers provided to Montserrat GIS Information Centre.</p>	<p>Weather conditions suitable for survey activities to be undertaken during time in country.</p>
<p>Output 3</p> <p>Increase awareness on marine issues affecting Montserrat by creating an educational resource pack to be used within the secondary school. Work closely with the community, providing information and support to current local</p>	<p>3.1 By March 2019 consultation meetings with Montserrat secondary school, Deputy Minister of Education, parents, National Trust and Aqua Montserrat attracts a good number of interested education professionals.</p>	<p>3.1 Meeting Minutes; testimonial from teachers at Montserrat secondary, two GoM and Aqua Montserrat by May 2019.</p> <p>3.2 Feedback from Secondary school, Aqua Montserrat and parents.</p>	<p>Local teachers are able to participate in consultation meetings.</p>

<p>projects (Aqua Montserrat) and attend community events (St Patricks Day Parade) by March 2023.</p>	<p>3.2 By December 2019 successful delivery of first draft educational resource pack will be provided to Montserrat Secondary school. Feedback from two teaching staff, two GoM, Aqua Montserrat and parents will allow for the resource pack to progress into the final version by February 2021.</p> <p>3.3 By June 2019 a joint stand with the National Trust, at St Patrick's Day Parade will be well received, increasing the community awareness on marine issues affecting Montserrat.</p> <p>3.4 By November 2022 two GoM representatives and two teaching staff attend a workshop detailing the teaching resources with a view to supporting the inclusion of ocean literacy topics in the secondary school curriculum for Yr9/10/11 Geography by March 2023.</p> <p>3.5 Resource pack and training materials are well received by pupils and teachers at Montserrat Secondary school and put to use within the Geography curriculum by March 2023.</p>	<p>Successful delivery of draft educational resource pack by December 2019.</p> <p>3.3 Attendees list; testimonial from community and National Trust by July 2019.</p> <p>3.4 Training agendas and attendee lists; workshop report; resource pack; teachers support pack, differentiated activity resources and practical displays. Feedback and testimonials from two GoM representatives and two teaching staff by November 2022.</p> <p>3.5 Successful delivery of final educational resource pack, teachers support pack, classroom displays, differentiated activity resources and practical displays by March 2023.</p>	
<p>Activities (each activity is numbered according to the output that it will contribute towards, for example 1.1, 1.2 and 1.3 are contributing to Output 1)</p> <p>1.1 Project kick off meeting, mid-project and final stakeholder meeting</p> <p>1.2 2 day video survey techniques and analysis training course</p> <p>1.3 1 day data interpretation and mapping training course</p> <p>1.4 Researcher exchange</p> <p>1.5 Two 4-5 day workshops in Montserrat to build the capacity of staff in managing the marine environment through enhancing knowledge on the EIA evaluation process, its use in decision-making and identify relevant issues associated with marine development projects</p> <p>1.6 EIA evaluation support</p> <p>2.1 Review multibeam echosounder data and design video characterization survey</p>			

- 2.2 Undertake 14 day video characterization survey
 - 2.3 Analyse and quantify physical characteristics and biological communities from video and photographs
 - 2.4 Combine data with Waitt Institute survey to develop habitat characterization data layers
 - 2.5 Share habitat layers with local stakeholders
 - 2.6 Publish paper in peer review journals to increase knowledge of the distribution of the marine biodiversity
 - 2.7 Make data freely available to data archive centres. Data available to UK and Local government to inform development
-
- 3.1 Premeeting
 - 3.2 Preparation ahead of consultation
 - 3.3 1st consultation meeting in Monserrat
 - 3.4 Creation of draft resource pack
 - 3.5 2nd consultation meeting to be held virtually
 - 3.6 Amending and finalising resource pack
 - 3.7 3rd and final meeting in Monserrat; launch and celebration of the new education pack

Annex 2 Report of progress and achievements against final project logframe for the life of the project (if your project has a logframe)

