Darwin Plus:
Overseas Territories Environment and Climate Fund
Annual Report

Important note *To be completed with reference to the Reporting Guidance Notes for Project Leaders:*

it is expected that this report will be about 10 pages in length, excluding annexes

Submission Deadline: 30th April 2018

Darwin Plus Project Information

Project reference	DPLUS061
Project title	Protecting herbivorous fish to conserve Cayman Island coral reef biodiversity
Territory(ies)	Cayman Islands
Contract holder institution	CCMI
Partner institutions	Cayman Islands Department of the Environment (DoE), RARE/Smithsonian Institute, Washington D.C.
Grant value	£249,096
Start/end date of project	April 2017 to December 2019
Reporting period (e.g., Apr 2017-Mar 2018) and number (e.g., AR 1,2)	Annual Report 2
Project leader name	Dr. Carrie Manfrino
Project website/blog/Twitter	www.reefresearch.org
Report author(s) and date	Dr. Claire Dell April 2019

1. Project overview

Herbivorous fishes are key to maintaining coral reef health and resilience. In the Cayman Islands however, the specific species responsible for this ecosystem balance remain unknown which is vital information if they are to be managed effectively. We aim to determine which herbivorous species are critical to the Cayman Islands and to use this information to inform a biodiversity action plan that empowers government to establish policies to manage and sustain these ecologically important species.

2. Project stakeholders/partners

The Cayman Islands Department of the Environment (CIDoE) is a key project partner and have been integrally involved in the project from its inception. This past year has seen our relationship develop further as we commence drafting the biodiversity action plan (BAP). Dr Claire Dell spent 6 weeks working in the CIDoE office in Grand Cayman where she held frequent meetings with our key partner, John Bothwell, as well as other CIDoE officers on various topics related to this grant. Dr Dell also presented an update of the work to the entire department. Furthermore, this year we have held two collaborative group meetings to discuss progress of the grant and to hear viewpoints from all our project partners.

In addition to frequent project partner meetings, we have held multiple community meetings and outreach events to share our findings with the public and gain their input. These have taken place across the country and have been an excellent way to engage the community and to hear their concerns and experiences.

3. Project Progress

3.1 Progress in carrying out project Activities

Output 1: Draft biodiversity action plan to protect key herbivores is approved internally by the Dept. of Environment.

As indicated in the first annual report, the reef surveys are completed, the education module is taught. As you will see in the following section, sample collection for genetic work and diet analyses is on track and the focus group is formed with 21 members and counting. All activities towards this output have been completed and the BAP is on track to be finalised by October, well before the end of the grant.

Data collection for the BAP is almost complete and the writing of the draft is underway. We are writing the BAP in close collaboration with the DoE, ensuring we include the information and level of detail they find relevant. For example, the legislation expanding the marine protected areas has recently been passed, which means that half of the reefs in the Cayman Islands (48%) will soon be protected. As a result, the DoE has requested that we focus future recommendations on the research that still needs to be conducted to elucidate our understanding of herbivory on these reefs. They feel that the level of protection in the Cayman Islands will be adequate so our attention should turn to improving our understanding other actions that will help save these reefs.

Output 2: Spatial map establishes the levels of herbivory and regional connectivity of key herbivorous fish and supports regional benefit of protecting herbivores.

As indicated in the following section, the preliminary spatial maps are included and will be developed further as our analyses continue. The spatial map will become part of our project webpage where it can be viewed and referred to in an open access manner. Collecting the genetic samples is ongoing and we will analyse them in July with our project partner. The movement ecology data collection will commence in the next few weeks as was approved in our change request. This output is also on track to be completed by the end of the grant.

Output 3: Herbivorous fish impact assessment based on levels of fishing

The historical fishing component of this output was completed in year 1. Obtaining catch at landing sites is now underway and will be completed by the end of May. As we move towards the summer months there will be increased fishing activity (as the seas calm) so we will be able to complete this final piece of data collection.

Output 4: Dissemination and application of results

An active, ongoing process of dissemination of information has progressed throughout the grant period. The Department of Environment have been continuously involved as collaborators and have attended our outreach activities including our Reefs Go Live broadcasts and lecture series. Two meetings have been attended, one regional and one international. Completion of two scientific peer reviewed papers is progressing and one will be submitted this summer and another by the end of the grant period. This is the main focus of the last period of the grant. The BAP is underway, and we will be creating the education module over the next few months in conjunction with the next Reefs Go Live lesson (the underwater classroom programme CCMI is running).

