



Department  
for Environment  
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Department  
for International  
Development



## Darwin Plus: Overseas Territories Environment and Climate Fund

### Final Report

**Important note** To be completed with reference to the Reporting Guidance Notes for Project Leaders:  
it is expected that this report will be a maximum of 20 pages in length, excluding annexes

#### Darwin Project Information

Project Ref Number	DPLUS010
Project Title	Coral Nursery Project in Little Cayman: Enhancing Resilience and Natural Capacity of Coral Reefs in the UKOTs
Territory(ies)	The Cayman Islands
Contract Holder Institution	Central Caribbean Marine Institute
Partner Institutions	Cayman Islands Department of Environment; University of Essex
Grant Value	£41,631
Start/end date of project	01April2013 to 30March2015
Project Leader	Carrie Manfrino, PhD
Project website	<a href="http://reefresearch.org/research/staghorn-coral-nursery/">http://reefresearch.org/research/staghorn-coral-nursery/</a>
Report author and date	Kristi Foster, PhD; 29June2015

### 1 Project Overview

Little Cayman is a small (10 sq km), sparsely populated (<200 residents) island fringed with coral reefs. Little Cayman is located 8 km from its nearest neighbor Cayman Brac and approximately 120 km east of Grand Cayman, the largest and most populated (~ 53,000 residents) island in the chain (Fig. 1). The Cayman Islands are positioned 145 km south of Cuba and 320 km northwest of Jamaica. All three Cayman Islands have the same geographic and oceanographic setting, with deep open ocean water surrounding a double coral reef terrace shelf that extends from sea level to approximately 150 meters in depth. They are flat, low-lying carbonate islands that extend along a tectonic ridge that extends from Cuba to Nicaragua.

CCMI and the Little Cayman coral nursery are located on the northern side of the island, within the Bloody Bay Marine Protected Area (MPA) (Fig. 2). The MPA system has been in place since 1986 with no-take marine reserves and replenishment zones protecting threatened and harvested species, further supported by environmental zones and wild life interaction zones that regulate tourist interaction with the marine environment.



Figure 1. Map of Caribbean basin and Cayman Islands.



Figure 2. Map of Little Cayman.

Yellow pins indicate location of CCMI and Little Cayman coral nursery.

Like other locations throughout the Caribbean, low and declining densities of the critically endangered staghorn (*Acropora cervicornis*) have been documented around the Cayman Islands. These once-dominant, large reef-building corals are now IUCN Red-Listed as critically endangered species. The demise of this branching coral, which functions as a habitat for fish and invertebrates, has reduced both the structural and biological diversity of Caribbean reefs. Stressors, including widespread outbreak of white band disease in the 1980s, reduced the population by 90% in the Cayman Islands and across the region. Low coral (breeding) densities have impeded successful spawning and these species have been unable to substantially recover making the regeneration efforts of CCMI in the Cayman Islands especially important for the region.

CCMI's coral nursery project was designed to improve the biological diversity, health, and architectural structure of reef ecosystems by multiplying the current wild staghorn coral population. By developing local knowledge and capacity, CCMI and its partners have established coral gardening as a viable conservation practice within the Cayman Islands. Results from this project have been disseminated through scientific publications, conference presentations, workshops, and outreach programs allowing stakeholders throughout the UKOTs and the Caribbean to benefit from the lessons learned.

## 2 Project Achievements

### 2.1 Outcome

The project achieved its intended outcomes as laid out in CCMI's application, which were threefold:

1. Enhance the Cayman Island's capability to protect marine biodiversity and specific coral species' long-term capacity to recover naturally by establishing a productive coral nursery. The nursery will provide more independently growing colonies as a result of outplanting nursery-reared corals, which will encourage a genetically diverse and sexually viable breeding population.
2. Increase project partners' and local stakeholders' knowledge and ability to develop reef restoration techniques.
3. Develop climate change mitigation and adaptation techniques to provide a stronger response to threats on the marine environment from increasing climate change impacts such as ocean acidification and coral bleaching.

