



Darwin Initiative, Darwin Plus and Illegal Wildlife Trade Challenge Fund Covid-19 Rapid Response Round - Final Report

Due within two months of the end date of the Rapid Response Round project

(maximum 6 pages)

Project reference	CV19RR03
If linked with an ongoing project, please include that project reference here (e.g. IWT001)	
Project title	Quiet Oceans: Assessing and communicating COVID-19 impacts to reef biodiversity
Country/ies	Cayman Islands (Grand Cayman)
Lead organisation	CCMI (Central Caribbean Marine Institute)
Partner institution(s)	
Start/end date of project	Start: January 2021 End: March 2021
Which fund was this project relevant to?	Darwin Plus
Grant value (£)	£53,952.00
Project Leader name	Dr. Gretchen Goodbody-Gringley
Report author(s) and date	Sabrina Weber and Dr. Gretchen Goodbody-Gringley Date: May 27, 2021

1. Project Summary

The aim of this project was to determine how the biodiversity of fish populations in and around the George Town harbour area of Grand Cayman was impacted by reduced human activity and the closure of borders in the Cayman Islands to International travel as a result of COVID-19.

Coral reefs are declining at an alarming rate, and as scientists, we are in a race against time to find solutions to protect coral reef ecosystems for the future. In the Cayman Islands, the oceans have been quiet for over a year due to the lockdown resulting from the COVID-19 pandemic. Human activity has been significantly reduced, in particular due to the halt in international tourism in the Cayman Islands. This has provided us with a unique opportunity to study how fish populations react when human activities are minimized and the oceans are relatively 'quiet'.

Locally, the ocean had almost no direct human impact between March and July 2020, due to severe lockdown restrictions in the Cayman Islands. The borders remain closed to this day (May 2021), however, from July 2020 onwards, the Cayman Islands lifted many domestic (water) restrictions. This re-introduction of minimal human activities (such as water sports, scuba diving, fishing and light boat traffic), gave us the opportunity to study how fish populations reacted to gradual, less disruptive interference, in addition to the typical, more disruptive human activities (such as cruise ship travel, etc.).

Beginning in July 2020, when lockdown restrictions lessened, CCMI researchers began the first in a series of fish population surveys, with initial surveys occurring when the oceans had been untouched for an unprecedented period. This project then continued in situ-surveys and analysis as the oceans gradually became busier, and water restrictions were eased. CCMI researchers completed fish population surveys every 2 months, in and around the typically heavily trafficked George Town harbour and 3 sites on Little Cayman Island (Annex 1). George Town harbour acts as the cruise ship base for visitors to Grand Cayman (the most frequented of the three Islands in the Cayman Islands) and is likely the busiest marine environment in the Cayman Islands. For this reason, this area was particularly interesting to study at a time with no international tourism and a significant decrease in human activity.

Understanding how fish populations respond to human activity, and therefore how/if their natural role in the reef ecosystem is interrupted or changed, can help to provide critical reef management insight. In addition, in order to increase global awareness to the impacts of human activity to biodiversity and promote ocean stewardship, we incorporated significant outreach efforts within this project, including a live underwater broadcast, public presentations, and local stakeholder seminars. Importantly, communication with key stakeholders and subsequent incorporation of our results to the redevelopment of tourism and on-water activities will contribute to the future management of reef biodiversity.

2. Project Achievements

Intended outcome

The intended outcome of this project was to 1) determine how human activities on the water affects the biodiversity of reef fish populations and 2) communicate these findings to the general public and important stakeholder groups. To achieve this goal, we assessed the diversity and abundance of fish populations using in-situ surveys at historically heavily trafficked reefs and disseminated findings globally through a live underwater broadcast and locally through public presentations and stakeholder seminars.