3.2 Progress towards project Outputs

1.1 Partners assess fish from 15 reefs across the three Cayman Islands; Historic reef trends quantified and key species reducing algae growth are identified by the end of year 2

-Completed in year 1 and included in annual report

1.2 Number of members in an expert Herbivorous Fish Focus group by end of year 2

This group has now been formed and is composed of 21 representatives from many different demographics including the government, NGOs, local businesses, fishermen and also concerned members of the community. Here is the advert in the newspaper of the first meeting that took place on Grand Cayman:

https://cnslocallife.com/2019/02/ccmi-healthy-reef-campaign/?utm_source=CNS+Newsflash&utm_campaign=d1fc1f367e-RSS_EMAIL_CAMPAIGN&utm_medium=email&utm_term=0_e5aea46d5d-d1fc1f367e-59680349

The follow-up meeting will take place at the end of June.

The list of members of the Focus Group is included in Annex 8 and continues to grow with our ongoing efforts across the three islands.

1.3 Empower 300 local students through new educational modules about herbivory, (specifically taught to students in grades 5 and 6) by the end of year 2.

Completed in year 1 and included in the year 1 annual report.

2.1 Project data and map is posted, and partner media pages and newsletters raise awareness (from 0 to 2000) via partner networks including DoE, CCMI, school groups by end of project

Data is currently being collected for the spatial map on herbivory. A first draft is included in Annex 9 & 10 and this will be posted on the website by the end of the project as proposed.

2.2 Regional connectivity (tagging and genetics) of herbivore fish determined by end project

We have collected 54 samples for the genetic & diet analyses and sample processing will begin in July with our project partners at the Smithsonian in Washington D.C. Photographs of some of the sampled fish are included in Annex 14 as evidence.

The movement ecology methods were changed as per the change request form and are commencing in year 3 as approved.

3.1 Fishing effort surveyed (data on catch and effort at 6 landing sites across the Cayman Islands by end of year 2.

These surveys are underway and will be completed by May as the weather is improving and we move into the summer months. It was determined by our project partners (CIDOE) that the information that would be most valuable would be from Cayman Brac, so we are focusing our efforts there. The map of landing sites and popular shore fishing spots is included in Annex 22 and a sample of photos from the landing sites are in Annexes 23 & 24.

3.2 Historical effort and catch data compiled by end of year 2 (interviews with (6) local Little Cayman fishermen

Completed in year 1 and included in annual report

In addition to these interviews, a further 18 were conducted to quantify current levels of fishing and preference for herbivorous fish species. The interviews are now complete and data analysis is underway; see Annex 11 for preliminary analyses.

4.1 Results incorporated into the BAP.

The data is currently being analysed and Dr Dell has begun writing the BAP. The BAP draft has been discussed and agreed upon with our project partners, the DoE. Annex 1 & 2 show evidence of discussions with the DoE regarding this document.

4.2 Scientific papers (2 submitted for publication, 2 meetings attended by end of project)

The first paper is being drafted and the data analysis for the second is currently being conducted. Figures from each paper are included in Annex 12 & 13 as evidence. Two meetings have been attended and were included in the first annual report.

4.3 Completion of public education curriculum with herbivory modules for all K-12 CCMI programs;

This output was completed in year 1 and included in the annual report, however we have continued to build on this deliverable and have expanded CCMI's curriculum to include herbivory modules for each age group.

We are on target to complete the grant by December 2019 as proposed.

3.3 Progress towards the project Outcome

Outcome: Herbivorous fish species that are key to maintaining reef health are incorporated into a draft biodiversity action empowering government to establish policies to sustainably manage herbivores.

Our intended outcome is to identify the key herbivorous fish species and to inform an action plan that the government can develop to sustainably manage these fish populations effectively. By the conclusion of year two we have collected all the data necessary to commence writing the BAP and are currently doing so in close collaboration with our project partners, the CIDoE. We have also collected the majority of the samples for genetic analyses so that we can identify the species present and understand the population connectivity across the Cayman Islands. Sample processing will commence with our project partners in Washington D.C. in July. The Focus group has been formed (Annex 8) and have contributed their insight to the BAP (See Annex 15 for a sample of input from such meetings). Follow up meetings will be held in year 3 to maintain dialogue with these members and the communities they represent.