Evidence of successful achievement of intended outcomes are provided below.

#### Establishment of a productive nursery

The nursery is now a regular part of CCMI's research and conservation programs. The nursery is comprised of floating lines and trees. CCMI and the Cayman Islands Department of Environment installed eight new pins into the substrate and have constructed 10 additional trees in preparation for expansion later this year. Nursery maintenance now occurs monthly and includes health checks, cleaning, reattachment (should corals become dislocated from the lines or trees), and repairs to the physical structures (as needed).

The nursery currently contains fragments from five genetically distinct parent colonies. (CCMI has submitted an environmental permit application to add 10 genotypes to the nursery and is awaiting approval.) The wild parent colonies were monitored quarterly for a year beginning immediately after the collection of nursery fragments (September 2012), in order to assess the condition of fragmentation lesions. All parent colonies recovered fully after 4–6 weeks and continued growing normally. Fragmentation lesions were overgrown by new tissue, and in most cases, new branches started growing on the lesion sites. In September 2013, quarterly monitoring of wild parents ceased as agreed at the initiation of the project

With CCMI's discovery that up to 75% of nursery-reared colonies may be fragmented without any negative impact on survivorship, growth rate, or branching of the parent colony; the five original branches have "multiplied" into 250 colonies within the nursery. Fragmenting using this technique results in the highest possible productivity for a nursery focused on *Acropora cervicornis*. This important finding was published in *Endangered Species Research* (see Annex 2) and can be used to help deliver long-term strategic outcomes of reef regeneration in the UKOTs.

The nursery is productive to the extent that CCMI has been able to outplant colonies in 2013 (66 colonies), 2014 (62 colonies), and 2015 (105 colonies). CCMI intends to continue outplanting to the wild reefs throughout the lifetime of the Little Cayman nursery within the guidelines established by the national Coral Nursery policy.

White band disease has been suspected in a few nursery colonies. To manage disease outbreak, the following two-part protocol has been developed: (1) affected colonies will be moved to a quarantine area at a distance of at least 20 m from both the existing nursery and wild coral colonies, (2) bands of marine epoxy will be placed on affected branches at the disease margin creating a physical barrier to stop the active progression of disease. (Alternatively, affected portions of branches may be excised completely from the affected colony and discarded.) Those colonies which recovered were transplanted to the reef in June 2015 and are being monitored for survival.

A natural disaster protocol has been established. In the event of a serious natural threat such as a severe hurricane, a portion of colonies at the nursery will be moved to a deeper site adjacent to the nursery, which would be less impacted by hurricane wave action. Upon DoE approval of the nursery expansion, sand anchors will be installed at a depth of ~18 m. In the event of inclement weather, entire tree and line nurseries will be removed from their anchors at the nursery site and towed by boat to the deeper contingency site, where they will be reattached to the sand anchors. To date, the severe storm protocol has not been necessary.

Project progress and results have been reported to Darwin Plus in Sept2013, Apr2014, Oct2014, and with this final report. Results and best practices have been share with stakeholders via CCMI's publications (Annex 2), workshops (described below), CCMI's coral nursery webpage (<http://reefresearch.org/research/staghorn-coral-nursery/>), and various outreach and education programs.

#### Reef restoration capacity building

CCMI facilitated three annual workshops for CCMI and DoE staff, project, partners and stakeholders during this project. Training included nursery construction; maintenance protocols; collection methods; donor colony recovery monitoring; nursery colony health monitoring; risk management; fragmentation guidelines; outplanting methods; outplant site selection; outplant growth measurements; and genetic sampling. Workshop concept notes and best practices presentations have been made available for public access on CCMI's coral nursery webpage. An additional published resource on *Acropora* nursery techniques and best practices has also been linked through the project webpage to increase knowledge of nursery techniques among interested parties.