We took advantage of an opportunity when the oceans in the Cayman Islands were 'quiet' and we were able to observe the impact and extent to which human activity (including boat traffic, snorkelers, divers, water sports, etc.) has on fish abundance and diversity. By comparing our post-COVID data with pre-COVID fish population data we intended to show how populations differed when human impacts associated with water-based activities were minimized.

The global COVID-19 crisis and the ensuing closure of borders came at a pivotal moment in the strategic development of the Cayman Islands. The Cayman Islands Department of Environment and local stakeholders have put forward ideas for a green recovery that prioritizes sustainable tourism, which would benefit from and be guided by insights gained from this project. Thus, the final intended outcome of the project was contribution of quantitative data to strategic development plans for reopening tourism in the Cayman Islands and across the region.

Work undertaken

We hypothesized that fish abundances and biodiversity would increase at heavily used sites during the 'quieter ocean' period, as human interaction ceased to minimal levels. To test this, we conducted a series of in-situ fish surveys at several reef sites on Grand Cayman (5 sites) and Little Cayman (3 sites) Islands that vary in historical ocean use. For each survey, divers counted and identified all fish encountered within 1m of either side of a 30m transect tape (60m²). Fish size was estimated to the nearest 5cm size class and biomass estimated. At each site, 6 replicate surveys were conducted. Surveys for this work began in July 2020 and were repeated by the same set of researchers every other month through March 2021. CCMI baseline fish population data, from AGGRA studies done in 2018 in Grand Cayman, were used for comparison of pre-COVID versus post-COVID fish populations. In addition, baseline data from the Cayman Islands Government and Department of Tourism was used to inform conclusions made regarding ocean use in these areas, over time.

Overall fish density, diversity and biomass was compared overtime with differences between sites and compared with historical use. In addition, species specific comparisons were made to identify shifts in community composition over time relative to habitat use. Findings from this project were shared via outreach efforts to local stakeholders and CCMI's strong education programming. Public outreach for this project included a lecture in Grand Cayman, which was shared via YouTube and included a stakeholder webinar discussion with representatives from the Cayman Islands National Trust and the Guy Harvey Ocean Foundation. Results were also livestreamed through an interactive underwater broadcast. This broadcast was a component of CCMI's ongoing Reefs Go Live series, which is aimed at making marine literacy accessible and engaging for teachers, students, and parents anywhere in the world.

Problems encountered

One inevitable problem which occurred at times throughout this project were the unforeseeable weather disturbances. For this reason, we had to be flexible with dates and times of the fish surveys and were not always able to collect data from our site outside of the George Town harbour area (Bonnie's Arch). This dive site was particularly susceptible to bad weather and was difficult to approach during sub-par weather conditions. However, we collected data at this site during most bi-monthly sessions and ensured that it was not the basis of our project, rather, additional reference information from a site outside of the busy George Town harbour area.

An additional problem we encountered was miscommunication with the Department of Environment in the Cayman Islands, in regard to the baseline data which was agreed to be shared to supplement the Quiet Oceans project. The baseline data in the Department of Environment's possession was a different data set than was expected and was not relevant to the Quiet Ocean project, as the location of the DOE surveys was over seagrass meadows and not coral reefs. In order to overcome this obstacle and to acquire baseline data to use as a reference for a time when the oceans were at a booming point for tourism and human activity, CCMI used AGGRA fish data from 2018. Two sites from the AGGRA 2018 fish data set were used for comparative data for the study both within close proximity to the same sites used for the current surveys.

Elements of project design

CCMI (the facilitating organization) is a female run company, and this project in particular, utilized a core staff of all women. CCMI is committed to promoting diversity in the sciences, backed by substantive local scholarship opportunities and our Women in Ocean Science Award programme.

