# Darwin Initiative Main and Post Project Annual Report

To be completed with reference to the "Writing a Darwin Report" guidance: (http://www.darwininitiative.org.uk/resources-for-projects/reporting-forms). It is expected that this report will be a **maximum** of 20 pages in length, excluding annexes)

**Submission Deadline: 30th April 2019**

## Darwin Project Information

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| Project reference | 23-003 |
| Project title | Eradicating invasive species from the highest priority Caribbean island |
| Host country/ies | Antigua and Barbuda (with Montserrat) |
| Lead organisation | Fauna & Flora International |
| Partner institution(s) | Department of Environment (Government of Antigua and Barbuda), Environmental Awareness Group, British Mountaineering Council, Wildlife Management International Ltd. |
| Darwin grant value | £ 285,000 |
| Start/end dates of project | Apr 2016 – Mar 2019 |
| Reporting period (e.g., Apr 2018 – Mar 2019) and number (e.g., Annual Report 1, 2, 3) | Apr 2018 – Mar 2019; Annual Report 3 |
| Project Leader name | Dr Jenny Daltry |
| Project website/blog/Twitter | e.g. https://www.facebook.com/RedondaRestoration/; https://www.faunaflora.org/projects/redonda-restoration-programme; https://environment.gov.ag/news-events#news/article/41 |
| Report author(s) and date | Dr Jenny Daltry, April 2019 |

## 1. Project rationale

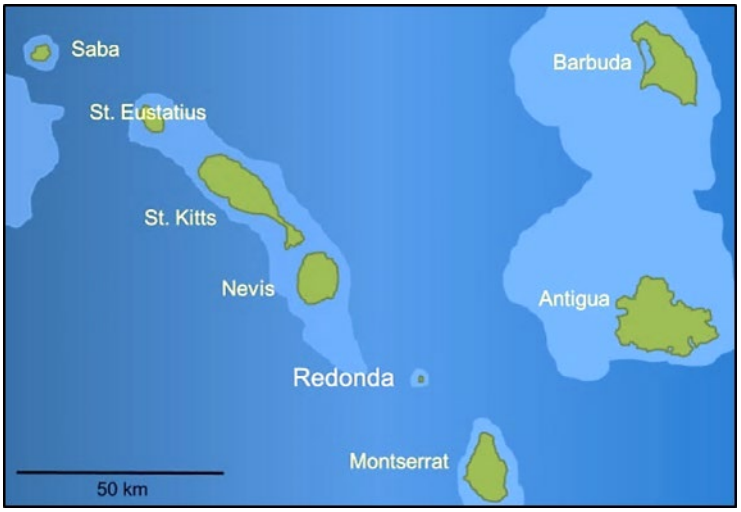
Caribbean islands cover only 0.15% of the Earth's land area yet have accounted for 10% of the world's bird extinctions, 38% of mammal extinctions, and >65% of reptile extinctions since 1500. At least two-thirds of extinctions on islands have been attributed to invasive alien species, especially rats, mongooses and other mammals from the Old World.

This is the first Darwin Initiative project to address such species on a Caribbean island outside of the UK Overseas Territories. Redonda is a small island 56 km Southwest of Antigua and 23 km Northwest of Montserrat. The urgent need to save its biodiversity from invasive alien mammals was confirmed through regional workshops attended by governments, NGOs and academics from 23 Caribbean nations in 2009 and 2015, which identified Redonda as the top priority for restoration due to its critically endangered wildlife and excellent prospects of success. The island was prized by Britain for its seabird guano until the outbreak of World War I forced its mining community to leave. Redonda has been a dependency of Antigua & Barbuda since 1967 but is now uninhabited and rarely visited except by a handful of artisanal fishers and

British volcanologists who use the island as a fixed observation point for Montserrat. It is a difficult island to get to, being remote and encircled by high, crumbling cliffs and scree slopes.

Although only 1.5km long and less than 80 hectares in surface area, Redonda supports rare and important biodiversity. These include five endemic reptile species— four of them Critically Endangered— and an uncertain number of endemic invertebrates and plants. The island has been designated an Important Bird Area because of its globally significant, but dwindling, seabird colonies. Pre-project surveys by FFI and our partners confirmed that the diversity and abundance of the island's native fauna and flora were still in sharp decline due to feral goats *Capra hircus d.* (an unusual, long-horned breed from Spain) and over 5,000 black rats *Rattus rattus*. The island has become so severely deforested and eroded that even the surrounding reefs were choked and broken by heavy soil run-off and falling rocks.

This Darwin project aims to eradicate the rats, translocate the goats to Antigua (where the Department of Agriculture will study and preserve this rare breed), and expedite the recovery of native species and habitats. This project has firm backing from civil society and the governments of Antigua & Barbuda and Montserrat, who share a common vision for Redonda as an internationally recognised centre for island restoration, conservation and research.




**(Above) Aerial photo of Redonda** showing its badly deforested and eroded state in 2016. **(Left) Map showing the location of Redonda.** Pale blue indicates shallow banks that formed land bridges during the Pleistocene. Redonda has always been isolated**.**

## 2. Project partnerships

This Darwin project is coordinated by Fauna & Flora International (FFI) with the four core partners named on the proposal: the Department of Environment (DoE, the lead agency representing the Government of Antigua & Barbuda), the Environmental Awareness Group (EAG, lead local NGO), Wildlife Management International Ltd (WMIL, New Zealand-based company specialising in invasive species eradications) and British Mountaineering Council (BMC, which provides technical support for work on cliffs). FFI has worked with all four organisations before, including more than five years collaborating to research and develop this island restoration project.

The project's core management team comprise Dr Jenny Daltry (FFI) and three senior Antiguans: Dr Helena Jeffery-Brown (DoE), Natalya Lawrence (EAG) and the Project Coordinator, Shanna Challenger. Ms Challenger is jointly employed by FFI, DoE and EAG: a novel arrangement that continued to work in the project's favour by enabling her to readily access facilities and support from all three institutions whenever needed. This all-female core team is further supported by the Project Steering Committee: a body of 23 expert advisers, including representatives from all the partners and other key stakeholders, such as the Fisheries Division, Forestry Unit, National Parks Authority and the private sector (see Annex 4 for details). The Project Steering Committee continued to meet every quarter through Year 2 to review project progress, resolve problems and discuss upcoming activities. This arrangement has worked very well throughout this project, and we have been fortunate to be able to draw on such a wide range of willing hands, expertise and influence.

Building on Years 1 and 2, relationships between FFI and the aforementioned partners and other agencies represented on the Steering Committee continued to be harmonious and fruitful throughout Year 3. All the agencies and stakeholders willingly pulled together to keep the programme running as smoothly as possible. FFI's partner agencies have in turn helped to bring in additional sources of support where needed through our wide network of contacts, nationally and internationally. For example, towards the end of Year 3, GEF funding was secured by the DoE to support and strengthen biosecurity and wildlife monitoring on Redonda for a further two years.

Compared to Year 1, during which more than a dozen Britons were heavily involved in fieldwork for many months, national partners handled a far greater proportion of day-to-day activities in Years 2 and 3, especially biosecurity monitoring, biodiversity monitoring and outreach. For example, while the entire Steering Committee was involved in designing the Redonda biodiversity monitoring plan, outreach strategy and the island biosecurity plan, their implementation in Year 3 was chiefly carried out by trained EAG and DoE personnel with only occasional inputs of advice and assistance from international members of the project team. This demonstrates the welcome advances in both local capacity and ownership of this project.

## 3. Project progress

Following the enormous effort made in Year 1 to launch the project and remove invasive alien species, Year 3 was chiefly focused on monitoring, and developing the new protected area management plan. Below is a summary of our progress against the agreed timetable:

### 3.1 Progress in carrying out project Activities

**Output 1 Alien invasive vertebrates (rats and goats) successfully removed from Redonda, with systems in place to prevent (re)invasions**

1.1 Complete Operational Plan and SOPs to remove goats and eradicate rats (COMPLETED).

See Year 1 Annual Report.

1.2 Capture and transfer goats from Redonda to enclosed government farmland on Antigua (COMPLETED).

See Year 1 and 2 Annual Reports.

In Year 3, more than half of the feral goats from Redonda were transferred from the government's Veterinary & Livestock Division facility to several carefully selected farms on Antigua, where these rare-breed animals are being bred (there is no intention to utilise them for meat or other purposes until they have attained larger numbers). Dividing up the herd was necessary to give the animals more space to graze and to reduce the risk of disease. Several males have already been paired with the Antiguan breed in line with a national plan to improve the hardiness of local farm stock and, potentially, increase their resilience to climate change.

1.3 Establish baiting grid on Redonda and eradicate rats (COMPLETED).

As reported previously, the last known rats on Redonda were detected and destroyed in the second week of March 2017. No more signs of any rodents have been seen since, despite ongoing biosecurity checks (conducted at least once every quarter, Activity 1.4) and additional, intensive island-wide surveys using a battery of detection tools (camera traps, tracking plates, flavoured wax blocks, etc.). In Q3/Q4 of Year 3, the project undertook a very intensive 3-week survey, led by the rat eradication expert Elizabeth Bell (WMIL) with two skilled rope-access climbers from BMC and other persons from EAG and FFI to verify whether any rodents were present before formally declaring the island to be rat free. (It is considered best practice to wait at least one year in the Tropics before confirming the eradication to have been successful: While it might be easy to overlook a few survivors and make the mistake of thinking the operation has succeeded, a year is enough for the rats to have multiplied through several generations to become detectable). Happily, no signs of rodents were detected on any part of

the island and the rat eradication operation was officially announced in media releases as a success.

1.4 Establish biosecurity surveillance system to prevent incursions, and monitor Redonda every 2 months to verify no invasive vertebrates remain (COMPLETED/ ONGOING).

See Year 1 and 2 Annual Reports. The biosecurity system is being implemented as planned, including routine biosecurity surveillance visits and rigorous inspection of persons and their gear for any seeds, insects, etc. before travelling to Redonda. The team met with scientists from the Montserrat Volcano Observatory, who occasionally visit the seismic monitoring equipment they have placed on Redonda, to impress on them the importance of not transporting any soil or organisms to Redonda.

During the routine surveillance visits in Year 3, the project team discovered (and destroyed) some highly localised alien *Leucaena leucocephala* seedlings and around 20 clumps of Guinea grass *Megathyrsus maximus*: The latter was probably present in the soil before this project began but was only able to grow once rats and goats had been removed. It is not uncommon for the removal of a major alien to create a 'release effect' for another alien. We believe we have been successful in removing the plants but will continue to monitor the island in case any more appear.

1.5 Publish technical reports detailing the methods, results and any lessons learned from Output 1 (COMPLETED).

The final technical reports on the goat removal operation and the rat eradication operation were produced in Year 1. A technical report on the 2018 final check of the island (verifying the rat-free status of the island) was produced in Q3 and only remains to be copy-edited before it is publicly disseminated. The project team also produced a suite of illustrated progress reports that were disseminated to the Steering Committee members and other interested stakeholders and highlight some of the challenges and lessons learned.

1.6 Incorporate biosecurity system into the costed management plan for Redonda (COMPLETED).

The new management plan (3.4) includes the main tasks, running costs and a schedule for the biosecurity system, including biosecurity surveillance visits at least once every quarter.

**Output 2 Monitoring system established to measure the responses of fauna, flora and ecological processes to the removal of alien invasive vertebrates**

2.1 Project scientists design and agree standardised methods to monitor birds, reptiles, bats, invertebrates, plants, soil and microclimate (COMPLETED).

See Year 1 and 2 Annual Reports.

2.2 Conduct monitoring as per 2.1 during the grant period (before and after removing the goats and rats) (COMPLETED/ ONGOING).

In Year 3 the project team, including FFI, EAG and Government staff and volunteers, conducted several trips to monitor the island's ecology. As in previous years, this work covered a range of taxa and other components of this ecosystem including: Birds (whole colony seabird counts, species checklist, and over 100 land bird point counts, conducted annually); Reptiles (over 100 point counts for lizards conducted annually, plus more intensive mark-recapture studies every 5 years); Invertebrates (relative abundance and diversity monitored using 14 pitfall traps and 2 Malaise nets in fixed locations, conducted annually); Plants (compilation of a species checklist and fixed point photos taken from 20 sites at least once a year); Marine fish (using transects), Coral reefs (using transects and fixed photo quadrats); and Soil properties (evaluated in fixed locations once a year using a professional field testing kit). As part of the monitoring work, the team has collected a reference collection of invertebrates and lichens (using specimens) and a photographic library of plants. The most recent, intensive round of monitoring was conducted in Q4.

Findings at the start of the project had confirmed the catastrophic decline in bird populations, reptile populations and vegetation cover on Redonda, which we attributed largely to the heavy impacts of the voracious goats and rats. In Year 2, after removing the alien mammals, we observed very promising signs of recovery, including a sharp increase in the abundance of invertebrates and plants (including hundreds of new tree seedlings), the endemic lizards have more than doubled, and at least one species of bat, Audubon's shearwaters and nine land bird species have naturally recolonized the island. In Year 3, we were pleased to see the vast number of new tree and shrub seedlings had survived the dry season and continued to grow, with some *Ficus citrifolia* specimens having reached 2 metres high by Q4. By Q4, the abundance of invertebrates was still very high (at least three times greater than in Year 1 even at the peak of the dry season), almost all of the exposed soil has become covered in vegetation, the endemic lizards have more than tripled in density, and at least one species of bat and 13 bird species, including Audubon's shearwaters, have naturally found their own way back the island. MS Excel files have been developed to store and share data, and all georeferenced data are being entered into EIMAS, the national DoE database, to support national analyses and decision making.

2.4 Publish technical reports detailing the results and lessons learned from Output 2 (COMPLETED/ ONGOING).

In Year 3, the project team produced two more technical reports: *Assessment and Survey of the Flora of Redonda Two Years Post-rat Eradication and Feral Goat Removal* (Lindsay, K, Daltry, J.C., Challenger, S., Otto, A. & Lawrence, S.N., 2019) and *Baseline Survey of Redonda's Nearshore Marine Environment* (Steele, S. & Camacho, 2018). The project team and collaborating scientists have worked on additional publications from the biodiversity surveys, including papers presented to the annual conference of Caribaea Initiative in Guadeloupe in Q2 and Latin America and Caribbean Conference on Conservation Biology in Trinidad in Q3. The latter covers the methods used to eradicate rats and remove goats as well as the preliminary findings from monitoring wildlife on the island. Two more papers (one terrestrial, the other marine) were accepted for presentation at the fourth annual conference of Caribaea Initiative in the Dominican Republic in 2019.

2.5 Incorporate ecological monitoring plan into the costed management plan for Redonda (COMPLETED).

The new management plan (3.4) includes the main tasks, running costs and a schedule for monitoring.

**Output 3 Redonda becomes a protected area in accordance with the Sustainable Island Resource Management Zoning Plan for Antigua & Barbuda, with an effective structure to manage its ongoing ecological recovery and sustainable use**

3.1 Complete stakeholder consultations in Antigua and Montserrat (COMPLETED).

Although the workplan in the original proposal indicated consultations would cease after Year 1, we agreed active engagement with stakeholders should be ongoing, especially considering the need for regional cooperation to safeguard the island and its biodiversity. Stakeholder consultations continued in Antigua during the reporting period with a wide range of interested individuals and organizations. The '*Redonda on the Road*' events (Activity 4.2) proved to be excellent opportunities to engage with a wide cross section of the public and discuss the island's protection and management. Senior members of the team also revisited Montserrat to discuss the project and the plans to formally protect the island and surrounding sea. In Q4, the Project Coordinator and other members of the team also visited the sister island of Barbuda (where many residents have now returned following the mass evacuation after Hurricanes Irma and Maria in Year 2) and spoke with residents about Redonda. Overall the team met with a great deal of interest and support for protecting Redonda as a nature reserve.