Project summary	Measurable Indicators	Progress and Achievements for the life of the project
<p>Impact:</p> <p>To provide the Montserrat government with the necessary skills and tools for effective management of marine biodiversity.</p>		<p>The multi faceted approach to addressing this impact statement, through three complementary yet distinct outcomes, has been effective in delivering this impact. A holistic package of training, scientific study and educational outreach delivered by this project has improved the capacity of GoM to manage the marine environment.</p>
<p>Outcome Enhanced in-country capability and ability to protect biodiversity and manage the marine environment for sustainable use of its marine resources by March 2023.</p>	<p>0.1 A west coast database of coastal and offshore seabed environments will be published before March 2023, increasing habitat knowledge in waters exceeding 100 m compared to baseline.</p> <p>0.2 Delivery of a Montserrat-specific EIA training pack and assessment procedures will give Government of Montserrat (GoM) staff the skills to review EIAs and future confidence to challenge or support development.</p> <p>0.3 Delivery of equipment and training will give GoM staff the skills to implement marine underwater camera surveys and maintain a monitoring programme of mapped seabed environments by the end of the project.</p>	<p>Measurable indicator 0.1 has been progressed through the ground-truthing survey, and analysis of the data obtained, and production of a predictive habitat map to a depth of 80m. This map has been through a process of stakeholder verification and has been delivered to GoM alongside several derivative environmental layers.</p> <p>Measurable indicator 0.2 has been progressed through the EIA workshops and meetings undertaken in Year 1-2. EIA training pack was delivered in year 5 alongside the researcher exchange visit.</p> <p>Measurable indicator 0.3 has been wholly delivered. Equipment and training in video survey techniques was delivered alongside the video survey in year 2, with a further seabed imager analysis and habitat mapping workshop delivered in January 2023</p> <p>Measurable indicator 0.4 has been delivered in the main through the development of the educational resource pack and its finalisation (June 2022) and delivery (January 2023) in year 5.</p>

Project summary	Measurable Indicators	Progress and Achievements for the life of the project
	0.4 GoM staff has committed to the implementation of ocean literacy topics within the secondary school curriculum from September 2023.	
<p>Output 1. Undertake knowledge transfer and build capacity through workshops and training with a minimum of 10 GoM staff from different departments for the duration of the project.</p>	<p>1.1 Three days of training workshops delivered to a minimum of two GoM staff during May 2019 on video survey techniques and analysis of ground truthing data to produce classified seabed maps. Vessel crew will also gain understanding of the required processes for survey.</p> <p>1.2 Effective decision-making through three weeks of workshops demonstrating the interpretation and review of E.I.A:</p> <ul style="list-style-type: none"> • By the end of project year 2 (April 2020), at least six individuals total from the relevant departments will have received training via two separate workshops held in Montserrat and will have developed the skills and confidence to review EIAs within their own departments. • By the end of project year 5 (March 2023) two individuals total from the relevant departments will have received intense on e-on-one training via two separate training sessions in Montserrat and a one week training programme in the UK as part of a researcher exchange. 	<p>Progress has been made toward achieving this output.</p> <p>Measurable indicator 1.1 was partly delivered during year 2 with training in video survey techniques. Further training in data analysis was delivered in year 5 as a refresher course on underwater camera operation and survey planning. A further workshop was also delivered in year 5 (also January 2023) on data interpretation and mapping.</p> <p>Measurable indicator 1.2 was partly delivered in years 1 and 2;</p> <p>Bullet 1 has been completed with the two separate workshops being held in year 1 and 2. The second and third bullet points were delivered in year 5 (March 2022 and January 2023).</p>

Project summary	Measurable Indicators	Progress and Achievements for the life of the project
	<p>These individuals will have developed the skills and confidence to take the lead on reviewing EIAs within their departments and oversee future staff training.</p> <ul style="list-style-type: none"> • By the end of project year 5 (March 2023) an EIA training pack and series of desk-based procedures/policies will have been produced to assist Montserrat with ongoing training and management of the EIA review process after the end of the project. The identified EIA leads in the relevant departments will have been trained in the use of these resources. 	
Activity 1.1 Project kick off meeting, mid-project meeting and final project stakeholder meetings.		Completed. The kick-off meeting was completed in year 1, the mid-project meetings were completed in year 2, and the final meeting was undertaken in conjunction with the imager analysis and data interpretation training course in January 2023 (year 5).
Activity 1.2 Two day video survey techniques and analysis training course		Completed. Training was delivered during year 2 in video survey techniques. Due to the complexity of the seabed, the survey period focussed on data acquisition and training in video survey techniques. Training in analysis was delivered alongside activity 1.3 in year 5.
Activity 1.3 One day data interpretation and mapping training course		Delivered in January 2023 of year 5, a workshop with 6 Gov of Montserrat personnel was held on 25/01/2023 in Brades, Montserrat. This workshop covered the principals of subtidal habitat mapping, including OBIA, and bathymetric derivate creation.
Activity 1.4 Researcher exchange		Activity to completed in year 5 (August 2022). Three staff from GoM MAHLE (Lavern Rogers-Ryan, Ernestine Corbett and Stephen Mendes) spend 5 days at the Cefas Laboratory in Lowestoft.

