

Darwin Initiative Main/Post/D+ Project Half Year Report (due 31 October 2016)

Project Ref No	DPLUS036
Project Title	Sustainable management of threatened keystone predators to enhance reef resilience
Country(ies)/Territory(ies)	Cayman Islands
Lead Organisation	Marine Conservation International
Partner(s)	Cayman Islands Dept. of Environment, Guy Harvey Ocean Foundation, Nova SE University, Bangor University
Project Leader	Dr. Mauvis Gore
Report date and number (e.g., HYR3)	HYR2
Project website/ Twitter/ Blog/ Instagram etc	www.marineconservationinternational.org ; http://www.doe.ky/
Funder (DFID/Defra)	DEFRA

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

This account reports on activities as listed in the table of planned outputs of the project proposal of May 2014. It should be noted that our results suggest that sharks are not abundant in the Cayman Islands, hence the need for their protection. As a result, several times the anticipated effort has been required to obtain desired sample sizes compared to similar studies undertaken in some other countries such as the Maldives and Seychelles (Clarke et al. 2012).

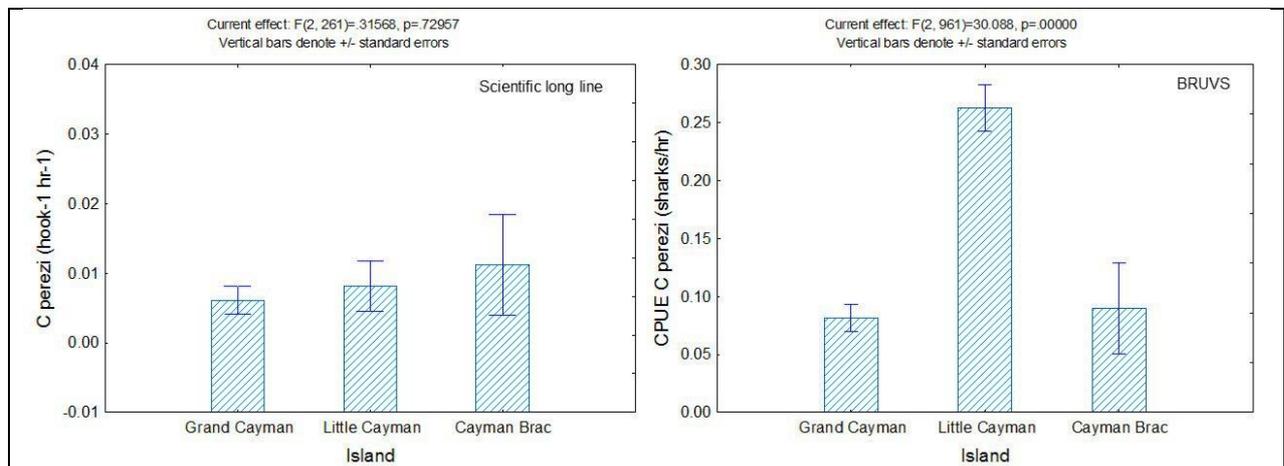
Output 1: Knowledge of population size

Over the whole project we have now undertaken and have data for a total of 1,048 camera trap (BRUVS) deployments (standard duration 90 min). 72 (ca. 110 hr of video) have been deployed in the past six months with target species detected including 18 *Carcharhinus perezi* (Caribbean reef sharks), 56 *Lutjanus analis* (mutton snapper) and 2 *L. griseus* (grey snapper). During the same period viewing, annotation and statistical analysis of all BRUVS deployments under the present grant have also been completed (see example plot below).

Similarly over the whole project 265 sets of scientific long-lining have been completed, including 13 days during the recent field season. In the latter period 23 sharks (including 11 Caribbean reef sharks) were caught, measured, sampled, live-tagged and released, and analysis of all catch data has been completed (see example plot below).

