Darwin Initiative
Overseas Territories Challenge Fund
Final Report

This report should be completed and submitted within a month of agreed end date of project

Darwin Ref Number	EIDCF010
Darwin Project Title	Biodiversity and food security: developing collaborative policy for seagrass conservation
Country (ies)	Turks and Caicos Islands
Award holding Organisation	Cardiff University
Partner Organisations	
Grant Value	£ XXX
Start/end date	1 September 2012 – 30 September 2013
Author(s), date	Susan Baker, Jessica Paddock, Leanne Cullen-Unsworth, Richard Unsworth, Alistair Smith 28 October 2013

1. Challenge Fund Background

Background and Location

GPS coordinates: N21 42.7303 W71 37.19237

As foundation species, conservation of seagrasses protects ecosystem functioning and marine biodiversity, thus supporting fisheries, coastal defense and other ecosystem services. Like marine habitats throughout the Caribbean Overseas Territories (COT), seagrass meadows are increasingly degraded, decreasing their resilience to stressors. The Turks and Caicos Islands (TCI) contain some of the highest quality marine habitats in the COT. However, knowledge of seagrass meadows, recognition of their social and ecological importance and effective conservation strategies are lacking. With rapid coastal development in TCI, marine ecosystems are subject to the anthropogenic stressors that have decimated other areas of the Caribbean.

Intended Achievements

The research sought to engage with local scientists, stakeholders and regulators to:

- provide evidence of the value of seagrass meadows
- highlight conservation priorities for marine biodiversity protection and food security
- develop and demonstrate cross-sectoral, collaborative management strategies

The case study hoped to deepen understanding of how best to promote sustainable practices in the context of local social, cultural, and economic conditions and practices. Research planned to identify how and in what ways different stakeholder interests can be brought together for more effective management of seagrass meadows.

2. Challenge Fund Activities

Summary of Work Carried out (all team)

- Desk based research
- Two periods of field work in TCI, involving elite interviews, participatory research with community groups, ecological data gathering, fisheries surveys and interviews, observation of socio-ecological processes
- Network building within government departments, local economic, including tourism stakeholders and community groups
- Scientific Training, involving capacity building and awareness raising within system of public administration
- Awareness raising workshops with local stakeholders
- Scientific Dissemination

Main Activities [evidence for achievements itemised in this section and hard copies supplied by post]

1. Desk based research was undertaken, including of academic, policy, historical and contemporary socio-economic profile of the islands and grey literature on environmental protection and marine resources in TCI (all team)
2. Two periods of field work in TCI (all team), involving primary research and scientific survey work. This enabled the team to:
    a) Liaise with the Department of Environment and Maritime Affairs and develop an understanding of how the team can contribute to the Department's research needs in support of policy development. This enabled us to investigate the capacity of the system of public administration to implement seagrass conservation plans and to identify the key implementation bottlenecks

b) Build local social contacts and networks, including with the School for Field Studies, the local Red Cross, the National Trust, Soroptomist International, Church groups such as The TCI Mother Theresa Centre, members of the Farmers' Association, TCI development community, and local informal volunteer networks and incipient Fishers' Co-operative.(all team).

c) Survey seagrass meadows using the SeagrassWatch (www.seagrasswatch.org) methodology at 13 sites spanning Providenciales, Grand Turk, and South Caicos. Samples for subsequent seagrass tissue nutrient analysis were collected at all sites.

d) Survey fish assemblages within near-shore lagoon and reef seagrass meadows surrounding South Caicos using Seine nets, Fyke nets and Underwater Visual Census (UVC)

e) Collect data on commercial fin-fish fishery landing from South Caicos from the main landing site. Preliminary trial interviews were undertaken with community members in South Caicos with respect to subsistence fisheries. Ad hoc interviews were also undertaken with commercial fishermen.

f) Engage with community groups and individuals to understand the socio-economic development needs of local communities. Elite interviews were conducted with the Governor's Office, Government Ministers, TCI Invest, the Department of Economics and Planning, National Trust, Department of Social Welfare and Department of Gender Affairs, Department of Education, Youth and Culture, TCI Tourism Board, Chamber of Commerce and individual private stakeholders such as Blue Water Divers and Big Blue and NGOs such as Reef Fund and Red Cross. Further participatory ethnographic research was conducted with The TCI Red Cross on Providenciales and Grand Turk by volunteering in Thrift Shops and attending volunteer training sessions in Disaster Management. Taken together, this enabled us to investigate the economic and social drivers of seagrass loses and how best to integrate seagrass conservation objectives into future economic development plans and programmes