Our indicators have been appropriate because they include the survey data, the focus group and the BAP, all of which are integral to the success of this project. Having completed the activities to date we can show the indicators are appropriate and also that we are well on our way to fulfilling the grant by the end of funding.

The legislation expanding the marine protected areas has recently been passed, which means that half of the reefs in the Cayman Islands (48%) will soon be protected. This changes the focus of the BAP considerably because the CIDoE believes the level of protection in the Cayman Islands will be adequate, so our attention should turn to improving our understanding other actions that will help save these reefs. As a result, the DoE has requested that we focus future recommendations on the research that still needs to be conducted to elucidate our understanding of key processes on these reefs so that we can inform other management actions.

Additionally, this Darwin grant is now able to provide baseline data that can be referred to when assessing the success of the MPA enhancement.

3.4 Monitoring of assumptions

Assumptions remain unchanged since year one and were all addressed in the first annual report.

Substantial evidence is available indicating that herbivorous fish are key to maintaining reef health (0.1). Similarly, we are certainly using past data to inform the decision making and execution of the grant and feel confident that the fishermen have been honest in the interviews to date (0.2). However, we assumed that the establishment of marine protected areas (MPAs) has led to long term increases in herbivorous fish and we have not seen that. This highlights shortcomings in the method of management and indicates more must be done to safeguard our reefs. This Darwin grant comes at a very opportune time as it enables us to investigate the situation further and research potential solutions.

Section 1 Assumptions: We have certainly found that some fish are more important than others in removing algal cover so assumption 1.1 holds true. Similarly, we have seen a change in the populations of herbivorous fishes over the last 20 years. Unfortunately, this is not a positive change, but this grant will assist in understanding why we see these trends and to make recommendations for improvement.

The assumption for section 2 is that: Movement patterns can be generalised for a range of herbivorous fishes with similar life history traits to facilitate broad management and conservation plans/action. This is still to be determined as we are just commencing this section of the grant. We received approval for our change request to replace the telemetry section with other methods and will commence this work this month (April 2019).

Section 3 Assumptions: Since year one concluded, we have conducted more interviews with the fishermen so can reflect more fully on the assumption that pertains to that part of the grant. This assumption is that the fishermen will honestly report their catch and their preference for

herbivorous fish species and is critical to the success of the BAP. Receiving incorrect information on this key part of the system could jeopardise the BAP and the protection of these key species. Fortunately, we feel confident that the majority of information we received in these interviews has been honest and accurate. This is because firstly, there has been great overlap in what the fishermen have said about their behaviours and about the reasons behind their preference for particular species. Secondly, the information the fishermen gave in the interviews about which fish species they prefer, has closely matched the data from the catch at landing sites. Hence this assumption has held true and assuages concern over this one source of risk (Annex 11).

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

The fundamental aim and outcome of this project is to determine the key species responsible for maintaining healthy coral reefs. Therefore, the very outcome is to positively impact biodiversity in the Cayman Islands and the Caribbean region. This entire grant and all submitted evidence directly relates to this objective. Considering the huge role coral reefs play in food provision, protecting the island from storms and generating revenue through tourism (0.5 Billion dollars in 2017), losing the reefs would detrimentally impact the nation severely. Nearly 90% of the fish caught in Grand Cayman are from the reef, so if we are not able to ensure the reefs survive, we will lose an important food source and potentially see people become deprived of food. Likewise, losing the protection from storms and erosion will mean the country spends more on sea wall defence; money which will no long be available for other issues. The loss of the reefs will mean the country and its people are far worse off. This grant is aiming to prevent that by informing the government about the critical fish species that help maintain reef health.

4. Monitoring and evaluation

As has been discussed in previous sections, we have been working closely with the CIDoE throughout year 2 and have sought their input at every stage of the grant. Annex 1 – 7 all relate to M&E. We are continuing with our quarterly meetings with the CIDoE and hold others as necessary, so our M&E plan remains unchanged. All project partners have been involved at different stages in the M&E work, and we hold meetings with project partners and share our progress with stakeholders via presentations, classes and through our social media. For example, the minutes from our most recent grant meeting (Annex 7: 21st March 2019) indicate how we as a team have discussed the delivery of the grant and the level of detail each section of the project must be investigated. The CIDoE have been pivotal in directing our focus in this regard. For example, as you will see in the minutes, the public perception of management strategies is critical information for the government and so will be a particular focus of our work in year 3.