Also during the past six months, 33 diver surveys of target snapper species were undertaken at potential roosting sites, yielding a mean of 51 (N=1674) grey and 10.8 (N=358) mutton snapper per survey. Fish traps were placed at two of these sites, but only numerous schoolmaster snapper (*L. apodus*) have been caught to date.

To supplement our SCUBA surveys, our Citizen Science programme has been expanded and we now have 13 volunteer divers (mostly instructors at dive centres) returning "Shark Logger" forms (36 to date) each recording a month of diving activities together with details of any sharks observed.



A photo-identification database with details and images of all individual sharks recorded by BRUVS, long line, SCUBA surveys, Shark Loggers and Project Facebook members is nearing completion. Re-sightings data will be applied to appropriate mark-recapture models but to date the number of matched individuals is surprisingly low, suggesting a high turnover of individuals.

Output 2: Knowledge of individual movement patterns

During the course of the whole project we have now implanted 66 sharks with acoustic tags (transmitters) including in the past six months 11 Caribbean reef sharks, while a total of 171 sharks have been marked with conventional fin tags. Also during the past six months acoustic tags have been implanted in 16 grey and 9 mutton snapper, and some marked with conventional tags.

No tagged Caribbean reef sharks have been re-captured during scientific long-lining but a small number with a fin tag have been re-sighted by divers. In contrast a small number of tagged grey snapper have been recaptured (one three times) during 44 snapper-directed fishing trips, but none re-sighted during in-water surveys.

Analysis of detections by acoustic receivers to date has revealed overall movement patterns of medium-sized sharks. Approximately half of tagged Caribbean reef sharks individuals have not been detected by the network suggesting they were migrants passing by the area.

Approximately a quarter of individuals appear to have been resident or semi-resident on parts of islands for periods of up to two years, while a few individuals have moved between islands.

Receiver detections have also demonstrated well the night-time dispersion of grey snapper to forage away from their day-time roosting sites.

Output 3: Knowledge of reproductive biology in Cayman

Visual surveys of potential shark nursery areas were carried out, with occasional young juveniles being observed in near-shore shallows on both Grand and Little Cayman. Juvenile sharks have also been observed on BRUVS camera and caught by scientific long-lining (especially during the past six months) suggesting that parts of North Sound on Grand Cayman and South Sound on Little Cayman are favoured by several species with juvenile Caribbean sharks making wider use of shallow reef areas.

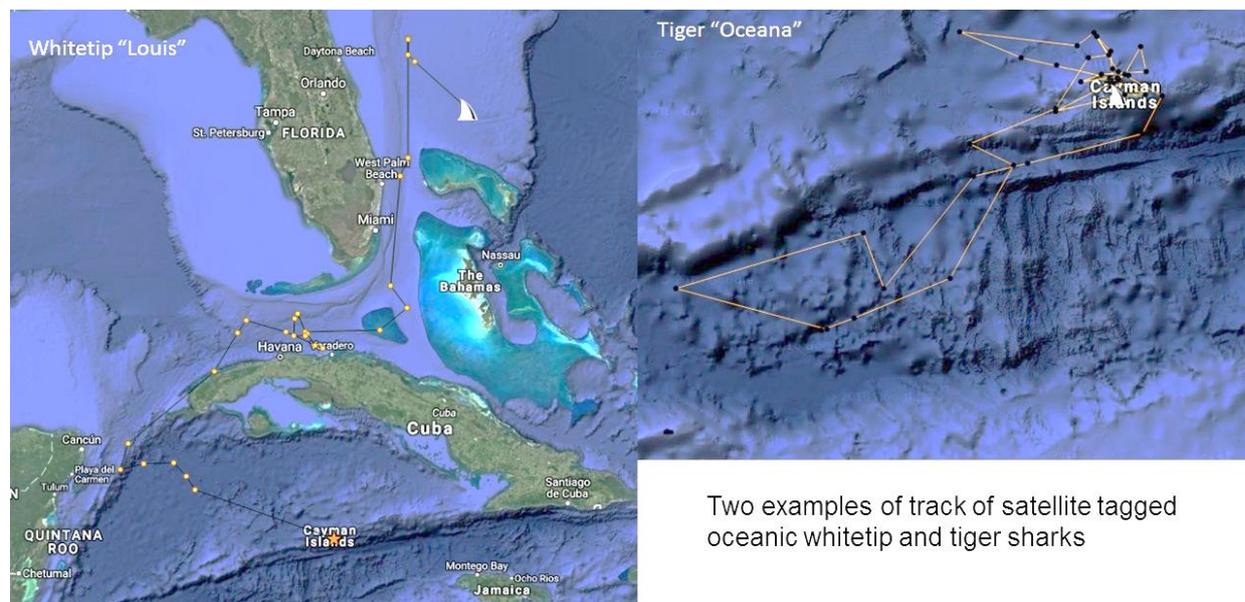
During the past six months small numbers of snapper (4 mutton and 17 grey) have been sampled to test breeding condition. The results supported the view that these species spawn at successive new moons in early summer. Critically, detections of acoustic tags has revealed that while mutton snapper migrate to traditional spawning aggregation sites at the end of the islands, grey snapper migrate from their normal inshore roosts to adjacent offshore sites.