Project summary	Measurable Indicators	Progress and Achievements for the life of the project
Activity 1.5 Workshops to build capacity of staff in managing the marine environment.		Completed in year 1 and 2. The first workshop in October 2018 was attended by 17 GoM staff members and stakeholders over the two days. The second workshop was attended by 11 participants on each day. The workshop included interactive sessions based on a local development EIA report. Based on feedback received from Darwin to the previous workshop in project Year 1, the workshops included an assessment of the participant's level of knowledge before the workshop began on the subjects to be covered in order to allow for an assessment of knowledge gained as a result of the workshop
Activity 1.6 EIA evaluation support		Activity completed in Year 5. Provision of EIA support has been ongoing throughout the project with the delivery of guidance documents and resources to GoM and EIA workshop attendees. This activity was progressed during year 4 through the delivery of a number of EIA books to GoM during the March 2022 Cefas in-country visit (evidence provided in section 3.1 and 3.2 and in Annex 4).
Output 2. Create and provide a GIS Database with environmental layers and maps of marine benthic environments in Western shelf waters by quarter three, 2022.	2.1 Completion of 14 day underwater video characterisation survey of area of interest with 60 stations successfully sampled. 2.2 All survey data made available to GoM as soon as possible following survey and analysis stages prior to public-access provision in GIS format via Cefas Datahub by quarter three, 2022. 2.3 A minimum of five data layers will be provided in the database.	This output has been fully delivered Measurable indicator 2.1 was successfully delivered in year 2, wherein Alex Callaway and Jon Hawes undertook a 10 day underwater video survey (with assistance from MAHLE and RMPS staff) on board the MV Heliconia Star. 116 video transects and 1,004 still images were acquired across the whole area of study. Measurable indicator 2.2 and 2.3 were partially delivered in years 2 and 3. The survey data collected was analysed in year 2. Seabed characterisation data layers were developed and shared with GoM and stakeholders in year 3. These were finalised and delivered during year 5 (January 2023) in line with the updated project timetable.
Activity 2.1 Review multibeam echosounder data and design video characterization survey		Completed in year 1 prior to 2019 survey, this work was undertaken in conjunction with the Waitt institute and was key to successful survey planning

Project summary	Measurable Indicators	Progress and Achievements for the life of the project
Activity 2.2 Undertake 14 day video characterization survey		Completed in year 2. Wherein Alex Callaway and Jon Hawes undertook a 10 day underwater video survey (with assistance from MAHLE and RMPS staff) on board the MV Heliconia Star. 116 video transects and 1,004 still images were acquired across the whole area of study.
Activity 2.3 Analyse and quantify physical characteristics and biological assemblages from video and photographs		Completed in year 2 / 3 wherein Cefas contracted seabed imagery analysis to Envision Ltd. Return of fully annotated (using BIIGLE image platform) dataset in form of cell frequency derived percentage cover values.
Activity 2.4 Combine data with Waitt Institute survey to develop seabed characterisation data layers		Partially completed in year 3. An in depth video conference with Key Waitt staff was undertaken on 29/10/2020, wherein it was decided that the two ground-truth data types were too distinct to be combined In any meaningful way.
Activity 2.5 Share characterisation layers with local stakeholders		An initial predictive habitat map was shared with local stakeholders in year 3, the final map (after stakeholder verification) was delivered in year 5.
Activity 2.6 Publish paper in peer review journals to increase knowledge of the distribution of Montserrat marine biodiversity		Activity yet to be completed.
Activity 2.7 Make data freely available to data archive centres. Data available to UK and Local government to inform development.		The final predictive habitat map, raw and analysed still and video positional data alongside bathymetry, backscatter and six derivative layers were delivered in March 2023, and these data made public
<p>Output 3.</p> <p>Increase awareness on marine issues affecting Montserrat by creating an educational resource pack to be used within the secondary school. Work closely with the community, providing information and support to current local projects (Aqua Montserrat) and attend community events (St</p>	<p>3.1 By March 2019 consultation meetings with Montserrat secondary school, Deputy Minister of Education, parents, National Trust and Aqua Montserrat attracts a good number of interested education professionals.</p> <p>3.2 By December 2019 successful delivery of first draft educational resource pack will be provided to</p>	<p>Measurable indicators 3.1 and 3.3 were successfully delivered in year 1.</p> <p>Measurable indicator 3.2 was partially delivered in year 2 and 3. The draft resource pack was completed during year 2. Feedback on this resource pack was obtained during year 3 through virtual consultation meetings with the Secondary School. Remaining consultation on this resource pack took place in early Q1 year 5 (March 2022) and in Q2 (June 2022). The final version of the resource pack was completed in August 2022 and delivered with final consultation in by Q4 year 5 (January 2023).</p>