3. Scientific Training

a) Seagrass workshops were held within DEMA, including of DEMA ground staff on two TCI islands. The workshops provided information on the ecological role of seagrasses, their role in supporting fisheries, seagrass species identification as well as discussion on seagrasses treats in TCI and elaboration of specific instances of seagrass threats across the islands.

b) To support this training, information was uploaded on to the Seagrass Ecosystem Research Group (SERG) website on the Darwin project: http://www.seagrass.org.uk/projects/

c) A Seagrass Conservation poster for DEMA Head Office was produced to inform staff and visitors about the importance of seagrasses to TCI [Item 1]

4. Awareness raising including

a) Stakeholder workshop to inform stakeholder groups about the importance of seagrass conservation for food security on TCI

b) Writing a dedicated TCI seagrass leaflet and wide distribution across the islands [Item 2]

c) Production of a leaflet explaining the nature and purpose of the Darwin work [Item 3]

d) A Press Release was also issued by DEMA, explaining the purpose of our research and the importance of seagrasses for TCI [Item 4]
e) Writing of an article for the *Times of the Islands* Magazine on the importance of seagrass conservation in TCI [Item 5]
f) Contributing to a global seagrass conservation blog *Notes from the Field*: Turks & Caicos Islands http://wsa.seagrassonline.org/blog/archives/281 [Item 6]
g) Contribution to the *Environmental Futures* blog http://environmentalfutures.wordpress.com/2013/04/19/team-seagrass-in-the-turks-and-caicos-islands/ [Item 7]

5. Scientific Dissemination, including

a) 'Seagrass meadows globally as a coupled social–ecological system: Implications for human wellbeing', Leanne C. Cullen-Unsworth, Lina Mtwana Nordlund, Jessica Paddock, Susan Baker, Len J. McKenzie, Richard K.F. Unsworth, *Marine Pollution Bulletin*, Vol.73, 2013. [Item 8]
b) March 2013: Presentation to School of Planning and Geography Food Studies group: Biodiversity and Food Security: Developing Collaborative Policy for Seagrass Conservation (JP) [Item 9]
c) April 2013: British Sociological Association Annual Conference, 'Biodiversity and Food Security: Developing Collaborative Policy for Seagrass Conservation' (JP) [Item 10]
d) August 2013: Presentation to the European Marine Biology Symposium, Galway, Ireland, 'Biodiversity and Food Security: Developing Collaborative Policy for Seagrass Conservation' (LCU) [Item 11]
e) Article in Darwin Newsletter, July 2013 on our research [Item 12]
f) Article in Climate Change Consortium of Wales Newsletter (forthcoming 2013) 'Biodiversity and Food Security: Developing a Collaborative Policy for Seagrass Conservation in the Turks and Caicos Islands (TCI) (JP) [Item 13]
g) November 2013: Presentation to Coastal and Estuarine Research Federation, San Diego, USA, 'Role of seagrass meadows in Turks and Caicos as a fish nursery'(RU)
h) A poster on Seagrass Conservation in TCI was prepared and presented at a number of Cardiff University events hosted by the Sustainable Places Institute, thus engaging a wide audience of scholars, practitioners and policy-makers alike from across the UK in project design geared towards achieving stated aims and objectives [Item 14]

Additional work undertaken but not planned and why

Embedded case study of the interaction between development and seagrass damage on an island transitioning towards a tourism-based economy previously focused only on Providenciales. Here, the team encountered local knowledge and documentation of seagrass damage and were approached to become involved in local activism. The team played a role in knowledge brokerage between concerned community members and state institutions, authorities and the private sector concerned. If funded further, we would draw on this unique opportunity to contribute to pre-emptive rather than reactive research led policy to reduce environmental impact of development i.e. seagrasss degradation and biodiversity loss.

