

Darwin Initiative Main/Post/D+ Project Half Year Report (due 31st October 2017)

Project reference	DPLUS045
Project title	Mapping Anguilla's 'Blue Belt' Ecosystem Services
Country(ies)/territory(ies)	Anguilla
Lead organisation	Cefas
Partner(s)	Department of Environment Anguilla, UKHO, Environment Systems Ltd, Newcastle University
Project leader	<i>Koen Vanstaen</i>
Report date and number (e.g., HYR3)	<i>31/10/2017 HYR2</i>
Project website/blog/social media etc.	<i>Updates through social media; Twitter and Facebook</i>

1. Outline progress over the last 6 months (April – Sept) against the agreed baseline timetable for the project (if your project has started less than 6 months ago, please report on the period since start up to end September).

The project started in April 2016 and this report covers progress between April and September 2017. The main activities identified in the baseline timetable for this time period are listed below, together with the progress to date.

1.1 Project kick-off meeting, mid-project and final project stakeholder meetings

In March 2017 the project team met in Anguilla to discuss the next steps of the project and review the first year's activities. A stakeholder meeting was also undertaken to update the various interested parties on the achievements of the first year of the project. The team went through the data which was collected during the surveys and how this data had been processed. Details were given to the group on what the project would achieve over the remaining project months.

The second half of the stakeholder meeting was designed to get the group thinking about the legacy of this project and how the results can feed into a longer-term monitoring plan for Anguilla. During the meeting we were able to identify several key areas which the team could work on to feedback to the stakeholders during the final meetings of the project and what additional training could be delivered during the next meeting to help the island realise its long-term monitoring goals.

2.8 Data processing of satellite imagery to derive bathymetry

During the final quarter of the first year of the project three different methods were developed for creating bathymetry maps of depth from satellite data. Out of the three methods trialled one showed a high level of accuracy as well as being relatively simple to undertake. This method is a modification of one described by Stumpf et al. (2003)¹ which uses the ratios between the different light bands to calculate depth and does not apply a sun-glint correction to the data before estimating depth. The method can be completed using standard geographical information systems (GIS) software which are in common use by agencies and organisations

¹ Stumpf, Richard P., Kristine Holdried, and Mark Sinclair. (2003). "Determination of Water Depth with High-Resolution Satellite Imagery Over Variable Bottom Types." *Limnology and Oceanography* 48.1 Part 2: Light in Shallow Waters: 547-556

including many in Anguilla. This would allow for future repeat analysis and allow to study changes following extreme events as originally identified in the project proposal.

2.9 Calibration of satellite derived bathymetry (SDB) against multibeam echosounder data

After assessments into the relative accuracies of the different maps the data from the chosen method of deriving satellite derived bathymetry was validated against the multi-beam echosounder bathymetry data collected from a vessel mounted system. The SDB data achieved a good level of accuracy when compared to the vessel collected bathymetry data.

3.3 Analyse and quantify physical characteristics and biological communities from video and photographs. Qualitatively describe reef health.

The video and stills data, which were collected during the survey work in year one, were analysed by the team at the University of Newcastle. The data was assessed with the following parameters being recorded: species, number of individuals, reef quality, reef coverage and substrate type. The results of the analysis went on to inform the mapping of the coastal habitats and the results of the analysis will be published on the Cefas Data Hub along with copies of the images. Video data will be published on the project's YouTube channel.

3.4 Undertake object based image analysis of satellite and multibeam echosounder data and combine with in-situ observations to develop habitat characterisation data layers.

The University of Newcastle undertook the development and creation of the coastal habitat maps derived from the satellite and multibeam echosounder data during the past 6 months. The final habitat maps of the coastal areas were created using object-based image analysis (OBIA). This technique is a two-step process which involves the segmentation of an image into objects followed by the classification of those objects to represent the real world. Two separate maps were created from the data; one being derived from the satellite data and the other from acoustic data collected in year one.

Satellite derived habitat map

Before the OBIA process was carried out the satellite data underwent a series of pre-processing steps to remove various errors and artefacts. Corrections were applied to remove any atmospheric, geometric and radiometric effects as well as removing sun glint and water column effects. The satellite image then underwent image segmentation using specialist software creating objects which are similar in size and shape to real-world objects.

The second stage, object classification, uses classified groundtruthing points, such as video and stills data, as a training dataset to inform a classification algorithm which then applies a habitat classification to all of the objects based on their spectral values, shape and context.

The habitat maps created from the satellite data were classified according to two different habitat hierarchies. The first uses a high-level classification scheme dividing the areas into different substrates, while the second classification hierarchy uses dominant species and substrate type. The habitat maps will be assessed for accuracy against existing datasets and the final results presented to the project team and stakeholders at the final meeting. Figure 1 shows an example of one of the habitat maps produced using the satellite data and the groundtruthing video stations.

Acoustic derived habitat map

A second high-resolution habitat map is currently in the process of being produced utilising the multi-beam bathymetry and backscatter data collected during year one of the project. This data focus on the area around Road Bay and Sandy Island. The data will be used in conjunction with the video and stills data processed by Newcastle University. The method of production is very similar to the map produced from the satellite data and uses OBIA to segment and classify the acoustic data to create the habitat map. The backscatter data should allow the identification and delineation of habitats to a higher resolution than the habitat maps derived from the satellite data. This map can then be used as both a high-resolution habitat map for the area and as verification tool for the presence and extent of habitats identified from the satellite derived maps.