This project requested a total of £53,952, which represented only 43% of total project costs. Therefore, this project represented an excellent value for money as the majority of project costs were already covered by other secured funding sources. Staff salaries for the PI and Education Manager were not requested in the project proposal, enabling the funds to contribute directly to the operating costs of the project. Additional support for conducting this project was sought through research and education interns, one of whom was supported by the requested funds, and the other was covered by matching funding. Using undergraduate interns also represents an excellent value for money as it integrates career development and hands-on-training for a minimal monthly stipend and housing allowance. Travel and subsistence funds requested applied only to local inter-island costs, with no international travel required to complete the proposed work. Costs associated with producing a live underwater broadcast and other outreach initiatives were realistic based on the costs of operating in the Cayman Islands and broadcasting from remote locations.

The lead organization for the project is the Central Caribbean Marine Institute (CCMI). CCMI researchers led the project and delivered the educational and outreach components of the project. Partners from the Department of Environment (DOE) and the Cayman Islands Government (CIG) provided support the project in the form of guidance for site selection based on historical on-water tourist use and activity. The Cayman Islands National Trust and Dr. Guy Harvey from the Guy Harvey Ocean Foundation provided support through participation in the live webinar that included a lecture, discussion, and live Q&A.

CCMI is committed to Darwin/IWT's key principles for ethics. CCMI's institutional code of ethics guides our work and is part of our contract with every employee. CCMI meets all legal and ethical obligations of the UK and the Cayman Islands; as responsible stewards of a science-based education, conservation and research organization we adhere to the highest ethical standards. We are compelled to uphold the integrity and credibility of our findings, to share them with stakeholders, and to consider/integrate local insight along with our research. There are no human rights or humanitarian law risks related to this project.

Project achievements

This project did indeed achieve what it set out to do. We were able to monitor fish populations over time as human activity in the Cayman Islands gradually resumed. Through these surveys, we were able to quantitatively describe the impact of increased tourism and human activity, on the ocean environments, in areas with different historical levels of usage.

Our hypothesis was supported by our results, showing that fish abundances and diversity increased immediately after the lockdown/quieter ocean period as human interaction ceased to minimal levels. Understanding the 'natural' composition of the fish population on a reef in the absence of human impact, and determining whether key species, such as herbivorous fish, take refuge elsewhere during high human traffic periods, is key to protecting reef ecosystems for the future. By monitoring fish populations over time as activity slowly resumed, we were able to quantitatively describe the impact of increased usage, information which can be used to develop capacity models to recommend thresholds of site-based activity that can guide tourism development. The objectives of this project were as follows:

- 1) Assess what impact reduced human activity (the 'quiet ocean' period during lock down) has had on local fish populations.
- 2) Compare heavy use areas (such as George Town Harbour) vs less utilised areas to understand the behaviours of key fish species, depending on human impact levels.
- 3) Understand the rate of impact/change on fish populations as the Cayman Islands slowly open up and tourism resumes higher footfall/volume, and the reef ecosystem returns to 'normal' traffic levels.
- 4) Communicate findings with key stakeholders and inform governmental planning for a green economic recovery in a webinar held in March 2021.
- 5) Share information on project aims and initial findings via a live underwater broadcast in February and a public lecture in March, both of which will be made available for public online viewing.

Objectives 1, 2 and 3 were all accomplished through the successful completion of surveys and data analysis. Overall, we were able to determine that during times of heavy human activity and interference, fish abundance and biodiversity was at an all-time low. In July 2020, after several months of strict lockdown regulations, and virtually no interference, fish populations rebounded, and fish abundance and biodiversity were found to increase significantly (Annex 2; Figure 1). However, as COVID-19 regulations lessened and local human activity recommenced, fish abundance and diversity again began to gradually decline across all survey sites (Annex 2; Figure 1). Similarly, diversity increased significantly immediately post-COVID compared to pre-COVID but gradually declined as activities resumed (Annex 2; Figure 2). Importantly, herbivorous species were found to significantly increase after COVID and remained at high levels throughout the study (Annex 2; Figure 3). These results indicate that fish populations were able to rebound when disturbance was removed, but even minimal levels of human activity (divers, snorkelers, boat traffic, water sports, etc.) can have a negative impact on fish abundance and biodiversity. However, these minimal interferences would still have a significantly lower impact on fish populations in comparison to heavy levels of human activity.