The lessons learned from this project have been incorporated into the new Cayman Islands public Coral Nursery Policy (Nov2014), thus building capacity throughout the sister islands. This was an unanticipated outcome as a result of the collaboration with project partners in the DoE. John Bothwell (DoE) developed the policy with was approved by the Cabinet. Through the national policy, the Cayman Islands Marine Conservation Board and DoE is now allowing coral nurseries to be constructed (pending permit approvals) at several Grand Cayman locations. The policy is also being used as a model within other Caribbean countries.

CCMI has developed a coral nursery workshop for 8 – 12 year olds to begin building capacity within the next generation(s) of stakeholders. The educational workshop is designed to give an introduction to what a coral is, why they are dying, and how nurseries can be a great tool for regeneration of staghorn coral. The program ends with a hands-on activity where students are given dead staghorn coral to examine and measure the total linear extension using rulers. The workshop was launched on 'Cayman Day' (April2015) at Cayman Prep Primary School (Grand Cayman) by Tom Sparke, our Education Program Manager. The workshop has now been incorporated into our marine ecology course which is delivered to 200 Caymanian students a year. Development for a higher level workshop for 16 – 18 year olds has begun to give students an insight into the best practices for outplanting corals back onto the reef.

#### Development of climate change mitigation and adaptation techniques

CCMI has used survival rates of outplanted corals to refine its outplanting strategies. First-year survival rates for the 2013 outplants were 29% and 83% at the ICON Reef and Coral City sites, respectively. The 2013 ICON Reef plot experienced a high amount of sedimentation, which likely led to high mortality. For that reason, plots with higher relief were selected for the outplants in 2014. The first-year survival rate for the 2014 outplants was 90% at ICON Reef and Coral City and these colonies grew by ~50% (based on total linear extension. The 2015 outplantings occurred in March (40 fragments) and June (65 fragments); it is too soon to predict their survival rates.

Genetic sampling results indicate that each of the five parent colonies chosen to “seed” the nursery are genetically unique. Our outplanting strategy in 2014 and 2015, therefore, included a mixture of all five genotypes within each plot to ensure a genetically diverse outplanted population which will encourage sexual reproduction.

CCMI attempted to identify other environmental factors, such as localized currents, which may have contributed to the site variations in outplant survival and growth. Unfortunately, the Acoustic Doppler Current Profiler (ADCP) was lost sometime during the extended deployment. CCMI relied on the survival and growth (biological) rather than the physical factors to determine site suitability for outplanting.

Researchers at CCMI tested ocean acidification variations in habitats relevant to staghorn coral in 2014. It is predicted that ocean acidification may promote algal growth, leading to an intensification of coral-algal interactions, with small fragments. To test this, 40 small fragments (<10 cm total linear extension) were collected from the nursery in June and used in an ex-situ laboratory experiment to determine the effect of *Dictyota* algae and pCO<sub>2</sub> conditions predicted for the year 2100 on *Acropora cervicornis* linear extension and calcification. Results after two month treatments indicated that the presence of *Dictyota* reduced calcification, but not linear extension, in *A. cervicornis*, suggesting sustained skeletal elongation at the expense of density. Increased pCO<sub>2</sub> itself (treatments without the macroalgae) did not affect linear extension or calcification. A scientific manuscript detailing these results is currently in progress. This work has been accepted for publication, but is still under revision, in a special issue of the ICES Journal of Marine Science. The expected title is “Effects of dynamic reef chemistry with elevated pCO<sub>2</sub> and coral-algal interactions on two dominant Caribbean branching corals: *Acropora cervicornis* and *Porites divaricata*” (H Bedwell *et al.*).