Output 4: Knowledge of population exchange with adjacent areas

To investigate the regional movements of the larger shark species, over the past six months

(ca. 100 hr fishing) 3 oceanic whitetip sharks (*C. longimanus*) and 4 tiger sharks (*Galeocerdo cuvier*) have been fitted with SPOT GPS satellite tags, bringing the total number of SPOT tags deployed during the whole project to 25 (18 on oceanic whitetip shark, 7 on tiger shark).

The duration of tracks (period for which tags have continued reporting their position) has been highly variable, but some generalisations are possible (see sample tracks below). Many individuals have remained near Cayman for periods of a month or two, but individuals also moved considerable distances through deep water. Most but not all oceanic white-tip shark have moved west or north, with one individual passing between the Bahamas and Florida. The tracks of tiger sharks by comparison have been largely confined to the Caribbean with indications that individuals make use of different feeding grounds to which they may return on an annual basis.



To investigate the population genetics of the target snapper species, additional fin and tissue samples (45 grey and 24 mutton) have been collected over the past six months through fishing by the research team or participating local fishers. It is anticipated that once sample collecting is complete, mitochondrial DNA from samples will be sequenced at Texas A&M University for comparison with data previously analysed there for samples from Florida and Gulf of Mexico.

Recent DNA samples from 20 Caribbean reef sharks are being shared with the Shark Centre at Nova SE University, where samples provided by the project are contributing to a biogeographical genetics analysis for Caribbean reef shark and other species. Results of a DNA analysis will not be available until the end of the project.

Output 5: Functional interactions of marine apex predators with other trophic groups

Gut samples from grey and mutton snapper continue to be collected through participating local fishers. These have revealed a clear difference in diet between the two species, however numbers are small as fishers have proved reluctant to sell or donate fish. The fishers often have an agreement with a restaurant or keep the fish for food. With Cayman's sharks now being protected and only present in low numbers, it is no longer feasible to obtain additional stomach contents for these species, but the general diets of the main species are well known from the literature.

Nevertheless to investigate the functional significance of sharks to Cayman reefs, project data on shark abundance will be co-analysed with abundance data on teleost fishes from different trophic groups obtained by the Darwin-funded coral reef monitoring project undertaken by the Cayman DoE in collaboration with Bangor University. During the reporting period comparable data have largely been collated with a view to undertaking statistical analysis during the next quarter.

Output 6: Establish & operate Fishers Liaison Groups

During the past six months meetings have been held with small groups of fishers with discussion largely focusing on findings from the snapper work and options for regulating the recreational snapper fishery. A range of views were distilled and a questionnaire offering five management options distributed. Several individuals have provided much assistance with fishing and some samples, but it has not proved practical to bring together larger groups as the numbers of active fishers is relatively small.