Objectives 4 and 5 were achieved through the Reefs Go Live livestreamed broadcast, and the public webinar, which took place in March 2021. The 'pre' communications and awareness campaign for this project had a reach of over 2000 views on Facebook and 1600 views on Instagram, and direct mailing communications with a reach of 3,652 CCMI stakeholders, creating positive coverage for both outcomes of the project. Whilst CCMI does not have the biggest reach, certainly in comparison to many large operations, we have a high engagement rate, often at circa 30%.

The Quiet Oceans live webinar was used to communicate key findings with stakeholders and make suggestions for future governmental planning in relation to the 'green economic recovery' initiative (Annex 3; Figure 1). Stakeholders included the Cayman Islands Government (various departments, including the department of tourism, department of international trade and department of environment), the Foreign and Commonwealth Office (Cayman Islands), the Cayman Islands Tourism Association, as well as key project partners such as the Ernest Kleinwort Charitable Trust, the local dive industry and a range of UK tourism partners. This webinar was livestreamed and made available to the public, and included a lecture to relay the main results of the study and a discussion session with several stakeholders, including a question and answer segment with the live audience as well as online audience (<https://www.youtube.com/watch?v=lcJpQNziggs>, Annex 3, Figure 2). The webinar had a live audience of 10 people, with 20 viewers tuning in online. The webinar has been viewed on YouTube a total of 210 times to date. The original webinar had to be postponed due to an evacuation of the location due to a fire, reducing the live interaction on the day and numbers of people who joined in person (from 32 expected in person, plus 50 expected to join via live link). However, we shared the link and communicated the postponed date to our stakeholders and via social media, and the high viewing return on the recorded links indicates whilst we lost traction on the day, we kept engagement in total. The engagement has been global, with 14% of views in the Cayman Islands, 7% in the UK, 6% in the US and 73% in other locations.

The Reefs Go Live underwater broadcast also took place in March, and was livestreamed to the public, and in particular, directed to local classrooms in Grand Cayman. This broadcast acted as an informative lesson which was accessible and entertaining for a large variety of age groups, and also gave a general overview of the project, its methods and goals, its findings, and the resulting overall implications for the Cayman Islands, and coral reef management as a whole. An activity sheet was also provided to participating classrooms, so that the school children were able to follow along and engage with the underwater broadcast <https://www.youtube.com/watch?v=9NcP7FxnTp4>. Overall, the broadcast has had a total of 398 direct views to date, with an estimated reach (based on registration details, many of whom were classes with 30+ students) of 2000 viewers who tuned in live. As with the Quiet Oceans Webinar, the reach was global, with 21% in the Cayman Islands, 8% in the UK, 8% in the UK and 64% from other locations. PI Goodbody-Gringley also gave a radio interview (Radio Cayman) that was broadcasted locally sharing the results and important implications of the study.

From a communications perspective, the research results also indicated a very clear message for the general public – fish populations can recover quickly, when given the opportunity to do so. Given the complexity in managing climate change adaptation and progressing measures to protect biodiversity, this type of clear messaging made the outreach compelling and useful for the range of stakeholders, particularly for students and teachers, that we can positively manage local ecosystems. Further communications on how this could be done is part of the CCMI remit with our local stakeholders.