Problems encountered and how addressed

Budgetary problems were encountered, as local costs proved far higher than anticipated. In particular, the costs of accommodation and subsistence proved very high. We addressed this issue by (i) receiving low cost accommodation from School for Field Studies, as part of their contribution to the research; (ii) having additional financial support from our home university, which paid for the costs of a field trip by a post-graduate student to support the work of Dr Richard Unsworth.

Accessing marginalised groups proved difficult, as somewhat anticipated. Engagement with these groups would involve continued presence in the community over a longer period. Initial steps have been made through the Scoping Award in order to support this process in any future project by volunteering with the Red Cross and wider network building with the Mother Theresa Centre. This networking has also identified appropriate candidates for involvement in future research as community level local researchers/cultural brokers. Similarly, the geographical fragmentation of communities means that it is difficult to get a critical mass together to support the implementation of environmental policy. We have identified here that an Environmental Champion could play a critical role in garnering support across sectors and in generating a critical mass of actors who act as longer-term conduits for co-ordination of activities across the islands.

Main Achievements

Scientific Knowledge

- Three species of seagrass were encountered in TCI, these were *Thalassia testudinum,* Syringodium filiforme and *Halodule wrightii.* In addition, the aquatic macrophyte *Ruppia maritima* (often referred to as a seagrass) was also found. Reef seagrass meadows were dominated by *Thalassia testudinum* whereas Lagoon seagrasses were dominated by *Halodule wrightii.* Seagrasses where sampled were mostly spatially extensive and in high density. Although mostly in a healthy state, many sites showed evidence of high nutrients and physical damage. Particular sites of concern were those at the Leeward area of Providenciales that were subject to high turbidity and East Bay on South Caicos, where seagrass meadows were extensively damaged by physical removal as a result of tourism development.
- Workshops with stakeholders in both Providenciales and South Caicos revealed that seagrasses are under a range of threats in the TCI. These provide evidence of the need for management of seagrasses to prevent further degradation and loss. Due to the diverse nature of these threats further evidence was sought by site inspection and literature searching. Evidence exists to suggest that significant seagrass loss has occurred throughout the TCI (see Table 1 below).
- Seagrass meadows were shown to be of significant value to the fisheries of TCI:
    - A small trial assessment of fish assemblages using TCI seagrasses was conducted at 6 sites surrounding South Caicos, resulting in the identification of 56 species from 22 families. In addition, a meta-analysis of fish species utilising seagrass meadows in surrounding islands of the Caribbean and Gulf of Mexico was also conducted. All fish species were categorised as using seagrass meadows as juvenile and/or adult.
    - Of the 21 species that comprise 99.5% of the commercial fin-fisheries landings (fish abundance) 12 were found in TCI to utilise seagrass meadows either as nursery habitats or as foraging habitat. These 12 species comprise 74% of the fisheries catch and contribute. When wider evidence of seagrass habitat usage

from adjacent countries is considered (due to the preliminary nature of the TCI fish assessments) 19 of the 21 most abundantly caught fish species are found to utilise seagrass. These 19 species constituted 93% of the wet weight biomass of the commercial fishery in 2012. The most abundant species caught in the commercial fishery is the Yellowtail Snapper (*Ocyurus chrysurus*) and was observed using seagrass meadows exclusively as a juvenile. The species contributing most to the overall wet weight of the fishery was the Nassau Grouper (*Epinephelus striatus*). This was not found in seagrass by our study. However surveys throughout the region have recorded it exclusively as a juvenile in seagrass meadows.

  - Information from interviews and discussions with fishermen, local scientists and middlemen reveals that close to 100% of the fish caught in the commercial fishery is exported from South Caicos directly to Providenciales for sale to the tourist sector.
  - Preliminary trial interviews with subsistence fishers and local people in South Caicos reveals that numerous species of fish utilising seagrass are commonly eaten by local people and actually favoured. These include species not targeted by the commercial fishery, such as Barracuda and a number of species of Mojarra. These interviews support significant anecdotal evidence of the presence of a large subsistence fishery based on small scale fishing gears.

- We gained a great deal of insight into the system of public administration, its capacities and where shortfalls exist. This has enabled us to better target efforts planned under the full grant proposal.
- More in-depth knowledge of the planning process was gained, in particular as it relates to how best to integrate economic and tourism development and conservation planning.
- Implementation capacity was identified as a clear bottleneck in conservation policy and a clear understanding of the concrete steps needed to best to support implementation efforts was gained.