After discussion with fishers, the design of a booklet concerning shark species and related issues has been finalised, with a sturdy water-proof format selected. The booklet will be distributed during the coming quarter.

Output 7: Develop and publish Conservation Plans

Conservation Plans are the formal documents via which on-going Cayman DoE species conservation and management activities are proposed and approved by the Cayman Government. Conservation Plans are required for all shark species in relation to the project's success in securing the full protection of all shark species throughout Cayman waters in 2015. In addition these plans were requested for the two snapper species to promote effective management in the light of perceived decline in abundance.

During the past six months, 8 Conservation Plans have been prepared for Caribbean reef, tiger, oceanic whitetip, *C. limbatus* (blacktip), *Ginglymostoma cirratum* (nurse shark) and *Negaprion brevirostris* (lemon) sharks, and for grey and mutton snappers. In addition a more general Elasmobranch Conservation Plan has been prepared. These documents have been reviewed by the relevant DoE staff to submit the plans to the National Conservation Council (NCL) for review and public consultation under the provisions of the NCL. Following public input the plans will be submitted to Cabinet who will have 60 d to register any concerns before the plans are adopted.

Output 8: Enhanced conservation and fisheries management of marine apex predators

We have continued to promote awareness and understanding of the Conservation Plans among fishers both during meetings and as opportunities arise during fieldwork. We have also continued to promote public awareness more generally through our Citizen Science programme (including our #SpotThatCayFish project and Shark Logger activities) using the media (social and mainstream), and via a major shark promotion event "SharkY Fest" attended by several hundred people from the general public including fishers and divers, from children to adults. The event included a series of short presentations on shark issues, children's activities including the award of prizes relating to a schools "shark conservation" poster competition, and the sale of various shark related items, including "shark-finned cupcakes" and Caybrew's "White-tip beer" and performances by two popular local bands.

The extent of media outputs, including press releases and radio and television interviews, over the past six months is summarised in the table below.

Project Facebook Site members	985	Cayman Govt. email server	4 posts
Flyers distributed to hotels	400	Cayman Govt. website	2 posts
#SpotThatCayFish postcards	2000	School postings	20 schools
SharkY Fest flyers	20	Press releases	3
SharkY Fest posters	1000	Radio interviews	5
School Shark competition posters	40	Television interviews	5

Reflecting our concern for increased awareness and enforcement the Cayman DoE has, during the reporting period, increased interaction of their patrol vessels with fishers through the addition of two new officers to their team.

To further promote public awareness and project sustainability we have also during this period initiated joint monitoring activities (using BRUVS) by course participants at the Central Caribbean Marine Institute on Little Cayman, and are approaching other potential collaborators on Grand Cayman looking for similar long-term commitments.

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

One significant problem has emerged affecting the value of the acoustic tagging programme. When attempting to download data from some of the network of receivers, a task normally undertaken at their request by DoE staff, it became apparent that some of the receivers had not recorded any detections because they were not working correctly. It appears that this fault may have affected a third or more of the network of 40 plus receivers and as a result much less data have been collected through the acoustic tagging work than had been expected. Despite the problem we have accumulated enough data to obtain a general impressions of the movement and foraging patterns of the main species.

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

Discussed with LTS: Yes/No

Formal change request submitted: Yes/No

Received confirmation of change acceptance Yes/No

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

Yes No Estimated underspend: £

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

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

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

We realise that the above report is longer than the 2-3 pages limit indicated. However we found it impossible in a shorter review to reflect fairly the considerable amount of work completed across this wide ranging project.

More generally we are concerned that both annual and half-yearly reporting forms unreasonably constrain the material that can be included if one responds conscientiously by limiting the responses to the questions actually asked.

If you were asked to provide a response to this year's annual report review with your next half year report, please attach your response to this document.

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

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