3.2 Prepare and submit technical proposal to Cabinet to designate the Redonda Environmental Protected Area (COMPLETED).

Building on the stakeholder consultations (3.1), and a series of meetings with the DoE's legal experts and relevant directors and ministers, the project completed and submitted the proposal to establish the new protected area in Q4.

As noted in our last report, this process took considerably longer than anticipated due to the Steering Committee's decision to explore options to protect of the seas around Redonda, as well as the island itself. While the justification for protecting the island as an IUCN Category Ia Strict Nature Reserve was strong (e.g. its globally threatened and endemic species, globally important seabird colonies, historical and archaeological significance), almost nothing was known about the surrounding sea. Baseline marine surveys were therefore undertaken in Q3 by marine experts from FFI, DoE and Fisheries Division, assisted with a drop camera, to learn more about the significance and requirements of this area. These surveys highlighted the national and global significance of the surrounding marine ecosystem, including a *circa* 180km$^2$ coral bank, extensive seagrass beds and shipwrecks, and is especially noteworthy for sharks, rare corals (e.g. the Critically Endangered *Acropora cervicornis* and *A. palmata*), sponges and an extraordinary concentration of foraging Critically Endangered hawksbill turtles *Eretmochelys imbricata*. In total, 30 Globally Threatened, 12 Near Threatened species and 19 Data Deficient species have been found in the project site, and more are expected with further research. Although such marine surveys were not planned as part of the Darwin project, they have greatly helped to strengthen the project's outputs and contribution to science and conservation in this region.

Supported by these findings, the idea of protecting both the island and its marine ecosystem has proved to be very popular. According to the DoE's GIS unit, the entire "Redonda Ecosystem Reserve" covers 24,159 hectares: almost as large as the entire land area of Antigua. The final decision from Cabinet is now awaited, but we are aware that the proposal is strongly backed by several ministers and is expected to be approved. Indeed, the national press has already declared that Redonda will become a reserve (https://antiguaobserver.com/redonda-to-be-designated-a-nature-reserve/)!

3.3 Quarterly management meetings of the Redonda EPA Management Committee (UNDERWAY).

In accordance with the management plan, the entire Redonda Steering Committee that was formed at the Darwin project inception workshop, and has continued to meet every quarter, is now evolving into two bodies: (i) The Redonda Management Board and (ii) Technical Advisory Committee. Once the protected area is officially designated, the Management Board will be co-chaired by the DoE and Fisheries Division, with a small number of representatives from the Technical Advisory Committee, and will appoint and oversee the park manager and other personnel responsible for the day-to-day management of the reserve. The Technical Advisory Committee is the wider panel comprising scientists and other experts from government agencies, the private sector and both national and international NGOs with an interest in Redonda. FFI is expected to serve on the Technical Advisory Committee for the foreseeable future.

3.4 Develop a costed 10-year management plan for the protected area using a participatory process (COMPLETED).

Much of Q3 and Q4 was devoted to developing the management plan, drawing on the information, recommendations and experience developed throughout the project. This became a bigger task that anticipated because of the decision to include a huge expanse of sea in the protected area, turning it from c. 100 hectares to more than 24,000 hectares. The task of writing up the plan was shared among a small team of nationals representing the EAG, DoE and FFI, but with much consultation with colleagues and other stakeholders. Protected area management specialist Michael Appleton (Vice-Chair of the World Commission on Protected Areas and Director of Protected Areas, Global Wildlife Conservation) from the UK facilitated the first round of protected area planning meetings in Q2 and returned in Q4 to assist with the plan's completion.

The plan focuses on the next 5 years. It proved too difficult to plan for the next *10* years because (a) the terrestrial ecosystem is changing so rapidly now that rats and goats have been removed, and (b) There are still large gaps in our knowledge of much of the marine area that will need to be addressed before prescribing how to manage the whole reserve. Further marine surveys are among the priorities in the management plan.

**Output 4 National capability to plan, manage and implement and monitor invasive species projects is raised, supported by enhanced technical skills and greater public awareness and cooperation**

4.1 Plan multi-media campaign to communicate project to the public on Antigua and Barbuda and neighbouring states (COMPLETED).

See Year 1 Annual Report.

4.2 Implement campaign, including media releases, signage on Redonda and phone-in radio shows, and evaluate impact on public (COMPLETED/ ONGOING).

The Darwin project received further coverage in Year 3 from a wide range of media groups, many of which centred on the remarkable recovery of the island's ecosystems since the invasive rats and goats were removed (e.g. editorials in the *Antigua Observer* https://antiguaobserver.com/editorial-magical-transformation/ and *The Montserrat Reporter:* https://www.themontserratreporter.com/magical-transformation-redonda/). The Project Coordinator Shanna Challenger continued to make frequent appearances on national radio and television to present Redonda and the project, and both Ms Challenger and Natalya Lawrence (EAG) gave numerous presentations to local stakeholders, schools, church groups and other target audiences across Antigua. Redonda and the project also featured in the popular sailing magazine *Caribbean Compass, BBC Wildlife Magazine, Scientific American,* two calendars, blogs by team members, and much more. Online, updates about the project were posted on the websites of DoE, FFI and other partners (e.g. https://environment.gov.ag/news-events#news/article/41, https://www.fauna-flora.org/news/magical-transformation-spells-brighter-future-redondas-fantastic-beasts, https://www.globalwildlife.org/plotting-a-future-for-the-wildlife-of-redonda-island/), the project's Facebook page (https://www.facebook.com/RedondaRestoration/), among others (e.g. https://www.birdscaribbean.org/2018/08/redonda-rebounded-magical-transformation-spells-brighter-future-for-redondas-wildlife/, http://www.greenantilles.com/removal-of-invasive-alien-species-revitalizes-redonda/).

Among the project's more innovative public outreach activities in Year 3 were the '*Redonda on the Road*" show – a roving galley of stunning images from the project presented at more than a dozen public venues such as the national museum, Independence Food Fair and Arbour Day Fair to raise awareness of Redonda's wildlife, the project, and why the island needs protection. The project also invited the presenters of the popular ABS TV show "*You For A Day*" to step into the Project Coordinator's shoes and try their hand at monitoring wildlife and biosecurity checks on Redonda: this episode was broadcast nationally and through live streaming in Q3. The Caribbean Endemic Bird Festival month of celebrations in Antigua in 2018 was led by the project's outreach officer Natalya Lawrence and especially highlighted the globally important seabird colonies on Redonda. The project team also began working on a new primary school curriculum for Antigua, using Redonda as a vivid example of the impacts invasive species can have.

For the benefit of fellow conservation practitioners and scientists, a paper from the project was presented at the Caribaea Initiative conference in Guadeloupe in Q1 (Herrel et al. 2018: "Recovery of an island ecosystem after eradication of rats and goats: the lizards of Redonda") and the Latin America and Caribbean Conference on Conservation Biology in Trinidad in Q3 (Challenger et al. 2018: "Early impacts of invasive species removal on a remote Caribbean island ecosystem").

It is hard to estimate how many people have been reached to date by all these means, but within Antigua alone it is credible more than 90,000 people have heard about the project through national media: It is increasingly difficult to find a resident who has not. Feedback received to date from Antigua and other islands has been very positive and supportive. The

impact of this activity is being more formally assessed by repeating the questionnaire survey from 4.1 (the data collected in Q4 are still being analysed and will be included in the Final Report).

4.3 Analyse training needs of field personnel (COMPLETED).

See Year 1 Annual Report.

4.4 Conduct training classes and on-the-job mentoring for local personnel participating in eradication and biosecurity activities (COMPLETED).

Further meetings and workshops led by the project team throughout Year 3 introduced more than 20 Antiguan government and NGO technical staff to methods for preventing, detecting and eradicating invasive alien species. These were reinforced with hands-on work to monitor and maintain the permanent bait stations and combat invasive alien plants on Redonda (Activity 1.4).

4.5 Conduct training classes and on-the-job mentoring for local personnel participating in biodiversity monitoring (COMPLETED).

Fifteen individuals participated in terrestrial and marine surveys in Year 3, including government staff, NGO staff and students (Activity 2.2), with mentoring from the Project Leader and other biologists affiliated to this project. Two nationals – Shanna Challenger and Natalya Lawrence – also undertook more advanced training on wader surveys and identification at a one-week training course run by BirdsCaribbean in Jamaica in Q4.

4.6 Local technicians participate in project meetings and key field activities with FFI training and mentoring where needed (COMPLETED).

From the start of this project, FFI staff have worked alongside more than 30 Antiguans from government agencies, NGOs and the private sector. Sixteen are members of the Project Steering Committee and most are colleagues from government agencies and NGOs. In Year 3, 19 Antiguans participated in fieldwork as well as protected area planning and other technical workshops.

At the request of technical staff from both the government and EAG, FFI organised a special 3-day training class for 15 individuals on protected area management planning in Q4, which was delivered by Mike Appleton (WCPA/GWC). Two Anguilla National Trust staff also attended the course to assist them with protected area management planning under DPLUS0060 in Anguilla.

4.7 Evaluate impact of 4.4–4.6 on the competences of local personnel in government and NGO sectors (UNDERWAY).

This element is slightly behind schedule because we decided to complete the protected area management planning course and final round of monitoring (in February and March 2019) before re-assessing the competences of personnel who gained experience and training from this project. We will complete the study and present the results in the Final Report.

4.8 Student research on Redonda's biodiversity and management for postgraduate degree(s) (UNDERWAY).

Shanna Challenger has begun studying the behavioural ecology of boobies on Redonda part-time for her Master of Science degree, with support from seabird specialists at the University of Roehampton, and fellow Antiguan Ruleo Camacho has started developing his Masters study on the corals around Redonda. Ms Challenger is expected to work on this full time from September 2019 onwards and submit her thesis in 2020 or early 2021.

**Output X Project Management**

X.1 Project inception meeting (COMPLETED).

See Year 1 Annual Report.

X.2 Project Steering Committee meetings (COMPLETED).

The Project Steering Committee was formed at the Inception Meeting in Year 1 and continued to meet every quarter in Antigua throughout Years 2 and Years 3. The most recent meeting was held on 20th March 2019. Meetings were typically held in the main meeting room of the DoE in St John's. As reported earlier, smaller sub-units or working groups were established to help plan and review specific areas of the project including biosecurity (representatives from FFI, EAG, DoE, WMIL and Caribbean Helicopters Ltd), marine surveys (FFI, EAG, DoE and Fisheries Division) and the core protected area management planning team (FFI, EAG and DoE).

X.3 Project biannual reports/ donor technical and financial reports (COMPLETED).

Reports produced by FFI during Year 3 include the internal FFI annual report for 2018, the final technical and financial reports to Global Wildlife Conservation, two reports to the Taurus Foundation, the second half-year report to Darwin Initiative, and illustrated updates to the Betty Liebert Trust and other private sponsors.

X.4 Monthly financial accounts (COMPLETED).

FFI maintains detailed accounts of spending each month, which are available for inspection at any time. Expenditures through the EAG (local partner NGO) are managed through a separate bank account for this project. The Project Coordinator oversees spending through this account and reports to the Project Leader every month. The Darwin grant will be audited in May 2019.

## 3.2 Progress towards project Outputs

**Output 1: Alien invasive vertebrates (rats and goats) successfully removed from Redonda, with systems in place to prevent (re)invasions:**

At the start of this project, the primary threats to Redonda were the presence of a small but destructive herd of feral goats (around 60 confirmed in pre-project survey) and at least 5,000 black rats. The operations to remove both species appear to have been fully successful, and the project indicators and means of verification are still applicable (Annex 1). No goats or rats remain on Redonda, based on the best available evidence (indicators 1.1 and 1.3). The rare breed goats removed from the island have been housed on enclosed farmland on Antigua since the end of Year 1 (indicator 1.2). The last known rats died in March 2017 (Year 1, Q4) and the last known goats were removed Year 2 Q1. Since then, the island has been diligently surveyed at least once a quarter by trained field personnel for any signs of rats, goats or other harmful aliens. In accordance with international best practice, Redonda was not officially declared rat-free until an even more comprehensive check had been conducted. The "Final Check" was completed in June/July 2018 by the rat eradication expert Elizabeth Bell (WMIL) with two skilled rope-access climbers from BMC and additional persons from EAG and FFI, and the operation was declared successful in a media release issued by FFI and its partners in Q2 (https://api.fauna-flora.org/wp-content/uploads/2018/07/Redonda-recovery-press-release-international-version.pdf).

Permanent bait stations were installed by the project team in March/ April 2017 to help prevent reinvasion by rodents: All 39 stations are checked and replenished at least once a quarter during Year 3, with no problems encountered. Other aspects of the biosecurity plan were implemented in Year 3 to safeguard the island from invaders, including stringent inspections of all personnel and gear for seeds, insects, etc. before departure, and training field personnel on how to detect and act on alien incursions.

While this output and its indicators speak to the removal of rats and goats and preventing incursions by alien vertebrates, the biosecurity programme also covers invertebrates and plants. In Year 1 the project field team destroyed the island's non-native *Casuarina equisetifolia* tree to prevent the spread of this notorious alien (see previous reports) and we have seen no sign of this species having persisted. In Year 3, the project team unexpectedly discovered, and promptly destroyed, a small number of alien *Leucaena leucocephala* seedlings and clumps of Guinea grass *Megathyrsus maximus*. Thanks to taking immediate action, we think we have probably been successful in eradicating the plants but will continue to monitor the island in case any were overlooked. Guinea grass is of concern because it not only takes over the habitats of

other plants but poses a fire hazard. Steering Committee member and renowned Antiguan botanist Kevel Lindsay taught team members how to distinguish Guinea grass from other, native grasses.

**Output 2: Monitoring system established to measure the responses of fauna, flora and ecological processes to the removal of alien invasive vertebrates:**

At the start of the project, limited baseline data were available on the ecology of Redonda other than the approximate size and location of nesting seabird colonies, the density of two endemic lizard species, and a preliminary checklist of land birds, vascular plants and invertebrates (see Bell & Daltry 2014). The project indicators and means of verification are still valid (Annex 1): Rapid methods have been established for monitoring short- and long-term changes in major taxa and abiotic characters (indicator 2.1) and the status of major taxa and soil composition has been monitored before and after removing the goats and rats (indicator 2.2).

The methods launched in Year 1 were repeated in Year 2 and Year 3 to monitor birds (diversity and abundance of seabirds and land birds), lizards (abundance and ecology), invertebrates, plants (diversity and abundance) and soils (moisture, composition and fertility). Ambient temperature and relative humidity, however, have not been monitored since the data-loggers were destroyed by Hurricane Maria in Year 2. The project also established methods and baseline data on the marine fish and coral reefs around the island, chiefly to determine whether restoring the island affects the health of its nearshore biodiversity (studies in other parts of the world have found that curbing erosion and increasing seabird colonies are very beneficial for fringing reefs).

While the monitoring programme was designed to be relatively rapid and inexpensive to make it easier to sustain over the long term, it has proved very effective in demonstrating many changes in the ecosystem over the past two years. The project's 33 fixed point photographs, spread across the island, are proving particularly valuable for conveying the rapid increase in vegetation. While most methods have been repeated annually, at the last Project Steering Committee meeting (Q4), members called for the frequency of monitoring to be increased to twice a year from 2019 onward.

The project team will continue to monitor the biotic variables using techniques that can be swiftly learned and applied by local technicians. To supplement the rapid programme, the project has been collaborating with scientists from Harvard University on an in-depth long term study of the Critically Endangered lizards (entailing at least 10 days per year on Redonda), the Natural History Museum in London to survey and monitor the island's rare and unusual lichens, and the Waitt Institute to survey and monitor marine biodiversity.