Contribution towards wider aims of Darwin Initiative

This project directly contributed to several of the wider aims of Darwin initiative. Specifically, this study increased our understanding of human activities and impacts to biodiversity and showed strong indications of how minimal activities can still affect biodiversity. These results lend support to conversation and management strategies that aim to minimize loss to biodiversity through implementation of strategic development plans that take environmental data into consideration. The recent expansion of the marine protected area in the Cayman Islands is a strong indication of the government's commitment to the environment and protection of biodiversity, yet our data show that as tourism resumes, on water activities other than fishing also need to be considered. Through extensive outreach campaigns we have broadly shared our finding with the aim of promoting responsible stewardship through increased awareness of our daily impacts to biodiversity and provided guidance towards sustainable use of our most precious resource. As such, our project directly contributed to the following aims of the Darwin Initiative: 1) to understand and support action to address linkages between biodiversity and human health including, but not limited to, the role of biodiversity loss in the increased emergence of zoonotic diseases; 2) to increase the area of coverage and

effectiveness of marine protected areas to meet global targets; 3) to promote the responsible stewardship of natural assets through sustainable use and the practice of sustainable livelihoods, both within and across borders; 4) to promote the sharing of the benefits arising from the use of biodiversity by facilitating sustainable access to genetic resources and traditional knowledge

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/900167/darwin-guidance-round-27.pdf

3. Lessons learnt

This project was executed as planned and completed within the expected timeline. As with any major undertaking, however, there are always lessons to be learnt. Our public outreach campaign was significant and we feel that we reached a broad audience, including the general public, key stakeholders, and government officials. However, the day of our webinar there was a local fire that forced us to reschedule. As a result, many of the pre-registered in-person attendees were not able to make it to the webinar. If we were to do this again, we would identify a “rain date” in advance so that communication of the new webinar date was more straightforward. Another lesson learnt was the time frame of the outreach components. Given the short period of the grant we wanted to wait as long as possible before doing the final set of fish surveys. This meant that all analysis and distribution of information took place in the last 2 weeks of the grant period. Looking back, we would have conducted our surveys a week earlier so that we could spread out the outreach components over a longer time period. Finally, reliance on others for baseline data again left final data analysis to the very last minute. In the end we were able to use our own data collected in 2018 as the baseline, however, clearer communication with partners about exactly what data were required within a given timeline would have made this aspect of the project easier. We would like to note that in our application there were concerns raised as to the final outcome of the project hinging on the re-opening of our borders. This was a valid concern as it turned out that the Cayman Islands did not open its borders, which still remain closed. However, our findings proved extremely insightful even without the borders opening as we found that just the gradual resumption of local activities led to a concurrent decline in diversity, showing how even minimal activities can have an impact.

We feel that overall, this project was extremely successful in both completion of data collection and analysis as well as our outreach campaign. In particular, our outreach efforts catered to several different audience levels, ensuring that the project information was extremely accessible to a number of different age groups. The public webinar contained detailed information related to the experiment, results and implications that was catered towards specific stakeholders and government entities, and livestreamed so that this could be available globally. The Reefs Go Live broadcast on the other hand provided a general overview of the project and was catered towards schoolchildren and was therefore accessible those with no previous knowledge on the subject and was designed to be easy to follow along with and understand. For this reason, we think that other projects could follow this model in order to reach the widest audience possible.

4. Other comments and feedback

Although we are pleased with the answers that this project provided, this project would greatly benefit from more data collection and a longer period of study. It would be particularly interesting to continue monitoring fish species diversity and abundance up until the point where COVID-19 regulations in the Cayman Islands greatly lessen, and tourism is reintroduced to the Island. The small amounts of increasing human and boat traffic since July 2020, have provided us with the opportunity to understand the gradual change in fish abundance and diversity with increased human activity, however, the more intrusive and impactful human activities, such as cruise ship traffic, are still yet to come. The more that we can understand how this increased human activity on the water can affect our fish populations, the better we will be able to inform future decisions on marine management in and around the typically booming George Town Harbour.

By gathering data in this urgent time window and communicating the results to key stakeholders and a wider global audience, we were able to convey the importance of these

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surveys and their benefit over a longer span. Continuing these surveys would further help to advise tourism and development plans to the benefit of a sustainable future for Cayman's coral reefs and regional biodiversity. While we understand the constraints of granting process, given the continuing global persistence and impacts of COVID-19 we would encourage consideration of a second round of grants.