The data we have collected and analysed so far has allowed us to evaluate our progress toward addressing the questions we have outlined for this project. This includes the ecological field work as well as the social and the multiple annexes to this document are indicators that we have achieved success.

5. Lessons learnt

One element of the grant that has worked very well this past year has been investigating the prevalence of an unusual species of algae on Cayman Brac. Dr Dell researched several of potential causes for this growth and has discovered the most likely culprits. She has subsequently presented the findings to the community who were extremely interested in the results. The local community is concerned about the situation and are keen to learn what can be done to address it and Dr Dell is now writing these data for publication. (See Annexes 12, 13 & 19 for evidence.) This section of the grant is an excellent example of the direct benefits that can be derived from research for the local community. The application of research is too often obscured, but in this case, there has been a direct link between a community's questions, the subsequent research & problem solving and then the final reporting back to the community. This question and part of the project clearly represents the ethos of the Darwin Initiative and has been a fulfilling and productive endeavour.

On the other hand, the time required to organise the focus group and to hold meetings was underestimated, so one recommendation to future researchers would be to allow extra time to complete this type of outreach and engagement work. Secondly, non-lethally sampling fish (to meet the stipulations of our research permit) has also proved more difficult than was anticipated. If we were to repeat this grant, we would suggest running for a full 3 years rather than 2.5, so that there would be adequate time. We are confident however that the grant will be completed as scheduled because, as mentioned in the first annual report, maintaining a strong team and receiving timely responses from our project partners is key to success. We still have these elements so will complete the work as proposed.

6. Actions taken in response to previous reviews (if applicable)

These were addressed in emails (on 26th June & 4th July) with Eilidh Young immediately after receiving the review to the first annual report. The first point was to clarify that Dr. Courtney Cox is still one of our project partners, the second point was to confirm that Dr. Alison Candelmo has left CCMI and her work responsibilities were taken up by Dr. Claire Dell.

7. Other comments on progress not covered elsewhere

The exit strategy and future goals are now somewhat different because the MPA enhancement plan has been approved by the government and will increase the protected area of reef in the Cayman Islands to 48%. This shifts the priorities and focus of future work because our original question was to understand which herbivorous species need protected so they could perform this critical function. Now, half of the reef will be protected so the CIDoE has requested we work to understand herbivory in greater detail so that we are better informed about this important process and what we can do to increase it on these reefs. Secondly, we are now in a position to investigate other methods of improving reef health and how these interact with herbivory and the abundance and distribution of key species. The data collected in this grant (especially from the reef surveys, spatial map and genetic & diet analyses) will form the foundation for these valuable future questions and will allow us to build a programme of reef improvement. These data will also be hugely informative for future reef assessment and comparative studies.

8. Sustainability and legacy

Both Dr. Manfrino, Dr. Dell and other CCMI employees have appeared numerous times in public talks, in the media and at two conferences where we have spoken about the Darwin Initiative. (For evidence See Annex 17a when Katie Correia presented to the public during a meeting on the proposed port expansion; Annex 17b Dr Dell presenting to the community on 28th Feb and Annex 18 Dr. Manfrino talking with HRH Prince Charles). Likewise, we have promoted the Darwin Initiative frequently in our newsletter (an example of which is here: https://myemail.constantcontact.com/CCMI-Update--Summer-2018.html?soid=1101597940827&aid=QTIZ07FzDMg) and in our social media, a log of which is in Annex16a. Additionally, the Darwin Initiative has received media coverage multiple times as a result of CCMI's work and presence in the Cayman Islands, details of which are in Annex 16b. Most recently, Dr Dell was interviewed by a journalist from the Cayman Compass about this project and she was able to discuss the Darwin Initiative then. The email is included in Annex 20 as evidence this meeting took place.

As mentioned in the first annual report, the key output from this grant is to inform an Action Plan that can be developed by government to improve management and policy design. This will mean the Darwin Initiative leaves a lasting legacy in the Cayman Islands that protects coral reef biodiversity. Similarly, the education of Cayman's youth is another avenue through which impact is made and legacy is achieved. We have already accomplished the education objectives through CCMI's 'Reefs Go Live' series, but we will be broadcasting an additional episode next month on the work from this project. In this way, the Darwin Initiative has a direct impact on the future of the Cayman Islands by educating and informing the generation who will become the policy-makers and governors of the future. The Darwin Initiative has also been included in CCMI's Healthy Reef campaign and the International Year of the Reef outreach

work completed in 2018 – both campaigns drive huge awareness for projects trying to improve reef health and the Darwin Initiative has been included in all the sponsor communications.