**Output 3: Redonda becomes a protected area in accordance with the Sustainable Island Resource Management Zoning Plan for Antigua & Barbuda, with an effective structure to manage its ongoing ecological recovery and sustainable use:**

At the project start, Redonda was fully state-owned but not really managed by Antigua & Barbuda, aside from occasional visits by the Coastguard. Project indicators and means of verification still stand (Annex 1): A committee with a clear management role has been established (indicator 3.1), and the project is close to getting Redonda designated as a protected area, encompassing the land and surrounding sea (indicator 3.2). The management plan has been prepared (indicator 3.3).

To achieve this output, the project has conducted a series of surveys, consultations and workshops over the past two years to plan the new protected area, with expert guidance from the DoE legal specialist and international protected area specialist Mike Appleton. The idea of establishing a protected area has met with seemingly universal enthusiasm at all levels and the proposed reserve has expanded in size to over 24,000 hectares: almost as large as Antigua. This area includes not only the whole of Redonda island (c. 60 hectares), but the little-known 18,000-hectare coral bank that extends to the North and South. Even though the project team has only just submitted the formal proposal to Cabinet, the national press has already announced that Redonda is being designated as a reserve. The stated Vision of the protected area reflects the goal of the Darwin project "*Significant recovery and regeneration of threatened*

*species and habitats on and around Redonda is a source of national pride and directly informs and inspires other Caribbean nations to eliminate harmful invasive species*".

To achieve this vision, the costed management plan for the Redonda Ecosystem Reserve was developed in Year 3. Key elements are already being implemented or about to begin, such as more detailed archaeological surveys, and research into suitable remote surveillance devices. The island is to be managed with a light touch, under the overall direction of a Management Board co-chaired by the DoE and Fisheries Division, with support from the Technical Advisory Committee/ Redonda Steering Committee. Thanks to highly collaborative approaches taken by the Darwin project over the past three years, the DoE, Fisheries Division, EAG and other agencies have developed excellent working relationships that will stand the new protected area in good stead.

**Output 4: National capability to plan, manage and implement and monitor invasive species projects is raised, supported by enhanced technical skills and greater public awareness and cooperation:**

At the start of this project, there was some relevant capacity among a small pool of Antiguans—chiefly staff and volunteers of the EAG, with whom FFI has worked on previous projects to remove rats and mongooses from offshore islands. The indicators and means of verification still stand (Annex 1). The project team has to date trained more than 30 persons from Antigua on invasive species control (more than the target of 20 by Year 2, indicator 4.1), more than 30 on ecological monitoring (more than the target of 20, indicator 4.2). Two local students have begun working toward MSc/MPhil degrees (indicator 4.3) and 17 persons from Antigua have gained increased skills and experience in managing projects and conservation sites, including training on protected area management planning (more than the target of 5 persons, indicator 4.4). Most of the beneficiaries are NGO staff, government staff, and local volunteers.

As clear evidence of their rising capacity, in Year 3 EAG staff successfully planned and implemented a project to eradicate rats from Maiden Island (off the West coast of Antigua) and are teaching local island owners how to keep islands pest-free. DoE staff have similarly built on the experience and skills developed through this project to develop a management plan for a national park on Antigua.

While we have not yet surveyed the percentage of local people who know about the project and are able to explain why Redonda merits conservation (we aim to influence at least 75% of the population, indicator 4.5), it is genuinely difficult to find anyone in Antigua who has not heard that work is taking place to restore Redonda. Comments received from local citizens in response to updates from the project point to a strong sense of pride and ownership of these achievements. For example, some of the recent comments received from residents include: "*The greening of Redonda is a fantastic achievement! Congratulations to all involved*" (T. Diamond), "*This is absolutely phenomenal work. A true success story that should help motivate and guide similar initiatives needed on other islands suffering from invasives. Congratulations to absolutely everyone involved* (J. Proctor), and even "*Being saying for some time now, that REDONDA, needs to be added to the National Anthem!*" ("Smood").

## 3.3 Progress towards the project Outcome

The project Outcome is "*The permanent removal of harmful invasive species triggers the recovery of endemic species, habitats and ecological processes on Redonda, and enhances Antigua & Barbuda's natural capital and conservation capacity*". Further, strong progress was made towards this in Year 3, and all three indicators have not only been reached, they have been greatly exceeded:

0.1 *No invasive mammals remain on Redonda by project end*: The last known rat was killed in early March 2017, and the last known goats were removed in April 2017. In addition, the project team eradicated the tree *Casuarina equisetifolia* and removed all known *Leucaena leucocephala* and Guinea grass *Megathyrsus maximus*.

0.2 *Net increase by at least 10% in abundance of fast-breeding native species by Year 3:* Monitoring using point count methods, validated by more detailed mark-recapture studies, have shown that the density of the endemic Redonda tree lizard *Anolis nubilus* and Redonda ground lizard *Pholidoscelis atratus*— both of which are Critically Endangered species— have increased by more than 300% and 600% respectively in just

24 months since rats and goats were removed. Invertebrate monitoring data show many species have increased very significantly: indicator species have more than tripled in abundance in the same period.

0.3 *Net increase by at least 10% in vegetation cover by Year 3.* Analysis of monitoring data in March 2019 is yet to be fully completed, but it is evident from site visits and photographs that the vegetation cover has increased by more than 2,000% (see before-and-after photographs in Annex 4). Most areas that were bare soil at the start of the project are now fully covered in grasses and herbaceous plants all year round. One of the most remarkable changes has been in the germination and growth of hundreds of new young native trees in many parts of the island, which we believe to be the first new trees to have successfully grown here in many, many decades. Many of the new *Ficus citrifolia* trees are over a metre tall, some more than 2 metres (see Annex 4).

The project has thus been successful in accomplishing its intended outcome. Having eliminated the main threats to biodiversity on Redonda, native species have increased far more quickly than originally predicted. It has been especially exciting to see natural recolonization of the island.

While the indicators in the log frame focused on changes in terrestrial biodiversity, if the Darwin grant period were longer, we would have included some marine indicators as well (see section 3.5). We have in fact begun monitoring the reefs and their fish stocks to determine whether they too have been affected by the project.

## 3.4 Monitoring of assumptions

**Outcome: Assumption 1— Recent scientific research is correct in identifying rats and goats as the primary drivers of biodiversity loss on Redonda, and that at least some of these changes are reversible if the aliens are removed:** This assumption has held true. Since rats and goats were removed in early 2017, there have been dramatic increases in wildlife populations and a clear improvement in overall habitat quality on the island. At the start of this project, for example, there were only two species of land birds on Redonda: peregrines (2 individuals) and zenaida doves (6 individuals) and seven species of seabirds, but since the rats were culled, the number of recorded species has jumped to 21: the additional dozen species being the Audubon's shearwater, Caribbean elaenia, pearly-eyed thrasher, bananaquit, yellow warbler, American kestrel, scaly-necked pigeon, Caribbean martin, grey kingbird, American oystercatcher, white egret, barn swallow and a small finch tentatively identified as the Lesser Antillean bullfinch, all of which are native to this region. The zenaida doves have multiplied, with at least 24 individuals present by the end of Year 3. At least one species of bat (still unidentified) has also been seen. This rapid natural recolonization is consistent with findings from other islands that have been cleared of invasive mammals (e.g. Dog Island in Anguilla, which was cleared of rats by FFI and local partners in 2012). During the same period, the endemic lizards have increased very significantly (the Redonda tree lizard population has tripled in number and the Redonda ground lizard has increased by six-fold). Preliminary analysis of monitoring data from Q4 points to even greater increases in invertebrates (at least three-fold since 2017) and especially plants. Hundreds of young tree seedlings have already emerged on previously barren slopes, most of them hardy native fig trees *Ficus citrifolia*: a keystone species that helps to stabilize the cliffs and support arboreal species and tree-nesting birds, such as red-footed boobies and magnificent frigatebirds. The island's soils are acidic but are remarkably fertile thanks to the seabird guano and the underlying volcanic bedrock. At the time of writing (March 2018), some of the new trees are already more than 2 metres tall. Where there are trees, a layer of leaf litter is now forming, creating important microhabitats for invertebrates and the rare Redonda pygmy gecko (*Sphaerodactylus* sp. nov.). Annual soil monitoring has shown that the soils in these areas are rapidly changing in structure and chemistry and appear to be becoming better at retaining moisture.

**Output 1: Assumption 1— Rats on Redonda are susceptible to the same bait and baiting methods that have been successfully used on other Caribbean islands:** This assumption held true. The rat eradication operation on Redonda looks to have been fully successful using Klerat™ bait distributed all over the island at intervals of not more than 30 metres. Rats showed

no hesitation in taking the bait in Year 1 and there was no sign of any of them being resistant to the toxin. Twenty-four months have now passed since the last two rats were detected, and the island was officially declared as rat-free in July 2018.

**Output 1: Assumption 2— No unusual and severe weather events during critical stages (this project will avoid conducting important activities during the hurricane season, especially August through October):** This assumption is essentially correct. This region was struck by two exceptionally powerful hurricanes in Year 2, but the impact on this project was relatively light because our team was well prepared for possible storms at that time of year and nobody was in the field at that time. See further comments in the Year 2 report.

**Output 2: Assumption 1— Long term monitoring strategy accurately predicts the future human and other resources available to implement it:** This assumption appears to be robust. In Year 1, many persons in the government agencies and NGO expressed a keen interest to be involved in monitoring Redonda but were reluctant to stay on the island for long periods or venture off the main trails onto the steeper slopes. Consequently, we designed the monitoring programme around rapid techniques, most of which can be completed in 1–3 days stints in areas on or close to the trails. The most difficult component to sustain will be the whole-island seabird counts because seeing all the nests entails leaving the main trails, including climbing up to the high ridge and other areas near cliff edges. Because it has proved difficult to find people locally who are comfortable with doing this, it may be necessary for staff from FFI or other partners to continue monitoring the seabirds for the foreseeable future (seabird colonies are expected to change very significantly from 2021 onwards, when the birds that fledged after the rat eradication return to breed) and/or to test whether the nests can be counted using a drone instead. Inevitably, there is some uncertainty over the resources for travel to Redonda over the long term, but ongoing monitoring has been factored into the protected area management plan and budget, and funding has been secured for at least the next two years.

**Output 3: Assumption 1— Continued cooperation among stakeholders:** This assumption is important and still looks robust. Redonda holds a powerful fascination for many Antiguans and Barbudans: Redonda is their third sister island and looks completely different to the rest of the country, yet few have been able to visit it. As reported previously, the project team refers to the typically swift response to any requests or invitations to meetings about this project as “the Redonda Effect”. It has been very pleasing to see such willing and positive cooperation between the government, civil society and private sector within Antigua, with many individuals finding themselves working together for the first time. This mutual desire to look after Redonda appears to have been further reinforced through the project’s education and outreach work in Year 3, as this has greatly raised national interest and pride in Redonda and the restoration programme. Both the EAG and DoE have spontaneously posted project updates on their websites and social media throughout the year, highlighting their important roles in this work while also acknowledging all the many other organisations who have contributed.

**Output 3: Assumption 2— Government willingness to protect Redonda, in accordance with its own national land use plan and legislation:** All of the relevant government agencies have senior representatives on the Project Steering Committee, including DoE, National Parks Authority, Forestry, Agriculture and Fisheries, whose have concurred the island and surrounding sea must be protected for the primary purpose of biodiversity conservation. Both the Minister of Agriculture Fisheries and Barbuda Affairs and Minister of Health, Wellness and the Environment have endorsed establishing the new protected area under both the Fisheries Act 2006 and Environment Law 2015. Thus, this assumption appears to have held true.

**Output 4: Assumption 1— Trained expertise remains in Antigua & Barbuda:** This assumption is never possible to guarantee, but we have trained more than 40 individuals, including persons who are already in full time employment in relevant agencies, to maximise the chance that Antigua and other countries will benefit from the increased conservation capacity for years to come.

**Output 4: Assumption 2— Increased knowledge results in positive attitudes and behaviours:** While it is beyond the scope of this project to prove this assumption to be universally true, we have seen examples within this project where information has changed attitudes and behaviours. We have mentioned before 180-degree change in the opinions of many persons in Antigua who were at first opposed to the idea of removing the feral goats from Redonda (on the grounds that goats can be useful and/or perceived to belong on the island) and changed their minds after being shown photographs and other evidence that the animals were starving to death on the island. Both local and international scientists affiliated to this project have become more aware and conscientious about making sure they do not inadvertently transport seeds, insects or other non-native species, after learning they could pose a serious threat to native wildlife. The conspicuous improvements on the island over the past 24 months provide a very striking reminder of why island biodiversity really needs protecting against alien invaders.

## 3.5 Impact: achievement of positive impact on biodiversity and poverty alleviation

While this ecosystem is still undergoing rapid changes now that alien rats and goats have been removed, the project can claim to have already achieved its proposed impact: "*Significant recovery and regeneration of threatened species and habitats on Redonda is a source of national pride and directly informs and inspires other Caribbean nations to eliminate harmful invasive species*".

Since the invasive mammals were removed in early 2017, we have witnessed wildlife populations increasing and conspicuous improvements in the overall habitat (see section 3.3 and images in Annex 4). These changes have been even swifter and more dramatic than we anticipated in our original proposal: Many parts of the island are now rapidly transforming from moonscape to grassland to forest. Looking ahead, the island could soon be in a fit state to receive some of the species that used to live here, such as Montserratian iguanas (now known to be a distinct taxon), burrowing owls (the original endemic subspecies is extinct but another subspecies could be suitable), various dry forest trees and agaves.

While more impacts on Redonda's terrestrial and marine biodiversity are expected to emerge over time, experiences gained from this project are already being transferred by our team to restoring other islands, including three in the Turks & Caicos and three in Anguilla. The latter include the Darwin Plus project (DPLUS060), which involves several members of the Redonda project team, including Jenny Daltry (FFI is an implementing partner) and Elizabeth Bell (who served as the Rat Eradication Team Leader on both projects). Our team has also received requests for advice and assistance from other parts of this region, including the Bahamas, British Virgin Islands and the Grenadines, which also have islands overrun by invasive rats, goats and other aliens.

The primary focus of this project on Redonda is biodiversity conservation rather than poverty alleviation. Nobody lives on the island and few fishers or other people come here. However, the rare-breed goats that have been relocated to Antigua are now being studied and bred, and have been spread across four locations. The genetics study in Year 2 confirmed the goats to be of Spanish origin, most closely related to the goats of Cape Verde, and distinct from the other breeds on Antigua. In Year 3, some of the male goats from Redonda were deliberately crossed with the local goats on Antigua to determine whether they produce hardier, more drought-resistant goats (the need to introduce new genes into Antigua's goat herds was identified by a national livestock project before the Darwin project began). Their total numbers are still low (c. 40 at the last count, not including hybrid offspring), but the government still intends to distribute the offspring in due course to more farmers in Antigua, Barbuda, Montserrat and other countries that wish to have them.

As part of the new protected area management plan, there could be more opportunities for people to benefit from Redonda and this project in other ways. In particular, the marine surveys in Year 3 have highlighted the potential for dive tourism here, as the marine landscape is strikingly different to that of the rest of Antigua and Barbuda and appears to have healthy populations of sea turtles, sharks and other wildlife. Boat tours around Redonda could be another excellent way to generate revenue from tourists interested in seeing the spectacular seabird colonies. Tourism is the largest employer and contributor to GDP in Antigua, and both

the Ministry of Tourism and several private operators have expressed great interest in collaborating with the Redonda Ecosystem Reserve to trial specialist tours for a restricted number of visitors.

## 4. Contribution to the Global Goals for Sustainable Development (SDGs)

This project principally addresses SDG 15 (*Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss*), and the permanent removal of highly destructive goats and rats from Redonda (Output 1) is already serving to directly combat desertification, halt and reverse land degradation and biodiversity loss, and re-establish forests. Parts of the island that resembled the surface of the moon in 2016 are becoming covered in young trees through natural recruitment (see images in Annex 4) and we have shown striking increases in the number birds, reptiles and invertebrates on Redonda since the project began.