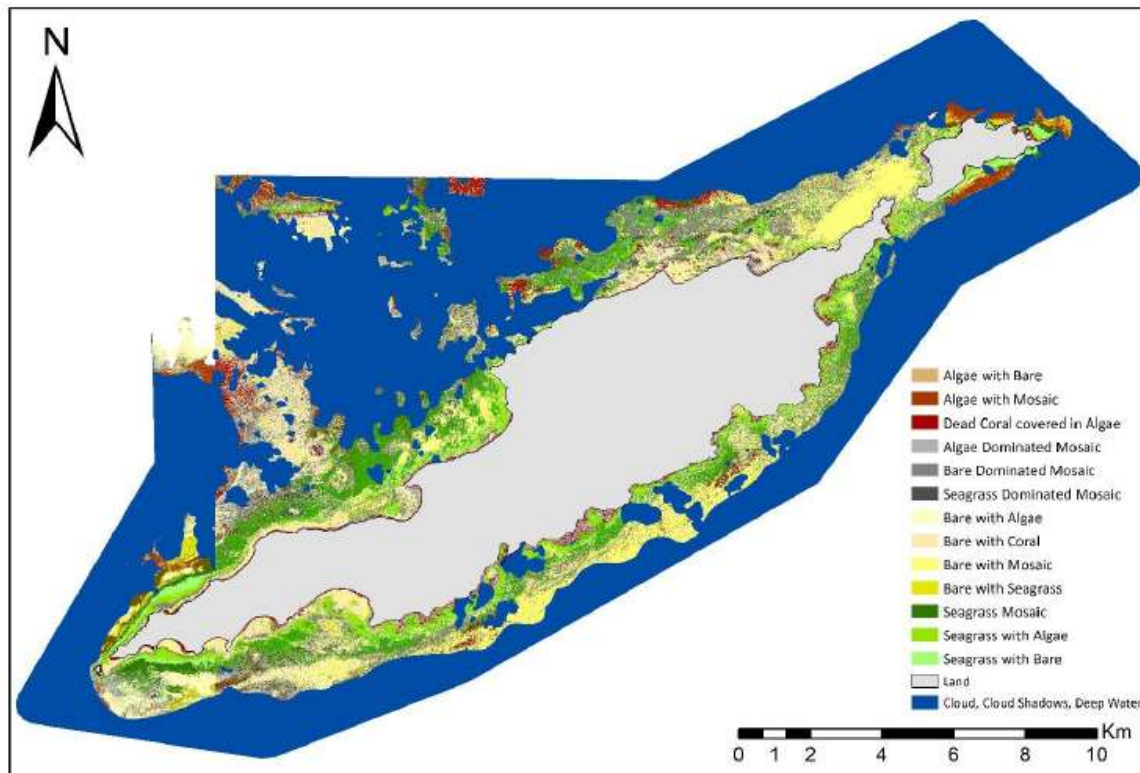


Figure 1. An example habitat map created from the satellite and groundtruthing data collected during the first half of the project.

2a. Give details of any notable problems or unexpected developments/lessons learnt that the project has encountered over the last 6 months. Explain what impact these could have on the project and whether the changes will affect the budget and timetable of project activities.

Hurricane Irma severely impacted Anguilla on the 7th September 2017. The islands' population, infrastructure and natural environment suffered significant damage, including the offices of our project partners. It is likely that with the very strong wind and wave action that there will have been movement of sediment around the island, leading to changes in bathymetry. This is likely to have changed the extent and location of many of the marine habitats. The Department of Environment are currently making an assessment of the marine areas and in consultation with them we will identify if there is any requirement to undertake additional mapping or training to help support Anguilla and realise the long-term legacy as discussed at the last stakeholder meeting.

The researcher exchange planned as part of the project is currently on hold due to the situation in Anguilla. If local partners decide that this is lower priority than other work, we will consider this and submit a change request.

Any changes identified will be discussed with LTS and should fall within the agreed budget of the project.

2b. Have any of these issues been discussed with LTS International and if so, have changes been made to the original agreement?

Discussed with LTS:	No
Formal change request submitted:	No
Received confirmation of change acceptance	No

3a. Do you currently expect to have any significant (e.g., more than £5,000) underspend in your budget for this year?

Yes No Estimated underspend: £

3b. If yes, then you need to consider your project budget needs carefully. Please remember that any funds agreed for this financial year are only available to the project in this financial year.

If you anticipate a significant underspend because of justifiable changes within the project, please submit a rebudget Change Request as soon as possible. There is no guarantee that Defra will agree a rebudget so please ensure you have enough time to make appropriate changes if necessary.

4. Are there any other issues you wish to raise relating to the project or to Darwin's management, monitoring, or financial procedures?

If you were asked to provide a response to this year's annual report review with your next half year report, please attach your response to this document. Additionally, if you were funded under R23 and asked to provide further information by your first half year report, please attach your response as a separate document.

Please note: Any planned modifications to your project schedule/workplan can be discussed in this report but **should also be raised with LTS International through a Change Request.**

Please send your **completed report by email** to Eilidh Young at Darwin-Projects@ltsi.co.uk . The report should be between 2-3 pages maximum. **Please state your project reference number in the header of your email message e.g. Subject: 22-035 Darwin Half Year Report**