Project summary	Measurable Indicators	Progress and Achievements for the life of the project
<p>Patricks Day Parade) by March 2023.</p>	<p>Montserrat Secondary school. Feedback from two teaching staff, two GoM, Aqua Montserrat and parents will allow for the resource pack to progress into the final version by February 2022.</p> <p>3.3 By June 2019 a joint stand with the National Trust, at St Patrick's Day Parade will be well received, increasing the community awareness on marine issues affecting Montserrat.</p> <p>3.4 By November 2022 two GoM representatives and two teaching staff attend a workshop detailing the teaching resources with a view to supporting the inclusion of ocean literacy topics in the secondary school curriculum for Yr 9/10/11 Geography by March 2023.</p> <p>3.5 Resource pack and training materials are well received by pupils and teachers at Montserrat Secondary school and put to use within the Geography curriculum by March 2023.</p>	<p>Measurable indicators 3.4 and 3.5 were delivered during year 5 in line with the updated project timetable. 3.4 was delivered by in person visit to meet with the new teacher representative in June 2022 – however this workshop only involved a single geography teacher.</p>
<p>Activity 3.1 Premeeting</p>		<p>Completed in year 1.</p>
<p>Activity 3.2 Preparation ahead of consultation</p>		<p>Completed in year 1.</p>
<p>Activity 3.3 First consultation meeting in Montserrat</p>		<p>Completed in year 1.</p>

Project summary	Measurable Indicators	Progress and Achievements for the life of the project
Activity 3.4 Creation of draft resource pack		Completed in year 2.
Activity 3.5 Second consultation meeting to be held virtually		Completed. Feedback on the draft resource pack was obtained during year 3 through virtual consultation meetings with the Secondary School. Remaining consultation on this resource pack took place in year 5 (march 2022 and June 2022 in country visits)
Activity 3.6 Amending and finalising resource pack		Activity completed in year 5.
Activity 3.7 Third and final meeting in Montserrat		Activity completed in year 5 in conjunction with the data interpretation workshop and final closing meeting. Representatives from the educational output team visited MSS to hand over the resource pack, further educational resources and present a session with pupils on the seabed characterisation undertaken as part of output 2.

Checklist for submission

	Check
Is the report less than 10MB? If so, please email to BCF-reports@niras.com putting the project number in the Subject line.	
Is your report more than 10MB? If so, please discuss with BCF-reports@niras.com about the best way to deliver the report, putting the project number in the Subject line.	
If you are submitting photos for publicity purposes, do these meet the outlined requirements (see section 11)?	
Have you included means of verification? You should not submit every project document, but the main outputs and a selection of the others would strengthen the report.	
Do you have hard copies of material you need to submit with the report? If so, please make this clear in the covering email and ensure all material is marked with the project number. However, we would expect that most material will now be electronic.	
Have you involved your partners in preparation of the report and named the main contributors	
Have you completed the Project Expenditure table fully?	
Do not include claim forms or other communications with this report.	