This project also contributes to SDG 14 (*Conserve and sustainably use the oceans, seas and marine resources for sustainable development*) through alleviating threats to marine life, especially close to shore, and bringing over 24,000 hectares of Caribbean Sea under protection. Marine surveys in Year 1 confirmed fears that the nearshore reefs have been severely impacted by erosion from the island, but this threat is diminishing as vegetation is rapidly growing back to stabilize the steep slopes. Furthermore, by eradicating rats and enabling seabird colonies to increase, guano from seabirds is expected to boost the natural productivity of coral reefs[1]. The marine protected area is yet to be zoned, but this is envisaged to include certain areas for sustainable fishing and for diving.

## 5. Project support to the Conventions, Treaties or Agreements

Under the Convention on Biological Diversity, the project has notably addressed article 8(h) "*Each contracting Party shall, as far as possible and as appropriate, prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species*". This project has removed five highly damaging invasive alien species from Redonda (black rat, feral goat, casuarina tree, leucaena and Guinea grass) and is helping to transfer the necessary knowledge, skills and contacts to more local persons to support biosecurity for this and other key sites. The project is also helps to deliver Article 8(a,d,f), including eliminating the main threats to, and protecting the entire range of, Redonda's Critically Endangered endemic reptiles (which have already more than tripled in abundance), and Articles 7, 12 and 13. Redonda is biogeographically unique and this project is working towards safeguard a significant proportion of Antigua & Barbuda's biodiversity. As noted in the previous report, the Darwin project was highlighted as an important example of where CARICOM countries are making progress against the Aichi Biodiversity Targets (it contributes to multiple targets, including 1, 5, 9, 12, 13, 15 and 19). This project also honours the Nagoya Protocol on Access and Benefit Sharing requirements and principles. Notably, we have repatriated goats from Redonda to Antigua where this rare breed— which is inferred to be more drought-tolerant than other local breeds— is being conserved, bred and utilized as a genetic resource for livestock farmers.

The Focal Point in Antigua and Barbuda for the CBD, ABS and CITES Management Authority is the Director of Environment, Diann Black-Layne. The DoE is the lead government partner in this project, and our Project Coordinator is based at the DoE head office. Ms Black-Layne provided a letter of support for the Darwin proposal and continues to be kept abreast of project activities and outputs. As further evidence of her interest and support, the DoE secured new GEF funding (2019–2021) to support ongoing management of Redonda, including covering the Project Coordinator's salary.

[1] Graham, N.A.J., Wilson, S.K., *et al.* (2018) Seabirds enhance coral reef productivity and functioning in the absence of invasive rats. *Nature*, 559, 250–253.

## 6. Project support to poverty alleviation

Poverty alleviation is not a major goal of this project because, as explained in the proposal, Redonda is uninhabited and rather remote. However, the reviewer of our first annual report remarked that "*there may well be indirect effects in Antigua & Barbuda of which Redonda is a dependency. The long term goal of establishing the island as a showcase for ecological protection and recovery will require the support and infrastructure of Antigua & Barbuda thereby bringing socio-economic benefits*". There is truth in this. As well as hosting visits by biologists and archaeologists, and the work plan for 2019/2020 includes trialling small group tours from Antigua to Redonda.

## 7. Project support to gender equality issues

The project has been very successful in ensuring women are actively involved in all aspects of project planning and implementation, from junior to senior levels. For example, all four members of the core project management team are women (including the Project Coordinator and lead representatives from FFI, DoE and EAG); the Project Steering Committee has 9 women and 14 men; the protected area management planning team comprised 4 women and 2 men; and most of the ongoing biodiversity monitoring and biosecurity fieldwork in Year 3 was implemented by 5 women and 3 men. Across the project, the gender ratio is close to 50:50.

## 8. Monitoring and evaluation

Regular and impartial monitoring and evaluation were necessary to help this project operate effectively and capture the lessons learnt. The Project Steering Committee (Section 2) met every quarter through Year 3 to review project progress, help to resolve any problems and discuss upcoming activities. From the committee, smaller technical working groups formed to discuss and review specific aspects of the project, such as the marine surveys conducted by FFI, Fisheries Division and DoE in Q2 and Q3.

Progress against all four project outputs was monitored throughout Year 2. Naturally, special attention was paid to monitoring whether any rats or goats remained on Redonda (Output 1). This entailed a number of visits (at least once every quarter, for up to one week per visit) plus a major three-week survey in Q2 to conduct search for the animals and their droppings, tracks and other signs, and use detection tools such as the permanent bait stations, tracking plates, non-toxic lures and camera traps (Activity 1.4, using methods described in the Redonda Biosecurity Plan). The operation to remove the invasive mammals was formally declared a success in July 2018.

Considerable effort was also devoted to measuring project's impacts on the island's wildlife and habitats (Output 2). In Year 1, and even during the project planning stages, we established measures and protocols for monitoring the flora, fauna and their changing environment, including standardised measurements of soil, microclimate, plants, invertebrates, reptiles and birds (Activities 2.1 and 2.2). These were repeated in Years 2 and 3, with the exception of the seabird monitoring transects, which had to be dropped because the increase in vegetation has made it harder to see the ground-nesting seabirds or even locate the routes (but, as in previous years, however, we still completed the total counts of the seabird colonies). The indicators for Outputs 1 and 2 also form the basis of the three main indicators for the overall Outcome, because the removal of invasive alien mammals (indicator 0.1) was recognised as key to the recovery of the native wildlife and their habitat (indicators 0.2 and 0.3). Routine biosecurity monitoring and monitoring of native wildlife and the wider ecosystem will continue through the remainder of 2019 and thereafter by trained local personnel as part of the island's ongoing management as a protected area (Output 3). At the last Redonda Steering Committee meeting, it was agreed that biodiversity monitoring should increase to twice a year to include the wet season as well as the dry season, as different species can be seen at different times of year.

Progress against Output 4 is being measured mainly in terms of the numbers of people trained or taught, according to the indicators on the log frame, but the project team also solicits and listens to feedback from the people involved, including comments received after training workshops and public events, and in response to media articles. The success and usefulness of the outreach programme, training exercises and exchange of knowledge is currently being

tested by repeating the Year 1 public questionnaire survey and competence self-assessment questionnaires, and the findings will be included in the Final Report.

In Year 3, at least 15% of grant expenditure was spent on Monitoring and Evaluation (Section 14), cf. 4% in Year 1 and 10% in Year 2. These figures do not include personnel costs.

## 9. Lessons learnt

Overall the project has gone very well and has accomplished highly ambitious targets, including the major operations to eradicate rats from Redonda and relocate the feral goats (completed by the start of Year 2). These were considerable feats given that the project site is remote, extremely arid, and much of it is very steep and prone to rock falls. Details of our work have been presented in technical reports and manuals and disseminated through regional conferences because they may be of value to other conservation practitioners working on other islands.

Previous annual reports identified several lessons learned, which still stand and need not be repeated here. Aspects that went particularly well in Year 3 were the marine surveys (partly thanks to months of preparation by FFI's regional marine specialist Sophia Steele), protected area management planning (which benefitted from expert guidance from Mike Appleton, Vice Chair for Capacity from the World Commission on Protected Areas), and the diverse and creative public outreach campaign led in Antigua by the Project Coordinator and the EAG.

Our experiences in Year 3 further highlighted the incredible rate at which Caribbean wildlife can rebound on islands cleared of rats and goats. We did not foresee that there could so many new trees within only two years of removing the mammals, for example, or that the endemic ground lizards could increase by six-fold in such a short time. This project certainly shows the value of gathering ample baseline data *before* eradicating invasive alien species, and to monitor the island regularly after the aliens have been eradicated. Fixed point photographs have again proved to be a simple yet very powerful way of monitoring the changing landscape and conveying this to the public, decision makers and other audiences. Annex 4 includes a few examples of the 'before-and-after' photographs taken in fixed points around the island. This lesson is now being applied by FFI and partners to Sombrero Island in Anguilla, which will be cleared of rodents as part of the new project DPLUS086.

Importantly, this project was genuinely wanted by both government and non-government agencies in the host country from the start. Having strong national ownership has enabled the project team to overcome many challenges. For future Darwin projects that aim to tackle invasive alien species in such challenging areas, it may be advisable to delay the actual eradication operation to the second or even third year until and unless the team is confident that enough support is already in place.

Despite careful planning, however, not everything worked perfectly in Year 3 and there were some unexpected surprises. In particular, the team discovered some invasive alien *Leucaena leucocephala* seedlings and clumps of Guinea grass *Megathyrsus maximus*, which had not been encountered during previous visits (although there were historical records of Guinea grass on Redonda). Both species could have been present before this project began but were suppressed by rats and goats. It is not uncommon for the removal of a major alien to create a 'release effect' for another alien, and this is a good reminder of the importance of monitoring islands very closely after removing alien invasive species. We believe we have been successful in removing the plants but will continue to monitor the island in case any seeds were missed.

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

The reviews of our Years 1 and 2 reports were very complimentary about the project design and progress to date and did not appear to require any changes. Our team greatly appreciate the encouraging remarks.

When the grant was awarded, the cover letter pointed out that "*currently few of the indicators have baselines - these will need to be added to allow verification of evidence presented in the first Annual Report*". We duly included the baseline information (chiefly sourced from the

ecological survey by Bell & Daltry, 2012) as footnotes to the log frame in Annex 2 of our Year 1 and Year 2 Annual Reports and repeat them again in Annex 2 of the present report. If the reviewer has any questions about the indicators, we will be happy to answer them.

## 11. Other comments on progress not covered elsewhere

The main issue affecting project design this year was the Redonda Steering Committee's decision to press for the protection of not just Redonda island but a very large expanse of the surrounding sea. While we had always intended to include nearshore waters to create a #ridge to reef' protected area, the proposed area now extends 16 km north and 11 km south of the island, giving a total area of 24,159 hectares. This created two main challenges to our team. First, we had to swiftly assess this vast and relatively unknown marine area to verify whether it is indeed of conservation value and its current uses and impacts, and second, to identify the legal tools and process by which the marine area would be protected in addition to the island. This meant we had to secure more funds for marine surveys and push back our anticipated dates for submitting the protected area nomination document and management plan. As reported in our last annual report, however, we felt this was justified in order to achieve an even greater outcome for biodiversity conservation.

The marine surveys proved rather difficult due to the stronger currents and deeper waters than our Antiguan colleagues were accustomed to, but the findings showed this area to be of outstanding importance for marine biodiversity, including a relatively undisturbed coral bank that extends over 180 $km^2$ and an abundance of turtles, sharks and rays. Happily, this area is under very little pressure from fishing because it is far from other land areas, but it needs protection against possible future dredging, shark fishing and other damaging uses. Managing such a large protected area (huge by Eastern Caribbean standards) will require more personnel and operational funds, but we are looking into remote surveillance tools to help monitor and manage this area, and can see opportunities for dive tourism to help generate additional revenue for the park.

## 12. Sustainability and legacy

The project has become widely known in Antigua as well as Montserrat, Nevis and other islands thanks to widespread media coverage (starting with the press release in Year 1), social media updates, and word-of-mouth. Because the public survey in Year 1 revealed many misconceptions about Redonda - most people knew it simply as a rock with goats - more concerted work took place under Output 4 in Years 2 and 3 to raise awareness of the island's unique and remarkable native wildlife and history, to help pave the way for the island to become a reserve. This diverse campaign included the *Redonda on the Road* show, in which team members took a galley of enlarged photographs of Redonda's wildlife to a range of public venues around Antigua to stimulate discussion (see section 3.1, Activity 4.2). The extensive media coverage, as well as individual and group meetings, has been crucial for communicating with the project's main target audiences – the public and decision makers in Antigua and neighbouring islands – and the project has ridden a wave of support to establish Redonda as a wildlife reserve. Assuming the proposed area is accepted in full by Cabinet in 2019, the Redonda Ecosystem Reserve will become the second largest protected area in the Lesser Antilles and a great testament to Antigua & Barbuda's commitment to the CBD.

We have also recognised the need to share our technical methods and results with ecologists and conservation practitioners more widely, and in 2018 and 2019 we presented our work at a number of regional conferences, including Caribaea Initiative, BirdsCaribbean, Latin American and Caribbean Congress of Conservation Biology, and the 2018 regional meetings of the Critical Ecosystem Partnership Fund and CARICOM. Our technical reports have been widely shared and will be posted online once they have been copy-edited (i.e. before the Final Report is due). Several peer-reviewed publications are already in the public domain, including our contributions to the *IUCN Red List of Threatened Species* (the species accounts for the endemic lizards *Pholidoscelis atratus* and *Copeoglossum redondae*, with the revised account for *Anolis nubilus* ready to be uploaded). The project has already helped inform other restoration and protected area planning projects in UKOTs in this region (including DPLUS060

in Anguilla), and, judging from the enquiries we have received, it has prompted several other countries to investigate whether they too could conserve seabirds and other wildlife by eradicating invasive rats and goats.

The project's exit strategy is still valid. The permanent removal of destructive alien mammals (Output 1) will surely stand as the greatest legacy from this project funded by the Darwin Initiative, having been the biggest threat to the biodiversity of a unique ecosystem. The removal of both goats and rats has already triggered remarkable increases in native wildlife populations and improvements in habitat quality on this degraded and unique site within 24 months (see section 3.3). Thanks to Redonda being remote, uninhabited and difficult to access by boat, the risk of re-invasions by these or other alien species is low and relatively easy to manage through the biosecurity systems established under Activity 1.4.

To see such swift results from conservation activities within such a short time is tremendously rewarding for everyone involved, and our local partners are proud of their parts in this and determined to continue building on this success. This motivation is demonstrated by the successful efforts of the DoE to secure funding from GEF to continue the project for two more years while at the same time identifying national sources of support, e.g. through the new Sustainable Island Resource Framework (SIRF) Fund which was established to provide financing to implement the Environmental Protection and Management Act (2015). The EAG meanwhile has been restoring additional, smaller islands around Antigua, using some of the skills and experiences gained from Redonda: Maiden island was cleared of rats in 2018, and Smith island is scheduled for 2019.

Although the Darwin grant has come to an end, this project and its partnerships are not coming to a halt now, but rather entering a new phase of activities to implement the new protected area management plan. Priorities include zoning the marine protected area, recruiting the protected area manager, planning the reintroduction of burrowing owls, iguanas and other keystone species to Redonda, and placing Redonda on the tentative list of World Heritage Sites. The Secretary General of UNESCO Antigua, who has been on the Redonda Steering Committee since the Darwin project started, has offered to help nominate Redonda under both cultural and natural criteria, and as an outstanding example of ecosystem restoration.

## 13. Darwin identity

The Darwin Initiative name and, where appropriate, logo have been used extensively to date, including on the widely disseminated media interviews and articles, on all project reports, PowerPoints, and other project documents such as agendas and minutes of Steering Committee meetings. Wherever possible, we have included the full clause "with support from Darwin Initiative through UK Government funding" (e.g. see the example magazine article in Annex 4). Indeed, the 'standard acknowledgements clause' FFI and our partners agreed to insert in all materials associated with this project reads as follows "*The Redonda Restoration Programme is a collaborative programme of the Government of Antigua & Barbuda, Environmental Awareness Group (EAG), Fauna & Flora International (FFI), British Mountaineering Council (BMC), Global Wildlife Conservation (GWC), Wildlife Management International Ltd (WMIL) and Island Conservation, with support from Darwin Initiative through UK Government funding, National Fish & Wildlife Foundation, Global Wildlife Conservation, Betty Liebert Trust, Taurus Foundation, US Fish & Wildlife Service, Caribbean Helicopters Ltd and Syngenta Crop Protection AG*." While some editors unfortunately refuse to include the complete list of sponsors, we have been persistent and for the most part successful at ensuring that the Darwin Initiative is named in the most prominent outputs, including the *BBC Wildlife* article published in Q1, most of our social media channels, and all conference presentations.