## 2.2 Outputs

CCMI listed three outputs in its original application and have achieved all three (without encountering problems) as indicated below:

1. Establish an *Acropora* nursery and outplanting system.

Indicators of success and status at end of project: The Little Cayman coral nursery, the first nursery in the Cayman Islands, sustains 250 healthy, growing colonies of *Acropora cervicornis*. This represents a nearly 5-fold increase in the amount of colonies present within the nursery in only 19 months. All parent colonies from which collections occurred were monitored and shown to have recovered fully. An outplanting strategy has been developed and implemented, resulting in the successful transplantation of 94 *Acropora cervicornis* to wild reefs (i.e. 94 survivors from the 2013 and 2014 outplants). In 2015, 65 additional fragments were outplanted; survival and growth are being monitored. Nursery risks have been mitigated.

2. Develop and implement training program for local region.

Indicators of success and status at end of project: CCMI facilitated three annual workshops for CCMI and DoE staff, project, partners and stakeholders during this project (See Section 2.1). Workshop concept notes and best practices presentations have been made available for public access on CCMI’s coral nursery webpage. The lessons learned from this project have been incorporated into the new Cayman Islands public Coral Nursery Policy (Nov2014), thus building capacity for the local region.

CCMI has developed a coral nursery workshop for 8 – 12 year olds to begin building capacity within the next generation(s) of stakeholders. The workshop has now been incorporated into our marine ecology course which is delivered to 200 Caymanian students a year.

3. Develop outplanting strategy, including investigation of climate change (bleaching and ocean acidification) on *Acropora*, in various habitats

Through the Little Cayman coral nursery, we have improved the survival capacity of the most threatened species in the Caribbean. CCMI has used survival rates of outplanted corals to refine its outplanting strategies. Plot selection criteria include high relief and low sedimentation. An assortment of genotypes are outplanted in a given plot to improve biodiversity and the chance of sexual reproduction. (Previous studies have linked higher diversity with higher resistance to stressors.)

Research conducted at CCMI indicated that the presence of *Dictyota* reduced calcification, but not linear extension, in *A. cervicornis*. Low presence of *Dictyota* has become part of the outplant plot selection criteria.

### 2.3 Sustainability and Legacy

The best practices learned during this project are being shared by CCMI with potential nursery managers (pending issuance of DoE permits) throughout the Cayman Islands and have been incorporated into a national Coral Nursery Policy.

Our findings regarding propagation within nurseries will endure through publication within *Endangered Species Research* scientific journal.

CCMI has secured funding to continue the Little Cayman coral nursery after closure of this project. We have submitted permit applications with the DoE to expand the capacity within the existing nursery, install nursery structures at additional locations, and add *Acropora palmata* to our nursery. We shall continue to monitor our coral outplants for years to come.

Katie Lohr, the CCMI Conservation Scientist, who was responsible for the day-to-day operation of the coral nursery is pursuing her PhD at the University of Florida, focusing on coral restoration. She continues to work as a part-time research assistant with CCMI, mentors undergraduate research within the Little Cayman nursery, and shares her technical expertise within the Cayman Islands coral nursery community. She is well on her way to becoming a recognized leader within the scientific community in the field of coral restoration.

CCMI's project staff continue to support the Little Cayman coral nursery and our other research, conservation, and education programs. Should the time come when it becomes necessary to shut down the nursery, the exit strategy will involve outplanting all nursery-reared colonies to the wild.

## 3 Project Stakeholders

Dr Diego Lirman, a specialist in coral nursery techniques from the University of Miami, led two 2-day workshops during which 24 local scientists and stakeholders received technical and hands-on training. Dr. Lirman served as a consultant and mentor for CCMI's Conservation Scientist, Katie Lohr, and was therefore involved throughout the project.

Katie Lohr has become a specialist in coral nurseries as a result of her daily involvement in this Little Cayman coral nursery. She led the third 2-day workshop during which she shared the best-practices and lessons learned the representatives from DoE, CCMI, and the local community. She was lead author on the *Endangered Species Research* article.

Tim Austin and John Bothwell of the DoE have been involved in all stages of this project including planning, granting permits, decision making, attending workshops, overseeing outplanting, and incorporating the lessons learned into the new Cayman Islands public Coral Nursery Policy.