Table 1. Threats to seagrass in the Turks and Caicos Islands proposed by stakeholder and community workshops together with evidence collected in support of these threats. Threats are described as either localised or extensive and whether they were proposed by one or two of the independent workshops.

Threat	Workshops	Extent	Evidence 1	Evidence 2	Evidence 3
Dredging	1 & 2	Localised	Documented in research paper [1]	Site visit to Leeward revealed high sedimentation	
Anchor and Mooring damage		Localised	Site visit on Grand Turk revealed mooring damage		
Propeller damage			Observation of propeller scars		
Oil Spills	1	Localised	Newspaper coverage	Site visit reveals presence of abundant seagrass, so if impacted site has now recovered	
Hurricanes			Concurrent decline in the Conch fishery	Key informant interview with fisherman	Severity of hurricane impacts on seagrass in other locations
Bleach Fishing	1 & 2		Observation of bleach spray bottles on beaches adjacent to seagrass	Observation of people buying large amounts of household bleach	
Nutrients (from fertilizers and sewage)			Site visit to North Creek on Grand Turk revealed very high epiphyte and macro algal problems	Lush lawns and golf courses on islands of poor soil quality	
Catching of juvenile fish			No fisheries legislation to prevent this		
Seagrass removal for hotel beaches	1 & 2	Localised	Documented in research paper [2]	Site visit reveals continued lack of seagrass and further removal beyond the extent of the licence	Discussions with communities
Coastal development	1 & 2				

1. Erickson, L., *Local sediment management at Leeward-going-through in Providenciales, Turks and Caicos.* Terra et Aqua, 2005. **10**: p. 3-12.
2. Zuidema, C., R. Plate, and A. Dikou, *To Preserve or to Develop? East Bay Dredging Project, South Caicos, Turks and Caicos Islands.* Journal of Coastal Conservation, 2011. **15**: p. 555-563.

Scientific Training

The training workshops held in TCI have resulted in high ranking administrators, scientific officers and conservation officers within DEMA gaining a better understanding of the role of seagrass in the ecological health of the marine ecosystem in TCI. DEMA is now better trained in how to monitor seagrass health, and specific training has been given to scientific officers in identification and monitoring of key seagrasses species in TCI.

Greater awareness of Seagrasses

Workshops to inform stakeholder groups have resulted in greater awareness of the importance of seagrass conservation for food security on TCI. Key stakeholders have been identified and have agreed to work with DEMA for more effective implementation and enforcement of seagrass conservation legislation and policy. This is reflected in the range of letters of support provided for the full grant proposal and in the MOU signed between DEMA and Swansea University; and between Cardiff University and DEMA.

Scientific Dissemination

The team has deepened its credibility among the international scientific community in relation to its interdisciplinary knowledge of and insights into seagrass conservation on TCI, as evident by acceptance for publication of an article in a peer review publication and in presentation of research findings at international conferences.

3. Outcome & Impact of Challenge Fund

The original application listed the following outcomes:

1. Pilot study demonstrating the biodiversity importance of seagrass meadows in TCI and corresponding links to ES
2. Elaboration of a seagrass management plan that can be piloted across COTs
3. Development of collaborative governance arrangements for marine biodiversity
4. Dissemination: community engagement activities, policy briefings and academic publications designed to attract additional UK and COT partners gaining buy-in for a Main-Round project
5. Capacity building: development of multidisciplinary research team with international partners
6. Development of web research support tool to aid on-going collaboration with overseas partners
7. Application for Cardiff University funds to support COT partners visiting UK to work with UK experts on the Main-Round proposal

Outcomes 1, 4, 5 and 6 have been fully achieved, as evidenced above

Outcome 2 proved not to be possible to implement during the time frame of the Challenge Fund grant. First, scientific knowledge of the extent and health of seagrasses on TCI proved to be far less developed that original anticipated. This necessitated that the team pay attention to how best to generate new scientific survey knowledge both during the period of the Challenge Fund but also over the longer term. Second, the capacity of the system of public administration to effectively implement a seagrass conservation management plan proved to be very low, with even basic knowledge [such as seagrass species identification] limited, particularly among conservation field officers. This necessitated basic training. The resource limitations of DEMA also provide to be a barrier, and this necessitated new thinking about how best to support

conservation efforts. This led the team to make a strategic decision to work with stakeholder groups so as to set up an implementation support network. The consolidation, further training of and activation of this network forms one of the main purposes of the recently submitted full grant proposal. This network will play a crucial role in supporting the development and subsequent implementation of a Seagrass Action Plan, hopefully to be developed under the new full grant research.