To further reinforce this relationship and ensure our partners are aware, stickers with the Darwin logo were fixed to all equipment purchased using grant funds, including the project laptop, GPSs, walkie-talkies, etc. This project is well understood by the host organisations (including the Department of Environment), other departments of the Government of Antigua & Barbuda and other participating organisations to be a UK Government-funded project, and that the Darwin Initiative has been the single largest funding source.

## 14. Project expenditure

**Table 1: Project expenditure during the reporting period (1 April 2018 – 31 March 2019)**

| Project spend (indicative) since last annual report | 2018/19 Grant (£) | 2018/19 Total Darwin Costs (£) | Variance % | Comments (please explain significant variances) |
|---|---|---|---|---|
| Staff costs (see below) | | | 0.9 | |
| Project Leader: Dr Jenny Daltry | | | 9.9 | |
| Project Coordinator: Ms Shanna Challenger | | | -10.0 | Not more than 10% difference. Overspend due to delayed start of GEF co-funding for this position. |
| Finance Administrator: Ms Isabel Vique | | | -0.8 | |
| Community Liaison: Ms Natalya Lawrence | | | 10.0 | Not more than 10% difference. Underspend due to co-funding secured for this position from USFWS. |
| Wildlife Officer: Ms Andrea Otto | | | 0.3 | |
| Biosecurity Officer: Mr Tahambay Smith | | | 0.0 | |
| Biosecurity Officer: Mr Sean Lee | | | 0.0 | |
| Consultancy costs | | | 0.0 | |
| Overhead Costs | | | 0.7 | |
| Travel and subsistence | | | 1.5 | |
| Operating Costs | | | -6.0 | |
| Capital items (see below) | | | 0.0 | |
| Monitoring & Evaluation (M&E) | | | -4.6 | |
| Others (see below) | | | 2.6 | |
| Other consumables | | | 2.6 | |
| **TOTAL** | 46,550 | 46,484.01 | | |

# Annex 1: Report of progress and achievements against Logical Framework for Financial Year 2018-2019

| Project summary | Measurable Indicators | Progress and Achievements April 2018 - March 2019 | Actions required/planned for next period |
|---|---|---|---|
| ***Impact***<br><br>**Significant recovery and regeneration of threatened species and habitats on Redonda is a source of national pride and directly informs and inspires other Caribbean nations to eliminate harmful invasive species.** | | Strong signs of ecosystem recovery, as of the end of Year 3, including:<br>• Six-fold increase in the number of Critically Endangered Redonda ground lizards (compared to Year 1 baseline),<br>• Three-fold increase in the number of Critically Endangered Redonda tree lizards (compared to Year 1 baseline).<br>• At least a three-fold increase in butterflies, moths, beetles, crickets and other invertebrates sampled since Year 1.<br>• Over 20-fold increase in vegetation cover and biomass.<br>• Hundreds of new tree saplings – the first new trees to have grown in decades.<br>• First record of bats<br>• Number of bird species seen on the island has increased from 7 to 22, including Audubon's shearwaters.<br><br>The rat eradication, biodiversity monitoring and protected area management planning methods from this project are already being cited and emulated by other projects, e.g.<br>• Darwin Plus project DPLUS060 on Prickly Pear Cays, Anguilla<br>• Pine Cays Rat and Cat Eradication, Turks & Caicos. | [redacted] |

| Project summary | Measurable Indicators | Progress and Achievements April 2018 - March 2019 | Actions required/planned for next period |
|---|---|---|---|
| ***Outcome***<br>**The permanent removal of harmful invasive species triggers the recovery of endemic species, habitats and ecological processes on Redonda, and enhances Antigua & Barbuda's natural capital and conservation capacity.** | 0.1 No invasive mammals remain on Redonda by project end.<br>0.2 Net increase by at least 10% in abundance of fast-breeding native species by Year 3.<br>0.3 Net increase by at least 10% in vegetation cover by Year 3. | 0.1 The last known rat died in early March 2017, and the last goats were removed in April 2017. No invasive mammals have been detected on the island since then, despite frequent surveys using a range of detection tools.<br>0.2 Monitoring using point count methods, validated by more detailed mark-recapture studies, has shown that the density of the endemic Redonda ground lizard *Pholidoscelis atratus* and Redonda tree lizard *Anolis nubilus* (both Critically Endangered) has increased by more than six-fold and three-fold respectively since rats and goats were removed. Invertebrate monitoring data from indicate a more than three-fold increase since Year 1.<br>0.3 Fixed point photographs show vegetation cover has increased by more than 20-fold: Most areas that were bare at the start of the project are now covered in grasses, cacti herbaceous plants and other plants, even at the height of the dry season. One of the most remarkable changes has been in the appearance of hundreds of new native tree saplings in many parts of the island, believed to be the first new trees to have successfully grown here in decades. | Although the Darwin funding ended in March, the project team continues to work together to implement the new Redonda Ecosystem Reserve Management Plan (developed under Output 3). This includes a variety of conservation actions, including ongoing biosecurity and biodiversity monitoring. Resources to continue to manage and monitor Redonda have been committed by the Government of Antigua & Barbuda, GEF, EAG and Betty Liebert Trust, and additional funding has been applied for. |
| **Output 1. Alien invasive vertebrates (rats and goats) successfully removed from Redonda, with systems in place to prevent (re)invasions.** | 1.1 No goats on Redonda by end of Year 2. | All three indicators were achieved in Years 1 and 2 (see previous reports).<br><br>In Year 3, the goats that had been housed at the Veterinary & Livestock Division facility on Antigua were split across an additional two locations to give them more space and reduce the risk of disease outbreaks. Also in Year 3, the project's rat | |

| Project summary | Measurable Indicators | Progress and Achievements April 2018 - March 2019 | Actions required/planned for next period |
|---|---|---|---|
| | 1.2 Rare breed goats from Redonda housed on enclosed government farmland on Antigua by end Year 1.<br>1.3 No rodents on Redonda by end of Year 2. | eradication experts undertook the 'final check' - an intensive island-wide survey for three weeks - that verified the island is rodent-free. This was in line with international best practice to wait at least 12 months (24 in temperate regions) before declaring a rat eradication successful, on the grounds that this would give enough time for any survivors to have multiplied and become more readily detected). Redonda was officially declared rodent-free at the end of the final check, in July 2018 (Q3). | |
| Activity 1.1 Complete Operational Plan and SOPs to remove goats and eradicate rats. | | Completed in Year 1. | |
| Activity 1.2 Capture and transfer goats from Redonda to enclosed government farmland on Antigua. | | Completed in Year 2. | |
| Activity 1.3 Establish baiting grid on Redonda and eradicate rats. | | Completed in Year 1. | |
| Activity 1.4 Establish biosecurity surveillance system to prevent incursions, and monitor Redonda every 2 months to verify no invasive mammals remain. | | Completed (but ongoing, post-project). Biosecurity plan and protocols that were developed in Year 2 continued to be implemented. Biosecurity surveillance visits were conducted at least once every quarter to search the island for invasive mammals, plus additional checks were conducted by team members whenever visiting Redonda for wildlife surveys or other purposes. See section 3.1. | |
| Activity 1.5 Publish technical report(s) detailing the methods, results and any lessons learned from Output 1. | | Underway. The project has produced a suite of illustrated technical reports during the grant period but several of these need to be copy-edited before being posted online. The latest addition in Year 3 is:<br><br>Bell, E.A. & Challenger, S. (2018) *Technical Report on the Final Check Following the Eradication of Black Rats* Rattus rattus *From Redonda (Antigua and Barbuda), June-July 2018*. Report from Wildlife Management International Ltd and Fauna & Flora International to the Redonda Restoration Programme, St John's, Antigua.<br><br>The project's methods for eradicating rats were also published in Year 3 in the following peer-reviewed journal:<br><br>Daltry, J.C. & Bell, E.A. (2018) Can brodifacoum save endangered species? Recent experiences from the West Indies. *Outlooks on Pest Management*, 18, 80–85. | |
| Activity 1.6 Incorporate biosecurity system into the costed management plan for Redonda (re: 3.4). | | Completed. The biosecurity objectives, key tasks and costs have been incorporated into the management plan as part of Activity 3.4. | |
| **Output 2. Monitoring system established to measure the responses of fauna, flora and ecological processes to the removal of alien invasive vertebrates.** | 2.1 Rapid methods devised and established for monitoring short- and long-term changes in major taxa and abiotic characters (in Year 1, tested and refine by Year 3). | Both indicators were achieved:<br>2.1 The rapid monitoring methods that developed in Year 1 were further re-evaluated and refined during Year 3. These cover a wide range of taxa, both terrestrial and marine, as well as their habitat. See section 3.1.<br>2.2 The third round of annual terrestrial surveys was conducted in Q4 using standardised methods. These data are being compared to the baselines in Year | |

| Project summary | Measurable Indicators | Progress and Achievements April 2018 - March 2019 | Actions required/planned for next period |
|---|---|---|---|
| | 2.2 Status of major taxa and abiotic characters monitored as per 2.1 before and after removing the goats and rats (every year). | 1 (and pre-project records where available) to measure changes. See section 3.1.<br>Note that although marine monitoring was not included in the original proposal, the monitoring programme includes transects and photo-quadrats of coral reefs and marine fish near to the island. The project team conducted the first round of marine surveys in Year 1 and a second, longer round of marine surveys in Year 3 (Q2) using funding from Waitt Foundation. | |
| Activity 2.1 Project scientists design and agree standardised methods to monitor birds, reptiles, bats, invertebrates, plants, soil and microclimate. | | Completed. Methods were developed in consultation with local scientists and refined through Activities 2.2 and 2.3. The manual of methods was prepared in Year 1 and updated following fieldwork in Years 2 and Years 3. See section 3.1. | |
| Activity 2.2 Conduct monitoring as per 2.1 during the grant period (before and after removing the goats and rats). | | Completed (but ongoing, post project). Using the agreed standardised methods (2.1), data were collected in Year 3 on the diversity and abundance of birds, reptiles, invertebrates (terrestrial and marine), plants and reef fish. Soil properties were also re-surveyed and analysed. Monitoring of microclimates has ceased since hurricane Maria destroyed the dataloggers (in early Year 2) but will resume pending funding to buy new dataloggers. Monitoring will continue, likely increasing to twice a year (dry season and wet season). | |
| Activity 2.3 Finalise manual detailing the monitoring methods, incorporating lessons learned from 2.2. | | Near-completed. We have a few minor adjustments to make to the manual following the last round of fieldwork in mid-March 2019, including the addition of some birds and invertebrates that had not been recorded in previous years. | |
| Activity 2.4 Publish technical reports detailing the results and lessons learned from Output 2. | | Underway. The project has produced a suite of illustrated technical reports during the grant period but several of these need to be copy-edited before being posted online. Three new reports in Year 3 are:<br><br>Lindsay, K, Daltry, J.C., Challenger, S., Otto, A., Lawrence, S.N. (2019) *Assessment and Survey of the Flora of Redonda Two Years Post-Rat Eradication and Feral Goat Removal.* Report from Natural Resources Management Initiatives to the Redonda Restoration Programme, St. John's, Antigua.<br><br>Steele, S. & Camacho, R. (2018) *Baseline Survey of Redonda's Nearshore Marine Environment*. Fauna & Flora International, Cambridge, UK.<br><br>Thomas, C. (2018) *Redonda Plant Survey*. Report from the Environmental Awareness Group to the Redonda Restoration Programme, St John's, Antigua. | |
| Activity 2.5 Incorporate ecological monitoring plan into the costed management plan for Redonda (re: 3.4). | | Completed. The monitoring objectives, key tasks and costs have been incorporated into the management plan as part of Activity 3.4. | |
| **Output 3. Redonda becomes a protected area in accordance with the Sustainable Island Resource Management Zoning Plan for** | 3.1 Management committee established and operational by end Year 2. | Most of the indicators have been achieved<br>3.1 The Redonda Steering Committee, established in Year 1, is working well, and, as predicted, is evolving into the protected area Technical Advisory Committee and Management Board for Redonda, co-chaired by the Department of Environment | |

| Project summary | Measurable Indicators | Progress and Achievements April 2018 - March 2019 | Actions required/planned for next period |
|---|---|---|---|
| **Antigua & Barbuda, with an effective structure to manage its ongoing ecological recovery and sustainable use.** | 3.2 Redonda designated as an Environmental Protected Area, encompassing the land and surrounding sea by end Year 3.<br>3.3 Management plan prepared (Year 3). | and Fisheries Division. FFI and other partners and stakeholder representatives will continue to serve on the committee for the foreseeable future.<br>3.2 Redonda has not been officially registered as a protected area yet, but is in practice being treated by the government and stakeholders as a strict nature reserve (e.g. it is necessary to seek permission to go to the island or collect specimens, and permission is granted only if the visitors are supervised by a member of the project team). In Year 3, the project team submitted the proposal to Cabinet to establish the Redonda Ecosystem Reserve and conducted a wide-reaching campaign to raise awareness and support for protection. The final decision from Cabinet is now awaited, but we are aware that the proposal is strongly backed by several ministers and is expected to be approved. Indeed, the national press has already leaked the announcement that Redonda is becoming a reserve: https://antiguaobserver.com/redonda-to-be-designated-a-nature-reserve/<br>3.3 Completed. The management plan has been prepared following a participatory process guided by Protected Area Management Expert Mike Appleton, incorporate data, consultations and the various plans (biosecurity plan, biodiversity monitoring plan) from other outputs. The plan is already being implemented but focuses on the next 5 years (see below) | |
| Activity 3.1 Complete stakeholder consultations in Antigua and Montserrat. | | Completed. The project team conducted another visit to Montserrat (plus one to Barbuda) in Year 3 and held numerous small and large meetings with stakeholders on Antigua. See section 3.1. Although the work plan in the proposal indicated consultations would cease after Year 1, it was very necessary to continue this outreach to solicit cooperation on the biosecurity measures (Activity 1.6), foster support for protecting Redonda (Activity 3.2), and engage stakeholders in the management planning process (Activity 3.4). | |
| Activity 3.2 Prepare and submit technical proposal to Cabinet to designate the Redonda Environmental Protected Area (EPA). | | Completed. The nomination document for proposing Redonda as a protected area (under the name “Redonda Ecosystem Reserve”) was submitted to Cabinet in Q4. This took longer than originally anticipated due to the Steering Committee’s interest in taking the opportunity to consider protecting more of the seas around Redonda, as well as the island. As very little was known about the marine area, the project team conducted marine surveys in Q3, assisted with a drop camera, and were able to demonstrate the national and global significance of the surrounding marine ecosystem. (In total, 30 Globally Threatened, 12 Near Threatened species and 19 Data Deficient species have been found in the project site, and more are expected with further research). The area that has now been proposed for protection is a ridge-to-reef reserve covering 24,159 hectares. | |
| Activity 3.3 Quarterly management meetings of the Redonda EPA Management Committee. | | As hoped, the Project Steering Committee has essentially evolved into the protected area Technical Advisory Committee and Management Board and is directing the | |