CCMI considers the residents of the Cayman Islands and visitors/tourists as critical stakeholders. While not involved in the project planning or decision making, the general public have been supportive and engaged in the Little Cayman coral nursery through our Lecture Series talks, weekly station tours, elementary school programs, undergraduate research opportunities, and social media postings.

## 4 Lessons learned

- Was the project management structure suitable for this style of project? **Yes**
- Did you have the right sort of expertise employed on the project? **Yes.** The pilot project which preceded this project provided CCMI and DoE with essential hands-on experience with coral nurseries. Dr. Diego Lirman from the University of Miami was an essential partner who provided training and shared his expertise during several workshops.
- Was the project well planned e.g., was it based on a good understanding of the underlying issues? Had you correctly identified the problems in the application form? Was the timeframe realistic? **Yes.** The timeframe was realistic. The project has allowed us increase the number of fragments in our nursery from 5 to 250 and we have outplanted over 160 nursery-reared colonies to the native reefs thereby increasing the biomass of threatened staghorn coral in the wild.
- Did you allocate sufficient resources to the problem outlined? **Yes**
- Any other lessons you could draw out from this project that could be useful? **Yes.** The lessons learned have been incorporated into the Cayman Islands' public Coral Nursery Policy, have been published in Endangered Species Research scientific journal, and presented at the 43<sup>rd</sup> Benthic Ecology Meeting thereby disseminating allowing other coral nursery managers to benefit from our findings. We plan to apply the lessons learned for *A. cervicornis* to *A. palmata* and have submitted permit applications to DoE which would allow us to add this second threatened species to our coral nursery.

### 4.1 Monitoring and evaluation

No major changes were made to the project design.

The half-year monitoring and evaluation system of project and financial reporting was practical with respect to Darwin Initiative. The project partners were actually updated more frequently

The health and status of the coral nursery continue to be evaluated by CCMI every two weeks during routine maintenance and cleaning. Outplants continue to be monitored by CCMI which includes measurements for total linear extension in order to document the increase in live coral cover and the long-term impact of the coral nursery project. External evaluations of this project include the peer-review of the scientific article published by CCMI, "Optimizing the productivity of a coral nursery focused on staghorn coral *Acropora cervicornis*." (See Annex 2 Publications.)

### 4.2 Actions taken in response to annual report reviews

On 19 June 2014, CCMI received three comments following our annual report which were to be addressed in the final report:

- 1) Is the project part of a larger government reef resilience strategy?

**CCMI Response:** Yes, this project was a collaboration with the Cayman Islands Department of Environment (DoE). The successes within this project contributed to the development and issuance of the public Coral Nursery Policy (Nov 2014). In May 2015, the DoE issued a call for applications throughout the Cayman Islands for other interested parties to install staghorn coral nurseries. CCMI submitted an application to continue the work from this project and to expand the scope of the Little Cayman nursery. Dive organizations in Grand Cayman and Cayman Brac are also applying for staghorn nursery permits.

- 2) Comment on any discussion on permanent multi-species nurseries.

**CCMI Response:** The Coral Nursery Policy specifically lists three coral species which may be nursery-reared: *Acropora cervicornis*, *A. palmata*, and *Porites porites*. A DoE goal is to have genetically diverse fragments in the various nurseries in order to maximize biodiversity during future outplanting. To date, CCMI and its partners have conducted preliminary genetic sampling around the three sister islands for *A. cervicornis* only. These results have been shared with DoE so that genetically distinct wild donor colonies can be identified when the newly permitted nurseries are ready to collect from parent colonies.

CCMI has submitted an additional permit application to expand the genetic sampling for *A. cervicornis* and to begin genetic sampling for *A. palmata*. Once these results are available, DoE will be more likely to allow both acroporids in nurseries. Similar genetic sampling may be required for *P. porites* and other species before collection for nursery propagation would be allowed by DoE.