This BAP forms the main part of this project's legacy and exit strategy and as such our plan remains unchanged. However, this work has stemmed an interest in the community and a request for other questions to be answered. Evidence for this is included in Annex 19a and 19b.

Annex 19a is an email from an attendee to one of Dr Dell's community presentations. After the talk, he spoke with Dr Dell at length about what he wanted to know and what he wanted to see done on the reefs and researched next. This email is him wanting to get involved.

Annex 19b is the response Dr Dell received from one of the focus group meetings. This person also has questions they want answered and are requesting new experiments.

Consequently, we are formulating ideas for a subsequent grant proposal to address these requests from the community.

CCMI celebrated 20 years in the Cayman Islands in 2018 and we are making plans for our work for the next 20 years. Our commitment to the reefs and the Cayman Islands is clear in the multiple grants we obtain and the many students we teach. We are working on creating a living, current legacy and building on the work we have already accomplished. Thus, as an institute CCMI does not plan to exit the Cayman Islands See our website www.reefresearch.org for more information.

9. Darwin identity

As mentioned in section 8, we have promoted the Darwin Initiative in our public talks (Annexes 17 & 18), focus group meetings (Annex 15) interviews with journalists (Annex 20) through our social media and on the CCMI website (Annex 16). This project is recognised as a distinct project in CCMI's work and outreach. Through our efforts, awareness of the Darwin Initiative is growing in the Cayman Islands and the UK Overseas Territories. The media, dive professionals, attendees to our presentations and of course, the many fishermen Dr Dell interacts with as part of this work are all now aware of the Darwin Initiative and this particular project.

10. Project Expenditure

Table 1: Project expenditure <u>during the reporting period</u> (1 April 2017 – 31 March 2018)

Project spend (indicative) in this financial year	**2017/18 D+ Grant (£)**	**2017/18 Total actual D+ Costs (£)**	**Variance %**	**Comments (please explain significant variances)**
Staff costs				
Consultancy costs				
Overhead Costs				
Travel and subsistence				
Operating Costs				
Capital items				
Others (Please specify)				
TOTAL				

Annex 1: Report of progress and achievements against Logical Framework for Financial Year 2018-2019 – <u>if appropriate</u>

Project summary	Measurable Indicators	Progress and Achievements April 2017 - March 2018	Actions required/planned for next period
Impact Targeted management of functionally important herbivorous fish and direct fisheries policies that improve coral reef biodiversity		The BAP aims to achieve a positive impact on biodiversity and consequently, also the human populations who rely on the system.	
Outcome Herbivorous fish species that are key to maintaining reef health are incorporated into a draft biodiversity action empowering government to establish policies to sustainably manage herbivores	0.1 Field survey data to indicate key herbivorous fish that is compile and used in a spatial map to inform plans which are endorsed by the Department of Environment managers during a meeting by the end of the second year.; 0.2 Creation of a public- private partnership as an expert fish focus group including members from National Trust, environmental, business, and tourism to empower new policy and protection; 0.3 Draft Biodiversity Action Plan (BAP) agreed internally and draft of management plan for key herbivores by the end of the project.	The first 2 outcomes have been completed, evidence for which can be found in the first annual report and in annex 8, 9, 10 & 11. The third outcome is underway and will be completed by the end of the grant as proposed.	Follow up meetings with the focus group to finalise details of the BAP. Finish drafting the BAP
Output 1. Draft biodiversity action plan to protect key herbivores is approved internally by the Dept. of Environment.	1.1 Partners assess fish from 15 reefs across the three Cayman Islands; Historic reef trends quantified and key species reducing algae growth are identified by the end of year 2; 1.2 Number of members in an expert Herbivorous Fish Focus group by end of year 2;	These three outcomes have all been achieved. 1.1 and 1.3 were completed by the end of year one and included in the first annual report. Outcome1.2 has been completed now and evidence for which can be found in Annexes 8 & 15.	