| Project summary | Measurable Indicators | Progress and Achievements April 2018 - March 2019 | Actions required/planned for next period |
|---|---|---|---|
| | | operations on the island. The committee met every quarter in Year 3. It includes senior representatives from all the government agencies, NGOs and key stakeholders (see Annex 4), co-chaired by the Department of Environment and Fisheries Division. | |
| Activity 3.4 Develop a costed 10-year management plan for the protected area using a participatory process. | | Completed (but as a 5-year management plan). The management plan was prepared in Year 3, drawing on the findings and outputs from other project activities, including the biodiversity monitoring plan and biosecurity plan. Please see Section 3.1 for more details. It proved too difficult to plan for the next *10* years, however, because (a) the terrestrial ecosystem is changing so rapidly and (b) There are still large gaps in our knowledge of much of the marine area that need to be addressed before prescribing how to manage the whole reserve. | |
| **Output 4. National capability to plan, manage and implement and monitor invasive species projects is raised, supported by enhanced technical skills and greater public awareness and cooperation.** | 4.1 At least 20 persons from Antigua trained on invasive species control and apply their skills towards Output 1 (by Year 2)<br>4.2 At least 20 persons from Antigua trained on ecological monitoring and apply their skills towards Output 2 (by end Year 2).<br>4.3 At least 1 local student studies Redonda for postgraduate degree (Years 2 and 3).<br>4.4 At least 5 persons from Antigua gain increased skills and experience in managing projects and conservation sites (by Year 3).<br>4.5 At least 75% of Antiguans, Barbudans and Montserratians know about the project and are able to explain why Redonda merits conservation (end Year 2). | The indicators have been achieved, if not exceeded:<br>4.1 20 Antiguans government and NGO technicians learned and participated directly in the removal of goats and/or rats in Year 1 (see names in Year 1 Annual Report). Further meetings and workshops led by the project team throughout Year 2 introduced more than 30 Antiguan government and NGO technical staff to practical methods for preventing, detecting and eradicating invasive alien species. In Year 3, at least 20 government and NGO technicians took part in workshops and hands-on work to monitor and maintain the permanent bait stations on Redonda (Activity 1.4) and other islands around Antigua. Twelve of these learned how to identify and remove the invasive alien Guinea grass, that was discovered on Redonda in Q4. The training and experience gained from the Darwin project was applied to other sites in Antigua: For example, several of the EAG staff and volunteers planned and successfully implemented the eradication of rats from Maiden Island, a small islet off the West coast of Antigua, in Q1.<br>4.2 More than 30 Antiguans (many of them the same individuals as in 4.1) gained increased knowledge and skills through being involved in designing and implementing the monitoring programme in Years 1 and 2, with technical support from FFI. Many of them practised wildlife monitoring on offshore islands closer to Antigua, but 15 staff and volunteers from the DoE, Fisheries Division, EAG and other organisations participated in the terrestrial and marine data collection on Redonda in Year 3. Two persons undertook a training course in Jamaica in Q4 to improve their wader identification and survey skills. Training and experience gained from the Darwin project was applied to other sites in Antigua: For example, several of the EAG and DoE staff and volunteers planned and successfully implemented a survey of the Barbuda warbler and magnificent frigatebirds on Barbuda in Q4.<br>4.3 Two students studied Redonda in Year 3. Antiguan Shanna Challenger has begun studying the behavioural ecology of boobies on Redonda for her Master of Science degree, with support from seabird specialists at the University of | |

| Project summary | Measurable Indicators | Progress and Achievements April 2018 - March 2019 | Actions required/planned for next period |
|---|---|---|---|
| | | Roehampton, and Antiguan Ruleo Camacho has started developing his Masters study on the corals around Redonda.<br>4.4 From the start of this project, FFI staff have worked alongside more than 30 Antiguans from government agencies, NGOs and the private sector, 16 of whom are members of the Project Steering Committee and most are colleagues from government agencies and NGOs. In Years 2 and 3, more than 20 Antiguans regularly participated in key technical workshops and fieldwork, and gained more expertise in project management, protected area planning and ecosystem restoration. Twelve of the Antiguans (plus two from Anguilla and one from St Vincent) also participated in a three-day training course on protected area management planning organise by the project and delivered by Mike Appleton (Vice-Chair for Capacity, World Commission on Protected Areas, and Director of Protected Areas, Global Wildlife Conservation). Training and experience gained from the Darwin project was applied to other sites in Antigua: For example, the DoE staff have begun developing a management plan for the Mount Obama/ Boggy Peak National Park.<br>4.5 Based on the questionnaire survey conducted in Year 1, most persons knew very little about Redonda at the start of this project. By the end of Year 3, it has become difficult to meet anyone on the islands who has not heard about the project to restore Redonda. To evaluate how much change there has been in knowledge and attitudes, the EAG has just repeated the questionnaire survey that was conducted in Year 1 on Antigua, and the results will be included in the Final Report. | |
| Activity 4.1 Plan multi-media campaign to communicate project to the public on Antigua and Barbuda and neighbouring states. | | Completed in Year 1. | |
| Activity 4.2 Implement campaign, including media releases, signage and phone-in radio shows, and evaluate impact on public. | | Completed. Actions in Year 3 included multiple articles in local and international newspapers and magazines, national television interviews, conference papers (presented at two regional conferences), and much more. Among the project's more innovative public outreach activities in Year 3 were 'Redonda on the Road" – a roving galley of stunning images from the project presented at more than a dozen public venues such as the national museum, Independence Food Fair and Arbour Day Fair. The project also invited the presenters of the ABS TV show "You For A Day" to step into the Project Coordinator's shoes and try their hand at monitoring wildlife and biosecurity checks on Redonda: this episode was broadcast nationally and through live streaming in Q3. It is increasingly difficult to find a resident who has *not* heard about the project. Feedback received to date from Antigua and other islands has been very positive and supportive. The impact of this activity is being more formally assessed by repeating the questionnaire survey from 4.1 (the data collected in Q4 are still being analysed and will be included in the Final Report). | |

| Project summary | Measurable Indicators | Progress and Achievements April 2018 - March 2019 | Actions required/planned for next period |
|---|---|---|---|
| Activity 4.3 Analyse training needs of field personnel. | | Completed in Year 1. | |
| Activity 4.4 Conduct training classes and on-the-job mentoring for local personnel participating in eradication and biosecurity activities (re Output 1). | | Completed. Over 20 Antiguans government and NGO technicians participated in the removal of invasive mammals in Years 1 and 2 and participating in the biosecurity workshops. Further training and mentoring in Year 3 again reached more than 20 individuals, many of whom received hands-on experience in checking and maintaining permanent bait stations on Redonda and other Antiguan islands and/or learned how to identify and destroy invasive plants (See Section 3.1). Using the training and experience they had gained from this project, several of the EAG staff and volunteers planned and successfully implemented the eradication of rats from Maiden Island, a small islet off the West coast of Antigua, in Q1. | |
| Activity 4.5 Conduct training classes and on-the-job mentoring for local personnel participating in biodiversity monitoring (re Output 2). | | Completed. More than a dozen Antiguans were involved in designing and implementing the monitoring programme, with training and support from FFI, in Years 1 and 2. Fifteen individuals participated in terrestrial and marine surveys in Year 3, including government staff, NGO staff and students (Activity 2.2), with mentoring from the Project Leader and other biologists affiliated to this project. Two nationals – Shanna Challenger and Natalya Lawrence – also undertook more advanced training on wader surveys and identification at a one-week training course run by BirdsCaribbean in Jamaica in Q4. | |
| Activity 4.6 Local technicians participate in project meetings and key field activities with FFI training and mentoring where needed. | | Completed. Well over 30 local persons participated in project management and implementation in Years 1 and 2, including 16 Antiguans on the Project Steering Committee (closely involved in most aspects of project planning and evaluation) plus others invited to take part in key workshops. In Year 3, 19 Antiguans participated in fieldwork as well as protected area planning and other technical workshops.<br>At the request of technical staff from both the government and EAG, FFI organised a special 3-day training class for 15 individuals on protected area management planning in Q4, which was delivered by Mike Appleton (WCPA/GWC). Two staff from the Anguilla National Trust attended the course to assist them with protected area management planning under DPLUS0060 in Anguilla. | |
| Activity 4.7 Evaluate impact of 4.4–4.6 on the competences of local personnel in government and NGO sectors. | | Underway. We decided to complete the protected area management planning course and final round of monitoring (in February and March 2019) before re-assessing the competences of personnel who gained experience and training from this project. We will complete the study and present the results in the Final Report. | |
| Activity 4.8 Student research on Redonda's biodiversity and management for postgraduate degree(s). | | Underway. In Year 2 Shanna Challenger began studying the behavioural ecology of boobies on Redonda for her MSc degree, with support from seabird specialists at the University of Roehampton. In Year 3, fellow Antiguan Ruleo Camacho has started developing his MSc study on the corals around Redonda. Ms Challenger is expected to work on this full time from September 2019 onwards and submit her thesis in 2020 or early 2021. | |

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

| Project summary | Measurable Indicators[2] | Means of verification | Important Assumptions |
|---|---|---|---|
| **Impact:**<br>Significant recovery and regeneration of threatened species and habitats on Redonda is a source of national pride and directly informs and inspires other Caribbean nations to eliminate harmful invasive species. | | | |
| **Outcome:**<br>The permanent removal of harmful invasive species triggers the recovery of endemic species, habitats and ecological processes on Redonda, and enhances Antigua & Barbuda's natural capital and conservation capacity. | 0.1 No invasive mammals remain on Redonda by project end.<br>0.2 Net increase by at least 10% in abundance of fast-breeding native species by Year 3.[3]<br>0.3 Net increase by at least 10% in vegetation cover by Year 3.[4] | 0.1 Biosecurity monitoring datasheets and quarterly reports.<br>0.2 Biodiversity monitoring data and reports.<br>0.3 Fixed point photographs and vegetation plots. | Recent scientific research is correct in identifying rats and goats as the primary drivers of biodiversity loss on Redonda, and that at least some of these changes are reversible if the aliens are removed. |
| **Outputs:**<br>1. Alien invasive vertebrates (rats and goats) successfully removed from Redonda, with systems in place to prevent (re)invasions. | 1.1 No goats on Redonda by end of Year 2.[5]<br>1.2 Rare breed goats from Redonda housed on enclosed government farmland on Antigua by end Year 1.[6] | 1.1 Monitoring reports and site visits by project biologists and biosecurity personnel.<br>1.2 Photographs and stock books. | Rats on Redonda are susceptible to the same bait and baiting methods that have been successfully used on other Caribbean islands.<br>No unusual and severe weather events during critical stages (this project will |

[2] The following notes have been inserted in response to the reviewer requesting more details of the pre-project baselines for the project indicators (see section 10) when the grant was approved. We recognise the importance of this request, but fear most of the following details are too cumbersome to insert into the log frame cells above. We hope presenting more detailed information in footnotes is an acceptable solution:

[3] Comparisons will be made to the pre-project baseline data in Bell & Daltry (2012) which included: (i) Density estimates of the endemic Redonda ground lizard *Pholidoscelis atrata* (146.9 per hectare) and Redonda tree lizard *Anolis nubilus* (770.9 per hectare) obtained from point counts in the 'safe zone' at the top of the island; (ii) Total numbers of nesting seabirds (West Indian red-billed tropic bird: 30 pairs; bridled tern: 41 pairs; brown noddy: 31 pairs; brown booby: 774 pairs; masked booby: 164 pairs; red-footed booby: 150 pairs; magnificent frigatebird: 119 pairs); (iii) Total number of land bird species (2 species only) and pairs (peregrine falcon: 1 non-resident pair; and zenaida doves: 2 pairs). For invertebrates and other taxa that haven't been surveyed before, net changes in abundance and diversity will be measured by comparing samples from Years 1 and 3 (Activity 2.2).

[4] Pre-project satellite images and photographs show not more than 1% of the island has permanent vegetation cover (mainly trees *Ficus citrifolia* and small patches of cacti *Opuntia* spp. and *Aloe vera*), while ephemeral weedy herbs and grasses form a thin layer across 20% of the island after rain. Changes are to be measured by comparing fixed point photographs in Years 1 and 3 (Activity 2.2) and, if available, satellite images.

[5] Pre-project baseline of an estimated 62–65 feral goats present on Redonda (Bell & Daltry, 2012).

[6] Pre-project baseline of zero goats of this breed being kept on government land at the project start.

| | | | |
|---|---|---|---|
| | 1.3 No rodents on Redonda by end of Year 2.[7] | 1.3 Monitoring reports and site visits by project biologists and biosecurity personnel. | avoid conducting important activities during the hurricane season, especially August through October). |
| 2. Monitoring system established to measure the responses of fauna, flora and ecological processes to the removal of alien invasive vertebrates. | 2.1 Rapid methods devised and established for monitoring short- and long-term changes in major taxa and abiotic characters (in Year 1, tested and refined by Year 3).[8]<br>2.2 Status of major taxa and abiotic characters monitored as per 2.1 before and after removing the goats and rats (every year). | 2.1 Biodiversity monitoring manual.<br>2.2 Data and annual monitoring reports. | Long term monitoring strategy accurately predicts the future human and other resources available to implement it. |
| 3. Redonda becomes a protected area in accordance with the Sustainable Island Resource Management Zoning Plan for Antigua & Barbuda, with an effective structure to manage its ongoing ecological recovery and sustainable use. | 3.1 Management committee established and operational by end Year 2.<br>3.2 Redonda designated as an Environmental Protected Area, encompassing the land and surrounding sea by end Year 3.<br>3.3 Management plan prepared (Year 3). | 3.1 Redonda Management Committee ToR and meeting minutes.<br>3.2 Official designation of the protected area.<br>3.3 Redonda Management Plan (to at least final draft form). | Continued cooperation among stakeholders.<br><br>Government willingness to protect Redonda, in accordance with its own national land use plan and legislation. |
| 4. National capability to plan, manage and implement and monitor invasive species projects is raised, supported by enhanced technical skills and greater public awareness and cooperation. | 4.1 At least 20 persons from Antigua trained on invasive species control and apply their skills towards Output 1 (by Year 2).[9]<br>4.2 At least 20 persons from Antigua trained on ecological monitoring and apply their skills towards Output 2 (by end Year 2).[10] | 4.1 Training workshop and field reports. Names of trainees participating in fieldwork. Self-assessment competence questionnaires by the trainees, and appraisals by trainers and field team leaders.<br>4.2 As 4.1.<br>4.3 Student research thesis/ theses. | Trained expertise remains in Antigua & Barbuda.<br><br>Increased knowledge results in positive attitudes and behaviours. |

[7] Pre-project baseline of an estimated 5,500 black rats present on Redonda at the project start (Bell & Daltry, 2012, 2016).

[8] No previous monitoring programme was prescribed or implemented for any aspect of Redonda's biodiversity.

[9] At the project start, only five local persons (all affiliated to the EAG) were known to have had previous advanced skills and experience of conducting rat eradications and/or rodent biosecurity in natural landscapes.

[10] At the project start, around 8 persons (most of them EAG staff or volunteers) were known to have had previous advanced skills and experience of surveying and monitoring wildlife on offshore islands.

| | | | |
|---|---|---|---|
| | 4.3 At least 1 local student studies Redonda for postgraduate degree (Years 2 and 3).<br>4.4 At least 5 persons from Antigua gain increased skills and experience in managing projects and conservation sites (by Year 3).<br>4.5 At least 75% of Antiguans, Barbudans and Montserratians know about the project and are able to explain why Redonda merits conservation (end Year 2).[11] | 4.4 Before and after self-appraisals by participating government and NGO staff.<br>4.5 Interviews of representative samples of general public (out of the total of approximately 90,000 on Antigua, Barbuda and Montserrat). | |

**Activities** (each activity is numbered according to the output that it will contribute towards, for example 1.1, 1.2 and 1.3 are contributing to Output 1)

1.1 Complete Operational Plan and SOPs to remove goats and eradicate rats
1.2 Capture and transfer goats from Redonda to enclosed government farmland on Antigua.
1.3 Establish baiting grid on Redonda and eradicate rats.
1.4 Establish biosecurity surveillance system to prevent incursions, and monitor Redonda every 2 months to verify no invasive vertebrates remain
1.5 Publish technical report(s) detailing the methods, results and any lessons learned from Output 1.
1.6 Incorporate biosecurity system into the costed management plan for Redonda (re: 3.4)

2.1 Project scientists design and agree standardised methods to monitor birds, reptiles, bats, invertebrates, plants, soil and microclimate.
2.2 Conduct monitoring as per 2.1 during the grant period (before and after removing the goats and rats).
2.3 Finalise manual detailing the monitoring methods, incorporating lessons learned from 2.2.
2.4 Publish technical reports detailing the results and lessons learned from Output 2
2.5 Incorporate ecological monitoring plan into the costed management plan for Redonda (re: 3.4)

3.1 Complete stakeholder consultations in Antigua and Montserrat.
3.2 Prepare and submit technical proposal to Cabinet to designate the Redonda Environmental Protected Area (EPA)
3.3 Quarterly management meetings of the Redonda EPA Management Committee.
3.4 Develop a costed 10-year management plan for the protected area using a participatory process.