Regarding “permanent” nurseries, the configuration of the nursery is up to the prospective nursery managers to specify in their permit applications. CCMI uses line and tree nurseries which are not permanent structures and can be easily repaired, replace, or moved (in the event of storms).

- 3) Please ensure Darwin is acknowledged in all material about the project.

**CCMI Response:** The Darwin logo is displayed on CCMI’s coral nursery webpage. Darwin was acknowledged in our recent peer-reviewed publication as a source of funding. CCMI also acknowledges Darwin in various presentations, press releases, etc. Please see Darwin Identity (Section 5 below) for specific examples.

## 5 Darwin Identity

Examples of publicity for the project and the Darwin Initiative include the following:

- CCMI has the Darwin Initiative logo displayed on its coral nursery webpage.  
<http://reefresearch.org/research/staghorn-coral-nursery/>
- Darwin Initiative was acknowledged in the peer-reviewed scientific journal article, “Optimizing the productivity of a coral nursery focused on staghorn coral *Acropora cervicornis*” by KE Lohr et al., published in *Endangered Species Research* Vol 27, 2015.  
<http://www.int-res.com/articles/esr2015/27/n027p243.pdf>
- Darwin Initiative is acknowledged as a funding source for the Little Cayman nursery in a local press release published on 06/18/15 in the Cayman Compass newspaper, “Cayman coral study published in global research journal”.  
<http://www.compasscayman.com/story.aspx?id=154244>
- Darwin Initiative is acknowledged as a funding source for the Little Cayman nursery in a local press release published on 06/15/15 in the Cayman iNews, “Cayman Islands coral nursery study published in global research journal”.  
<http://www.ieyeneews.com/wordpress/cayman-islands-coral-nursery-study-published-in-global-research-journal/>
- Darwin Initiative acknowledged as funding source for the Little Cayman nursery in a local press release published on 11/13/14 in the Cayman Compass newspaper, “Coral reef nursery blossoms in Little Cayman”.  
<http://www.compasscayman.com/caycompass/2014/11/13/Coral-reef-nursery-blossoms-in-Little-Cayman/>
- Darwin Initiative was in the title of an article published on 09/02/2014 in *What’s Hot* magazine, “The Darwin Initiative supporting new work to help conserve a critically endangered species in Cayman”.  
<http://www.compasscayman.com/whatshot/2014/09/02/The-Darwin-Initiative/>
- Darwin Initiative was in the title of a local press release published on 07/21/2014 in the Cayman Compass newspaper “Darwin Initiative Supports Cayman Islands’ Efforts to Conserve Biodiversity on Coral Reefs”.  
<http://www.caymanislands.ky/aboutcayman/news/tabid/1989/vw/1/itemid/148/darwin-initiative-supports-cayman-islands-efforts-to-protect-biodiversity-on-coral-reefs.aspx>
- Darwin Initiative acknowledged as funding source for the Little Cayman nursery in a local press release published on 07/16/14 in the Cayman Compass newspaper. “Little Cayman could hold key to reef survival”.  
<http://www.compasscayman.com/caycompass/2014/07/16/Little-Cayman-could-hold-key-to-reef-survival/>



The CCMI coral nursery project was funded in part by the Darwin Initiative and was part of a larger programme.

CCMI is the only marine research institute in the Cayman Islands. We work closely with the Department of Environment, which has also received funding from Darwin for other projects. The National Trust is also familiar with the Darwin Initiative.