Outcome 3 is in its early stage, as this development requires a long gestation period than anticipated [see comments on Outcome 2 above]. Having set in place a stakeholders group willing to work with both the Darwin team and with DEMA in TCI for seagrass monitoring and support of conservation action, the full grant proposal has this element – that is, the enhancement of the capacity and role of the stakeholder implementation network - as one of its key proposal.

Outcome 7 proved unnecessary. We developed very good working relations with both DEMA and other key stakeholders within TCI during the period of the Challenge Fund grant. We were able to therefore use internet technologies [in particular Skype and email] to develop up the full proposal. These communication tools would have been difficult to use had we not already established such sound and supportive working relations with colleagues in TCI

A full grant proposal was submitted in September 2013.

The project did not encounter any insurmountable difficulties.

4. Lessons

One of the main lessons learned from the research undertaken under the Challenge Fund is the importance of local contact. Local contact proved critical in helping us to gain access to key informants; in safeguarding the standard of our research by allowing us to gather information that is as accurate and insightful as possible; and in ensuring that all the relevant stakeholders were identified and included in our research. In small island states and especially in the case of TCI - given that it has experienced corrupt governance regimes and a period of unpopular direct rule - developing trust is a key to research and policy success. We worked hard during our field trips to ensure that we remained committed but impartial, inclusive but focused, and informed but keen to learn. This approach proved invaluable in ensuring that key informants opened up to us during the many interviews that we undertook during our field research and in building networks that we could work with in the future.

A lesson closely related to this is the need to ensure that local stakeholders come to understand that we are not present in TCI merely for the purposes of our own career enhancement. Rather, while we bring high level scientific expertise to bear on the issue, we do so in ways that both support and is supported by local knowledge and traditions and that builds upon, rather than replaces, the expertise and experience of local policy actors and social and economic groups.

We have applied both of these lessons to the way in which we have both prepared and designed our full grant proposal.

5. Project Expenditure

Item	**Budget for whole project***	**Actual Expenditure**	**Variance** as a %**	**Comments**
Travel Costs	XXX	XXX	113%	
Subsistence costs	XXX	XXX		
Overhead costs	XXX	XXX		
Operating Costs	XXX	XXX	-85%	
Capital Costs	XXX	XXX		
Other	XXX	XXX		
Salaries (specify by individual)	XXX	XXX		
TOTAL	XXX	XXX		

* please indicate which document you refer to if other than your project application or annual grant offer letter

** please explain any variance of +/- >10%

The University's budgeting system does not allow for a separate budget for travel and one for subsistence therefore the actual budget and actual expenditure come under travel costs.

The project as a whole has come in slightly under budget overall but there was more travel and subsistence expenditure than anticipated and less operating costs.

6. Other comments not covered elsewhere

Darwin Challenge Fund Reporting Guidelines

All Darwin projects are required to report on the work they have undertaken with Darwin funds and this offers you the opportunity to report on your achievements and lessons learnt and on any other issues you would like to raise. You report should show how you have progressed against the activities outlined in your application, or clearly explain any changes and the reasons why these changes were necessary.

You are expected to prepare the report in conjunction with your partners and you are expected to submit a Final Report within 1 month of completion of the agreed dates for the award (max 6 pages excluding annexes).

We will acknowledge and read all reports submitted, but will only contact you about your report if there are specific concerns.

If you have any additional queries about reporting, please feel free to email or call on 0131 440 5181.

Checklist for submission

	Check
Is the report less than 5MB? If so, please email to Darwin-Projects@ltsi.co.uk putting the project reference number in the Subject line.	x
Is your report more than 5MB? If so, please advise Darwin-Projects@ltsi.co.uk that the report will be send by post on CD, putting the project reference number in the Subject line.	
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.	
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.	x
Have you involved your partners in preparation of the report and named the main contributors	x
Have you completed the Project Expenditure table fully?	x
Do not include claim forms or other communications with this report.	