4.1 Plan multi-media campaign to communicate project to the public on Antigua and Barbuda and neighbouring states
4.2 Implement campaign, including media releases, signage and phone-in radio shows, and evaluate impact on public

[11] Based on the questionnaire survey conducted in Year 1, most persons knew little about Redonda at the start of this project (e.g. far fewer than half were aware it has endemic reptiles, or supports breeding colonies of the national bird, the magnificent frigatebird). We can safely assume 0% of the population knew of this project prior to 2016.

4.3 Analyse training needs of field personnel.
4.4 Conduct training classes and on-the-job mentoring for local personnel participating in eradication and biosecurity activities (re Output 1)
4.5 Conduct training classes and on-the-job mentoring for local personnel participating in biodiversity monitoring (re Output 2)
4.6 Local technicians participate in project meetings and key field activities with FFI training and mentoring where needed.
4.7 Evaluate impact of 4.4–4.6 on the competences of local personnel in government and NGO sectors.
4.8 Student research on Redonda's biodiversity and management for postgraduate degree(s).

Other Project Management activities:-
X.1 Project inception meeting
X.2 Project Steering Committee established and meets regularly to oversee project activities
X.3 Project biannual reports/ donor technical and financial reports
X.4 Monthly financial accounts
X.5 End of project Audit

# Annex 3: Standard Measures

### Table 1 Project Standard Output Measures

| Code No. | Description | Gender of people | Nationality of people | Year 1 Total | Year 2 Total | Year 3 Total | Total to date | Total planned during the project |
|---|---|---|---|---|---|---|---|---|
| 2 | Number of people to attain Masters qualification (MSc, MPhil etc.). | 1 female, 1 male | Antiguan | 0 | 1[12] | 1[13] | 2 | 1 |
| 6A | Number of people to receive other forms of education/ training. | 18 female, 24 male | 38 Antiguan<br>1 Vincentian<br>1 St Kittian<br>2 Anguillian[14] | 30 | 30 | 21 | 42 | 30+ |
| 7 | Number of different types of training materials to be produced for use by host country. | - | - | 0 | 0 | 1[15] | 1 | 1 |
| 9 | Number of species/ habitat management plans or action plans produced for implementing agencies in the host country. | - | - | 0 | 1[16] | 1[17] | 2 | 2 |
| 10 | Number of individual field guides/ manuals to be produced to assist work related to species identification, classification and recording. | - | - | 0 | 1[18] | 1[19] | 2 | 3 |

[12] One student studying the behavioural ecology of Redonda seabirds for her MSc degree.
[13] One student developing his thesis topic on the reefs around Redonda.
[14] In addition to West Indian trainees, in 2017, FFI contracted 6 British (2 female, 4 male) and 2 Irish (1 female, 1 male) interns who also each spent a minimum of 5 weeks on Redonda and received advanced training on goat removal and art eradication techniques.
[15] Protected Area Management Planning Manual (and accompanying training powerpoint package) provided by Mike Appleton (Vice-Chair of Capacity, World Commission on Protected Areas) as part of the Darwin project.
[16] Bell, E.A., Challenger, S. & Daltry, J.C. (2017) *Biosecurity Plan, Redonda (Antigua and Barbuda).* Redonda Restoration Programme, St John's, Antigua.
[17] Redonda Ecosystem Reserve Management Plan (2019).
[18] Janzan, S. (2017) *Biodiversity Monitoring Manual: First Edition*. Prepared for the Redonda Restoration Programme by Fauna & Flora International, Cambridge, UK. (NB, We do not count revised editions as separate outputs).
[19] Lindsay, K, Daltry, J.C., Challenger, S., Otto, A., Lawrence, S.N. (2019) *Assessment and Survey of the Flora of Redonda Two Years Post-Rat Eradication and Feral Goat Removal*. Redonda Restoration Programme, St. John's, Antigua. (Annex contains photos for identification purposes).

| Code No. | Description | Gender of people | Nationality of people | Year 1 Total | Year 2 Total | Year 3 Total | Total to date | Total planned during the project |
|---|---|---|---|---|---|---|---|---|
| 11A | Number of papers to be published in peer reviewed journals. | - | - | 3[20] | 0 | 1[21] | 4 | 4 |
| 11B | Number of papers to be submitted to peer-reviewed journals. | - | - | 0 | 1 | 0 | 1 | 1 |
| 12A | Number of computer-based databases to be established and handed over to the host country. | - | - | 1[22] | 0 | 7[23] | 8 | 3 |
| 13A | Number of species reference collections to be established and handed over to the host country. | - | - | 0 | 0 | 2[24] | 2 | 2 |
| 14B | Number of conferences/ seminars/ workshops attended at which findings from Darwin project work will be presented/ disseminated. | - | - | 1[25] | 3[26] | 1 (+2)[27] | 5 (+2) | 4 |
| 20 | Estimated value (£'s) of physical assets to be handed over to host country. | - | - | £10,000[28] | £3,700[29] | £5,000[30] | £18,700 | £10,000 |

[20] We erroneously reported only 2 peer-reviewed publications in Year 1 and hereby add: Daltry, J.C. (2016) *Copeoglossum redondae*. In *The IUCN Red List of Threatened Species 2016*: e.T47102774A47102780 (published Q2, Year 1).

[21] Not including the brief, non-peer reviewed news item published in *Oryx – the International Journal of Conservation* in 2018.

[22] Bait station database.

[23] Databases on lizards, birds, terrestrial invertebrates, soil samples, marine fish, corals and fixed point photographs.

[24] Invertebrates and lichens.

[25] Regional workshop on Invasive Alien Species organised by RSPB, Montserrat, 2016.

[26] Regional conferences of BirdsCaribbean, Cuba; Caribaea Initiative, St Kitts; CEPF and CARICOM meetings, Jamaica.

[27] Regional conference of LACCCB in Trinidad. Also, 2 papers accepted for the forthcoming Caribaea Initiative conference in the Dominican Republic.

[28] Camping equipment, computer, survey equipment, rodenticide, goat pens (purchased using Darwin grant and matched funding).

[29] Camping equipment and survey equipment (purchased using Darwin grant and matched funding).

[30] Camping equipment, microscope, camera, drop camera and other survey equipment (purchased using

| Code No. | Description | Gender of people | Nationality of people | Year 1 Total | Year 2 Total | Year 3 Total | Total to date | Total planned during the project |
|---|---|---|---|---|---|---|---|---|
| 22 | Number of permanent field plots and sites to be established during the project and continued after Darwin funding has ceased. | - | - | 135 | 25 | 0 | 160 | 150 |
| 23 | Value of resources raised from other sources (e.g., in addition to Darwin funding) for project work. | - | - | £202,669 [31] | £40,000 [32] | £87,050 [33] | £327,719 | £280,735 |

Darwin grant and matched funding).

[31] National Fish & Wildlife Foundation, Taurus Foundation, Global Wildlife Conservation, Disney Conservation Fund, private sponsors.

[32] Waitt Foundation, Taurus Foundation, Disney Conservation Fund, USFWS NMBCA, private sponsors.

[33] GEF, Taurus Foundation, private sponsors.

**Table 2 Publications**

| Title | Type (e.g. journals, manual, CDs) | Detail (authors, year) | Gender of Lead Author | Nationality of Lead Author | Publishers (name, city) | Available from (e.g. weblink or publisher if not available online) |
|---|---|---|---|---|---|---|
| Can brodifacoum save endangered species? Recent experiences from the West Indies | Journal | Daltry, J.C. & Bell, E.A. (2018) | Female | UK | *Outlooks on Pest Management* (vol. 18, pp. 80–85), Research Information Ltd., UK | https://www.researchgate.net/publication/324675566_Can_Brodifacoum_Save_Endangered_Species_Recent_Experiences_from_the_West_Indies |
| Redonda recovers rapidly after rodent and goat removal | Journal (news item) | Hochbach, J. (2018) | Female | UK | *Oryx—the International Journal of Conservation* (vol. 52, p. 605), Cambridge University Press, UK | https://www.cambridge.org/core/journals/oryx |
| Recovery of an island ecosystem after eradication of rats and goats: the lizards of Redonda | Conference Proceedings | Herrel, A., Losos, J., Daltry, J., Challenger, S. & Donihue, C. (2018) | Male | Belgium | Caribaea Initiative, France | https://caribaea.org/en/ |
| Early impacts of invasive species removal on a remote Caribbean island ecosystem | Conference Proceedings | Challenger, S., Steele, S., Daltry, J., Lawrence, N., Bell, E., Jeffery Brown, H. & Haverson, P. (2018) | Female | Antiguan | Latin America and Caribbean section, Society for Conservation Biology, Washington DC, USA. | https://conbio.org/groups/sections/latin-america-caribbean |

# Annex 4 Onwards – supplementary material (optional but encouraged as evidence of project achievement)

Appended to this report are:-

1) List of Project Steering Committee members and their affiliations
2) A selection of photographs from Year 3
3) Article published in the *Caribbean Compass* in Q2

Reports and other materials mentioned in this report can be provided on request.

### 1) List of Project Steering Committee members and their affiliations

| Name | Gender | Position | Institution | Nationality (Usual base) |
|---|---|---|---|---|
| Elizabeth 'Biz' Bell | Female | Senior Ecologist | Wildlife Management International Ltd (WMIL) | UK and New Zealand |
| Dr Karl Campbell | Male | Program Director | Island Conservation | Australia (Galapagos) |
| Shanna Challenger | Female | Redonda Programme Coordinator | Environmental Awareness Group/ Fauna & Flora International/ Department of Environment | Antigua & Barbuda |
| Dr Brian Cooper | Male | Head, Environment Unit<br>Board Member | National Parks Authority<br>Environmental Awareness Group (EAG) | UK and Antigua & Barbuda |
| Dr Jenny Daltry | Female | Head of Caribbean | Fauna & Flora International (FFI) | UK |
| Dr Tubal Edwards | Male | Chief Veterinary Officer | Veterinary and Livestock Division (VLD), Ministry of Agriculture | Antigua & Barbuda |
| Arica Hill | Female | Executive Director | Environmental Awareness Group | Antigua & Barbuda |
| Dr Helena Jeffery-Brown | Female | Technical Coordinator | Department of Environment (DoE) | Antigua & Barbuda |
| Astley Joseph | Male | Deputy Director | Department of Agriculture, Ministry of Agriculture | Antigua & Barbuda |
| Victor L. Joseph | Male | 1) Seabird Monitor<br>2) Science Teacher | 1) Environmental Awareness Group<br>2) Claire Hall Secondary School | Antigua & Barbuda |
| Natalya Lawrence | Female | Project Coordinator, OICP | Environmental Awareness Group | Antigua & Barbuda |
| Kevel Lindsay | Male | Consultant | Independent | Antigua & Barbuda |
| Adam Long | Male | Peak Area Access Officer<br>Director | British Mountaineering Council (BMC)<br>Access Techniques Ltd | UK |
| Tricia Lovell | Female | Senior Fisheries Officer | Fisheries Division, Ministry of Agriculture | Antigua & Barbuda |

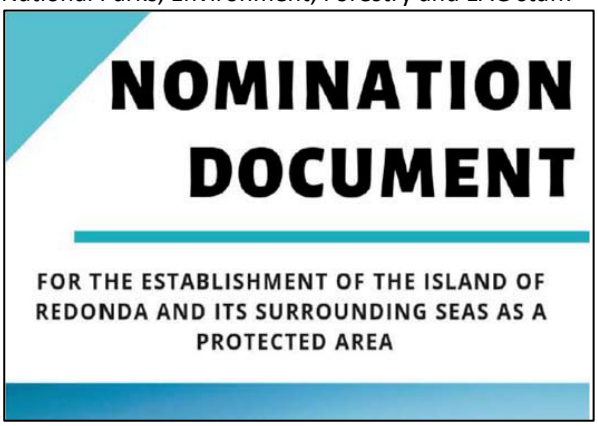
| Name | Gender | Position | Institution | Nationality (Usual base) |
|---|---|---|---|---|
| Jedidiah Maxime | Male | Director | Department of Agriculture | Antigua & Barbuda |
| Dr Reg Murphy | Male | 1) Director of Heritage<br>2) Secretary General | 1) National Parks Authority<br>2) UNESCO, Antigua | Antigua & Barbuda |
| Andrea Otto | Female | 1) Volunteer/ Field Biologist<br>2) Biology Teacher | 1) Environmental Awareness Group<br>2) Claire Hall Secondary School | Antigua & Barbuda |
| Joseph Prosper | Male | Acting Director | National Archives | Antigua & Barbuda |
| Greg Scott | Male | Chief Pilot | Caribbean Helicopters Ltd | Canada (Antigua & Barbuda) |
| Tahambay Smith | Male | President | Environmental Awareness Group | Antigua & Barbuda |
| Sophia Steele | Female | Eastern Caribbean Project Coordinator | Fauna & Flora International (FFI) | St Vincent & the Grenadines (Antigua & Barbuda) |
| Adriel Thibou | Male | Senior Forestry Officer | Forestry Unit, Ministry of Agriculture | Antigua & Barbuda |
| Ashton Williams | Male | 1) Board Member<br>2) Dive Operator | 1) Environmental Awareness Group<br>2) Private company | St Kitts & Nevis (Antigua & Barbuda) |

## 3) A selection of photographs from Year 3 (all photos by J. Daltry/FFI unless stated otherwise)

The Project Steering Committee continued to meet at least once every quarter to review and plan key tasks.

Protected area planning meeting session with senior National Parks, Environment, Forestry and EAG staff.

Protected area management planning course in Q4, including two trainees from Anguilla's DPLUS060.




The formal proposal to Cabinet to protect Redonda was prepared, along with the management plan.

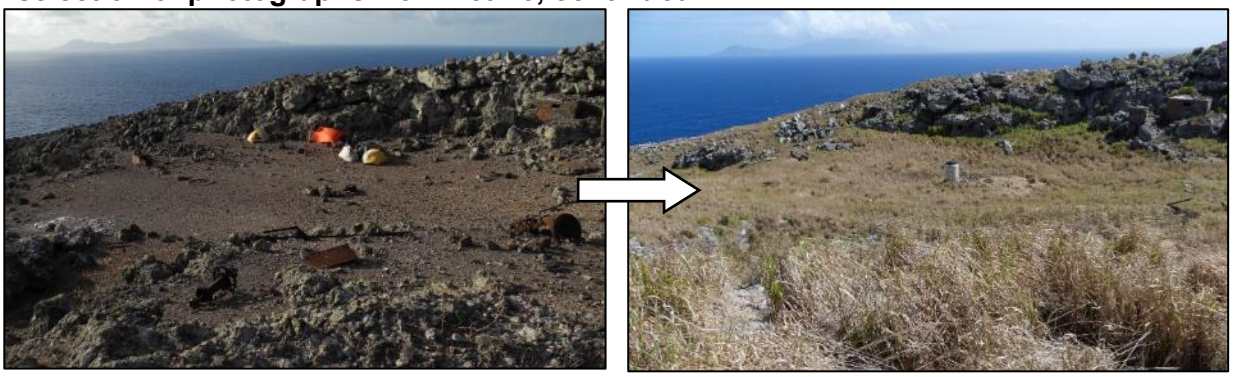
Quarterly biosecurity surveillance, using bait stations and other tools to combat incursions (S. Janzan/ FFI).