## 6 Finance and administration

### 6.1 Project expenditure

Project spend (indicative) since last annual report	2014/5 (£)	2015/16 Total actual Darwin Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs				
Consultancy costs				
Overhead Costs				
Travel and subsistence				
Operating Costs				
Capital items				
Others				
<b>TOTAL</b>				

Staff employed (Name and position)	Cost (£)
Katie Lohr, Conservation Scientist	
Jenna Binstein, Research Intern	
<b>TOTAL</b>	

Consultancy – description of breakdown of costs	Other items – cost (£)
<b>TOTAL</b>	0

Capital items – description	Capital items – cost (£)
<b>TOTAL</b>	0

Other items – description	Other items – cost (£)
Workshop and training supplies	
<b>TOTAL</b>	

## 6.2 Additional funds or in-kind contributions secured

Source of funding for project lifetime	Total (£)
CCMI Funds 2013/14	
CCMI Funds 2014/15	
<b>TOTAL</b>	

Source of funding for additional work after project lifetime	Total (£)
CCMI Funds through 2QTR2015 through 4QTR2015	
<b>TOTAL</b>	

## 6.3 Value for Money

CCMI is a non-profit organisation and we endeavour to conduct our research, conservation and education practices with the upmost economic efficiency. We believe this project was a good value for the money.

The coral nursery benefited from the following “value for money” elements:

- 1) Most of our staff costs are funded by other by CCMI efforts. The team which worked on this project included our Conservation Scientists, Research intern, boat captain, education coordinator, and the Assistant Director of Research and the Director of Research and Conservation who provided oversight. Because staff costs were shared with other conservation projects and revenue sources, staff costs for this project were greatly reduced.
- 2) The external project team from University of Miami and University of Essex provided their expertise *pro bono*, in the interests of delivering this crucial conservation project to the region.
- 3) A pilot nursery had already been established, funded by local fundraising activity, which eliminated all set-up costs (and associated risks) from the project.
- 4) The workshops and training courses held at CCMI were economical and utilized our sustainable facilities including solar power, rain water collection as sole freshwater source, composting toilets, passive solar heat in the bathhouse, etc).
- 5) Whenever possible, nursery maintenance was scheduled synergistically with other in-water work to share operating costs such as boat fuel, captain hours, vehicle transportation, and dive equipment usage.
- 6) CCMI was able to secure additional funding sources which will allow the coral nursery project to continue beyond the life of this project.

## Annex 1 Standard Measures

Code	Description	Totals (plus additional detail as required)
<b>Training Measures</b>		
1	Number of (i) students from the UKOTs; and (ii) other students to receive training (including PhD, masters and other training and receiving a qualification or certificate)	(i) 115 Cayman Islands elementary school students have received training related to the Little Cayman nursery during our Marine Ecology Course programs and an additional 20 students participated in a CCMI-led workshop in Grand Cayman.  (ii) the CCMI Conservation Specialist who worked on this project has received funding from the University of Florida to pursue her PhD, focusing on coral nurseries.
2	Number of (i) people in UKOTs; and (ii) other people receiving other forms of long-term (>1yr) training not leading to formal qualification	
3a	Number of (i) people in UKOTs; and (ii) other people receiving other forms of short-term education/training (i.e. not categories 1-5 above)	1450 visitors have toured CCMI during the term of this project and have learned about the coral nursery.  56 visitors to Little Cayman have attended CCMI's Weekly Lecture Series for nursery related topics during the term of this project.  27 local scientists and stakeholders received training during the three 2-day workshops held as part of this project.
3b	Number of training weeks (i) in UKOTs; (ii) outside UKOTs not leading to formal qualification	One training week in UKOTs (Cayman Islands) which was comprised of three separate 2-day workshops.
4	Number of types of training materials produced. Were these materials made available for use by UKOTs?	Two coral nursery best practices powerpoint presentations available on CCMI's website:  <a href="http://reefresearch.org/research/staghorn-coral-nursery/">http://reefresearch.org/research/staghorn-coral-nursery/</a>
5	Number of UKOT citizens who have increased capacity to manage natural resources as a result of the project	Two Cayman Islands citizens who work for the Department of Environment (DoE) have significantly increased their capacity to manage coral nursery programs as a result of this project.
<b>Research Measures</b>		
6	Number of species/habitat management plans/ strategies (or action plans) produced for/by Governments, public authorities or other implementing agencies in the UKOTs	Cayman Islands DoE and Marine Conservation Board issued a new public Coral Nursery Policy in Nov 2014.