	1.3 Empower 300 local students through new educational modules about herbivory, (specifically taught to students in grades 5 and 6) by the end of year 2.	
Activity 1.1 Report on herbivorous fish		Completed and included in Annex 21
Activity 1.2, Final Report on knowledge gained over duration of project by focus group		Will be completed by the end of the grant
Activity 1.3 Pre and post surveys indicating students empowered with knowledge and utilising CCMI resource		Completed and included in the first annual report and second 6 month report
Output 2. Spatial map establishes the levels of herbivory and regional connectivity of key herbivorous fish and supports regional benefit of protecting herbivores	2.1 Project data and map is posted and partner media pages and newsletters raise awareness (from 0 to 2000) via partner networks including DoE, CCMI, school groups by end of project; 2.2 Regional connectivity (tagging and genetics) of herbivore fish determined by end project	Data has been collected and featured in CCMI's social media and avenues of outreach. Samples are almost all collected (Annex 14) and will be analysed in collaboration with our project partner at the Smithsonian in Washington D.C. These outputs will be completed by end of project. The movement ecology methods were changed as per the change request form and are commencing in year 3 as approved.
Activity 2.1. Web analytics and newsletter opens with project views		Completed and included in second 6 month report
Activity 2.2. Fish connectivity report with data and photographs		As already mentioned, we have collected most of the samples and will be analysing them in July, see Annex 14.
Output 3. Herbivorous fish impact assessment based on levels of fishing	3.1 Fishing effort surveyed (data on catch and effort at 6 landing sites across the Cayman Islands by end of year 2. 3.2 Historical effort and catch data compiled by end of year 2 (interviews with (6) local Little Cayman fishermen	3.1 is underway and will be completed by May as the weather improves and more people resume fishing. See Annex 22, 23 & 24 for evidence. 3.2 was completed in year 1 and included in the first annual report.
Activity 3.1 Report of interviews quantify current levels of fishing pressure by end of year		Completed and addressed in first annual report. Analysis underway see Annex 11 for evidence.
Activity 3.2 3.2 Report documenting oral history with photographs		Completed and addressed in first annual report

4. Dissemination and application of results	4.1 Results incorporated into the BAP. 4.2 Scientific papers (2 submitted for publication, 2 meetings attended by end of project; 4.3 Completion of public education curriculum with herbivory modules for all K-12 CCMI programs;	The BAP is in progress as is the writing and analyses for the scientific papers (Annex 12 & 13). Two meetings have been attended and were included in the first annual report. The education module will be created in the next 3 months when the next intern arrives.

Annex 2: Project's full current logframe as presented in the application form (unless changes have been agreed) - if appropriate

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 Darwin-Projects@ltsi.co.uk if you have any questions regarding this.

Project summary	Measurable Indicators	Means of verification	Important Assumptions
Impact: Targeted management of functionally important herbivorous fish and direct fisheries policies that improve coral reef biodiversity.			
Outcome: Herbivorous fish species that are key to maintaining reef health are incorporated into a draft biodiversity action empowering government to establish policies to sustainably manage herbivores. (Max 30 words)	0.4 Field survey data to indicate key herbivorous fish that is compile and used in a spatial map to inform plans which are endorsed by the Department of Environment managers during a meeting by the end of the second year.; 0.5 Creation of a public- private partnership as an expert fish focus group including members from National Trust, environmental, business, and tourism to empower new policy and protection; 0.6 Draft Biodiversity Action Plan (BAP) agreed internally and draft of management plan for key herbivores by the end of the project.	0.1 By the end of Year 1, minutes from 2 partner meetings and report describes and quantifies the role of herbivorous fish in reducing competitive algae and improving reef health, and that elucidates species trends over the last 2 decades; 0.2 Meeting minutes that record the establishment and meetings of such group; 0.3 Final report with meeting minutes and attendee lists from 3 partner meetings (initial, review, final) discussing draft BAP and management plan;	0.1 Herbivorous fish are key to maintaining coral reef health; 0.2 Unknown trends for herbivorous fish on all three islands over the last 20 years of data collection will inform the plan and effectively impact decision making; Fisherman will support this effort and provide accurate data; Fish may be overfished in areas unknown to us; MPA has led to long term increases in herbivorous fish. Draft fish species protection plan which has parrotfish included has never progressed so we are starting from 0.
1. Output: Draft biodiversity action plan to protect key herbivores is approved internally by the Dept. of Environment.	1.4 Partners assess fish from 15 reefs across the three Cayman Islands; Historic reef trends quantified and key species reducing algae growth are identified by the end of year 2; 1.5 Number of members in an expert Herbivorous Fish Focus group by end of year 2; 1.6 Empower 300 local students through new	1.1. Report on herbivorous fish; 1.2. Final Report on knowledge gained over duration of project by focus group; 1.3. Pre and post surveys indicating students empowered with knowledge and utilising CCMI resource;	1.1 Hierarchy of herbivores, with some species playing larger roles in reducing algae; Populations of herbivorous fish species richness and fish biomass has changed over the last 20 years;