<b>Code</b>	<b>Description</b>	<b>Totals (plus additional detail as required)</b>
7	Number of formal documents produced to assist work in UKOTs related to species identification, classification and recording.	
8a	Number of papers published or accepted for publication in peer reviewed journals written by (i) UKOT authors; and (ii) other authors	One paper published in Endangered Species Research journal by non-UKOT authors.
8b	Number of papers published or accepted for publication elsewhere written by (i) UKOT authors; and (ii) other authors	
9b	Number of computer-based databases enhanced (containing species/genetic information). Were these databases made available for use by UKOTs?	
9a	Number of species reference collections established. Were these collections handed over to UKOTs?	
9b	Number of species reference collections enhanced. Were these collections handed over to UKOTs?	
<b>Dissemination Measures</b>		
14a	Number of conferences/seminars/workshops/stakeholder meetings organised to present/disseminate findings from UKOT's Darwin project work	Three workshops organized and held at CCMI to disseminate project information (06-08Sep2012, 27-28Jun2013, 02-03Mar2015)
14b	Number of conferences/seminars/workshops/stakeholder meetings attended at which findings from the Darwin Plus project work will be presented/ disseminated	One conference attended to present findings from this project: Benthic Ecology Meeting, 19-22Mar2014, Jacksonville, Florida, USA
<b>Physical Measures</b>		
20	Estimated value (£s) of physical assets handed over to UKOT(s)	
21	Number of permanent educational/training/research facilities or organisation established in UKOTs	
22	Number of permanent field plots established in UKOTs	
23	Value of resources raised from other sources (e.g., in addition to Darwin funding) for project work	£

## Annex 2 Publications

Type *	Detail (title, author, year)	Nationality of lead author	Nationality of institution of lead author	Gender of lead author	Publishers (name, city)	Available from (e.g. contact address, website)
Journal*	Lohr KE, Bejarano S, Lirman D, Schopmeyer S, Manfrino C (2015) Optimizing the productivity of a coral nursery focused on staghorn coral <i>Acropora cervicornis</i> .	American	Central Caribbean Marine Institute; non-profit organization incorporated as a UK charity (# 1104009), US 501(c)3 nonprofit organization (ID# 22-3609293), and a Cayman Islands charity.	Female	Endangered Species Research journal	<a href="http://www.int-res.com/articles/esr2015/27/n027p243.pdf">http://www.int-res.com/articles/esr2015/27/n027p243.pdf</a>
Presentation*	Lohr KE, Bejarano S, Lirman D, Manfrino C (2014) Optimizing the productivity of a coral nursery focused on <i>Acropora cervicornis</i> .	American	CCMI (UK, US, Cayman Islands)	Female	Benthic Ecology Meeting; Jacksonville, FL (scientific conference)	<a href="http://reefresearch.org/research/staghorn-coral-nursery/">http://reefresearch.org/research/staghorn-coral-nursery/</a>
National Policy*	Cayman Islands Department of Environment; Coral Nursery Policy Department of Environment Version 1b Public November 2014	Caymanian	Caymanian	Male	Department of Environment, Georgetown, Cayman Islands	<a href="http://www.doe.ky/wp-content/uploads/2014/11/Coral-Nursery-Policy-Public-2014.pdf">http://www.doe.ky/wp-content/uploads/2014/11/Coral-Nursery-Policy-Public-2014.pdf</a>

## Annex 3 Darwin Contacts

<b>Ref No</b>	DPLUS010
<b>Project Title</b>	Coral Nursery Project in Little Cayman: Enhancing Resilience and Natural Capacity of Coral Reefs in the UKOTs
<b>Project Leader Details</b>	
Name	Carrie Manfrino, PhD
Role within Darwin Project	Project design; project management
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<b>Partner 1</b>	
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Role within Darwin Project	Project design; environmental permitting; oversight of coral sample collection, fragmentation, and outplanting
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