	educational modules about herbivory, (specifically taught to students in grades 5 and 6) by the end of year 2.		
2. Spatial map establishes the levels of herbivory and regional connectivity of key herbivorous fish and supports regional benefit of protecting herbivores.	2.1 Project data and map is posted and partner media pages and newsletters raise awareness (from 0 to 2000) via partner networks including DoE, CCMI, school groups by end of project; 2.2 Regional connectivity (tagging and genetics) of herbivore fish determined by end project;	2.1 Web analytics and newsletter opens with project views; 2.2. Fish connectivity report with data and photographs;	2.1 Movement patterns can be generalised for a range of herbivorous fishes with similar life history traits to facilitate broad management and conservation plans/action.
3. Herbivorous fish impact assessment based on levels of fishing	3.1 Fishing effort surveyed (data on catch and effort at 6 landing sites across the Cayman Islands by end of year 2. 3.2 Historical effort and catch data compiled by end of year 2 (interviews with (6) local Little Cayman fishermen.	3.1 Report of interviews quantify current levels of fishing pressure by end of year 3.2 Report documenting oral history with photographs;	3.1 Fishing effort measured at landing sites reflect overall fishing efforts; Illegal fishing does not occur in protected zones; Fishers provide accurate data through face to face interviews. Fishers are reluctant to report fishing effort due to a potential perception of restricted access to certain herbivorous fish species.
4. Dissemination and application of results	4.1 Results incorporated into the BAP. 4.2 Scientific papers (2 submitted for publication, 2 meetings attended by end of project; 4.3 Completion of public education curriculum with herbivory modules for all K-12 CCMI programs;	4.1 Draft of Biodiversity Action Plan. 4.2 Peer reviewed publications; 4.3 Teaching modules and curriculum developed and posted to the CCMI website.	None

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)

Output 1: Draft biodiversity action plan to protect key herbivores

1.1 Survey reefs at 15 sites on the north sides of all three islands to determine fish biodiversity and benthic (algae and coral) community structure, abundance, and health, and identify key fish for protection.

1.2 Herbivorous Fish Focus stakeholder group meet with partners and expand their knowledge and grow support for a BAP.

1.3 Create and deliver new educational modules about herbivory that empowers 300 grade 5 and 6 students.

Output 2: Spatial map of key herbivorous fish.

2.1 Manipulation experiments determine dietary patterns and key herbivores are identified also using surveys (from Output 1.1).

2.2 Tag fish to determine range and impact on reducing algae on the reefs; genetics (fin clips) of selected species expand our knowledge on connectivity across the region.

Output 3: Herbivorous fish impact assessment.

3.1 12 Fisherman are surveyed for catch and effort data;

3.2 Historical fishing effort and catch is documented through oral history interviews which are available online.

Output 4: Dissemination and application of results.

4.1 Develop draft Biodiversity Action Plan with partners

2 Write and submit 2 scientific papers to peer reviewed journals and attend 2 international meetings to present research results.

4.2 K-12 Educational curriculum is developed and used for residential programmes; 200 additional students participate by end of project.

Checklist for submission

	Check
Is the report less than 10MB? If so, please email to Darwin-Projects@ltsi.co.uk putting the project number in the Subject line.	Y
Is your report more than 10MB? If so, please discuss with Darwin-Projects@ltsi.co.uk about the best way to deliver the report, putting the project number in the Subject line.	N
Have you included means of verification? You need not submit every project document, but the main outputs and a selection of the others would strengthen the report.	Y
Do you have hard copies of material you want 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.	N
Have you involved your partners in preparation of the report and named the main contributors	Y
Have you completed the Project Expenditure table fully?	Y
Do not include claim forms or other communications with this report.	