Antiguan botanist Kevel Lindsay uprooting clumps of invasive alien Guinea grass in Q4.

One of the 39 permanent bait stations to detect and prevent future incursions by rodents.

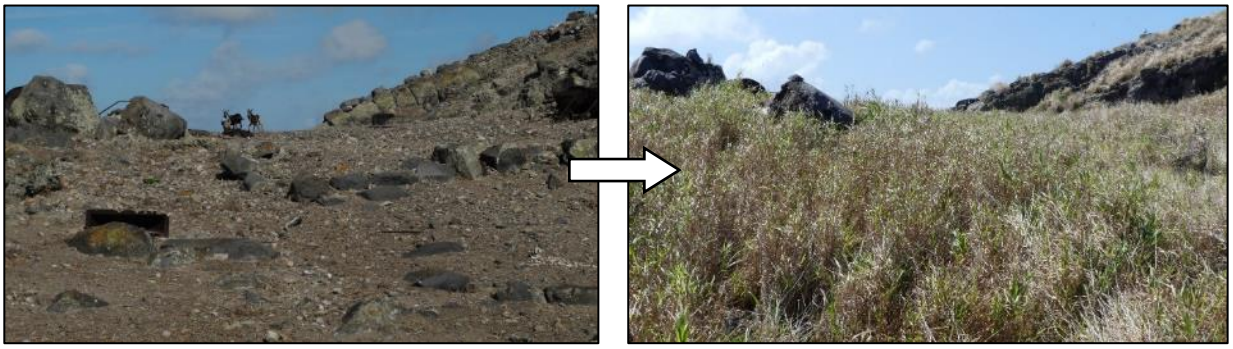
Various tools, including tracking tunnels baited with peanut butter, confirmed the island is rat-free.

## A selection of photographs from Year 3, *continued*



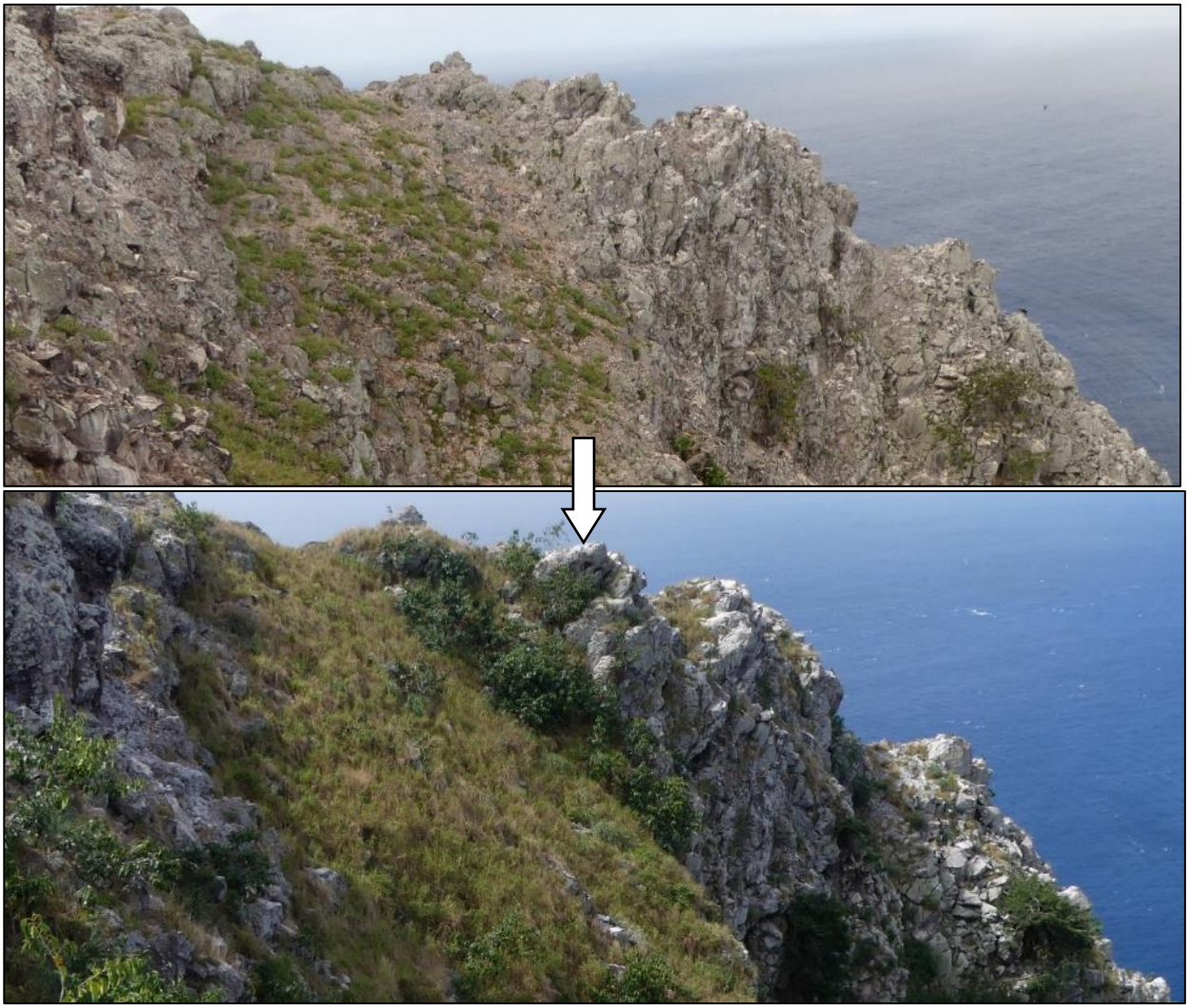
Redonda before rats and goats were removed. (Note the project camp).

Redonda in the dry season in March 2019, 24 months after removing rats and goats.



Redonda before rats and goats were removed. (Note the goats in the centre).

Redonda in the dry season in March 2019, 17 months after removing rats and goats.



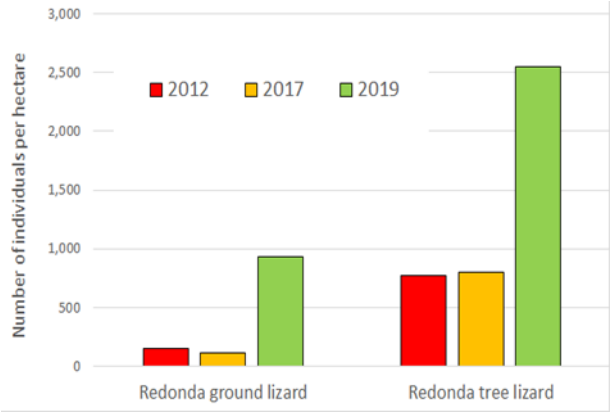
Western Ridge of Redonda in the dry season. Above: March 2017; Below: March 2019, 24 months after rats and goats were removed. Note the increase in *Ficus* trees (dark green foliage).

## A selection of photographs from Year 3, *continued*

One of the many native shrubs to have appeared since rats and goats were eradicated.

Elizabeth Bell inspects some *Ficus citrifolia* saplings that have sprung up since 2017 (S. Janzan/FFI).

The endemic and Critically Endangered Redonda tree lizards (left) and Redonda ground lizards (right) have increased by more than three-fold and six-fold respectively since this restoration programme began.




Graphs showing the increase in native lizards.

Soil analysis on Redonda in Q4.


Monitoring using pitfalls and malaise traps points to a three-fold increase in invertebrate abundance since rats and goats were removed from Redonda, including endemics as well as common and widespread species.

## A selection of photographs from Year 3, *continued*

The largest marine survey around Redonda to date was carried out in mid-2018 (S. Steele, FFI).

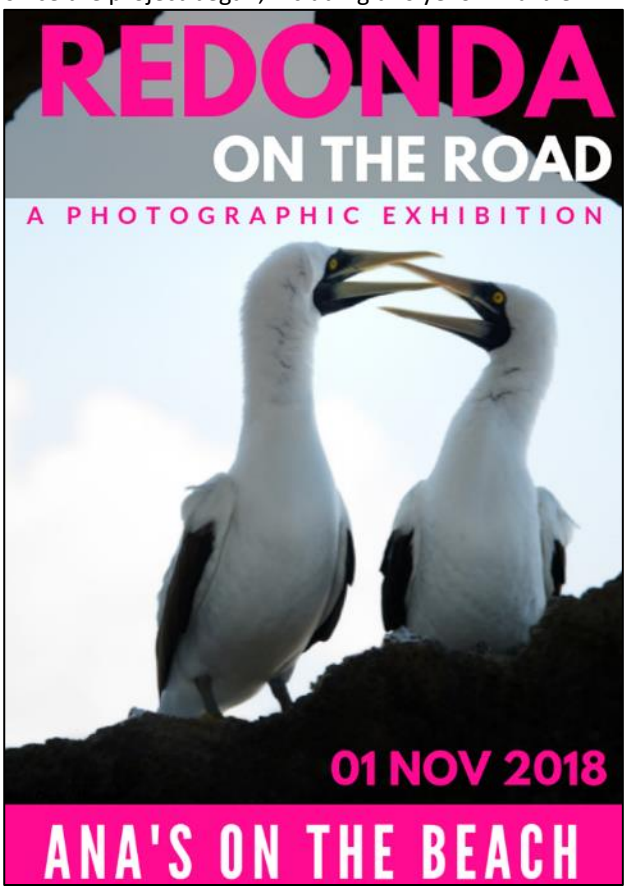
The seas around Redonda contain numerous adult hawksbill turtles (E. Marshall/FFI).

Magnificent frigatebirds and other seabirds are reproducing well in the absence of rats and goats.

Thirteen more species of birds have seen on Redonda since the project began, including this yellow warbler.


The Project Coordinator and EAG Executive Director discussing Redonda on national radio Pointe FM.

Local children viewing images from Redonda (S. Challenger)




Advert for the roving "Redonda on the Road" exhibition to raise awareness of the island's wildlife.

### 3) Article published in the *Caribbean Compass* in Q2

Authored by Tim Knight from the FFI Communications Department.

# Removal of Rats and Goats Transforms Redonda

*by Tim Knight*

If conservationists had waved a magic wand, the results could hardly have been more spectacular. Within 12 months of removing goats and thousands of rats from Redonda, this Caribbean island has experienced a miraculous transformation.

Since the ambitious restoration programme reported in the January issue of *Compass* (see "A Dying Island Given a Second Chance at Life" on page 11 at www.caribbeancompass.com/online/january18compass_online.pdf), the rock of Redonda has been transformed from an inhospitable lunar landscape to a greener haven. More importantly, the unique plants and animals native to this isolated, uninhabited outpost of Antigua & Barbuda are making a rapid recovery after being freed from an alien invasion.

The evocatively named Redonda Ground Dragon (*Pholidoscelis atrata*), a black lizard found nowhere else on the planet, has doubled in number — just one of the many beasts that have been pulled back from the brink of extinction by removing predatory black rats and plant-devouring goats.

In less than a year, numbers of the equally rare Redonda tree lizards have tripled, hundreds of new trees have sprung up, land birds have increased tenfold, and the island's globally important seabird colonies — including Magnificent Frigatebirds and several booby species — are having their best breeding year on record.

Speaking on behalf of the Department of the Environment, Dr. Helena Jeffery Brown said: "The Government of Antigua and Barbuda considers the return to life of Redonda as a shining beacon in our collective efforts towards ecosystem restoration and biodiversity conservation that will bring us another step closer to attaining some of the Aichi Biodiversity Targets."

The project's coordinator, Shanna Challenger, of the Environmental Awareness Group and Fauna & Flora International, added, "This has been the opportunity of a lifetime — witnessing the rebirth of an island. Changes forecasted to happen in five years occurred within months.

*—Continued on next page*

GREG SCOTT / CARIBBEAN HELICOPTERS

ELIZABETH BELL / WML

JENNY DALTRY / FFI

*In just a year, the removal of goats and rats from Redonda has allowed native plants and animals to flourish on this former 'lunar landscape'. The project's Isabel Vique and Shanna Challenger admired one of the re-emerging trees in March*

—Continued from previous page

Our conservation efforts really show the benefits of invasive species removal on Caribbean island ecosystems."

**Blood, sweat, toil and teamwork**

In the field of conservation, where successful outcomes can take years if not decades to materialize, the spectacular results on Redonda appear remarkably swift.

The reality, of course, is that this "overnight" transformation was a long time in the making. It took seven months of blood, sweat, toil and — above all — teamwork to catch dozens of nimble goats and remove over 6,000 rats from every inch of Redonda's rugged terrain. This Caribbean island makeover involved meticulous planning, ingenuity, and edge-of-the-seat manoeuvres that included abseiling down sheer cliff faces to lay down rat bait and — thanks to the skilled pilots of Caribbean Helicopters Ltd — landing equipment in very tight spots.

*Magnificent Frigatebird chicks in their nest on a ficus tree. The island's globally important seabird colonies are now having their best breeding year on record*

New Zealand-based Wildlife Management International Limited led the rat eradication team. "We have over 30 years of experience in clearing invasive species from islands," said ecologist Elizabeth (Biz) Bell, "but having a ground team, rope access team and helicopter team using a combination of bait stations and scattering by hand to successfully target all of the rats makes the Redonda project unique."

The British Mountaineering Council played a vital role in ensuring that even the steepest cliffs could be reached. Safety was paramount, as CEO Dave Turnbull recalls: "The volcanic cliffs of Redonda presented an extremely challenging environment for the climbers to operate in; the BMC was very pleased to support this important conservation project and help ensure the safety of the team throughout the work."

The safe removal of the malnourished herd of rare-breed feral goats presented an altogether different challenge, as Dr. Karl Campbell of Island Conservation can attest: "This project was essential for the well-being of the goats and to enable the ecological recovery of the island. The translocation of goats has seen a suite of positive impacts, and further benefits will unveil themselves in time."

One intriguing consequence of removing the predatory rats is that lizards on Redonda are rapidly changing their behaviour, according to scientists from Harvard University and the Museum of Natural History in Paris. "We measured anti-predator behaviour and found that the Ground Dragons are becoming fierce and fearless now that the rats are gone, chasing and eating even adult tree lizards," said Dr. Colin Donihue. "This new balance of nature is more in line with what we'd expect of these animals before rats were ever on the island."

The long list of organizations that cooperated in this mission reflects the complex challenges that had to be overcome. The government of Antigua & Barbuda along with the EAG and FFI joined forces with leading technical specialists from the UK, USA and New Zealand.

Thanks to their collaborative efforts, Redonda has been rat free since March 2017, while the feral goats have been rehoused and are being cared for by the government's Veterinary and Livestock Division on Antigua. Biosecurity equipment and protocols have also been installed to prevent future invasions.

**What's next for Redonda?**

Redonda harbours endemic species that occur nowhere else in the world, including at least five species of reptiles, and globally important colonies of seabirds. Conservationists argue that Redonda's unique wildlife, coupled with the historical remains of one of the region's largest guano mines, warrants greater protection for the island. They're not the only ones. A recent nationwide survey revealed that over 96 percent of Antiguans and Barbudans agree the island should be protected.

Preparations for designating Redonda and the surrounding sea as a reserve are now underway, led by the Redonda Steering Committee, chaired by the Department of Environment.

According to Dr. Robin Moore from US-based Global Wildlife Conservation, which has supported this project and is now helping with planning for the protected area, "It's incredible to see this radical and rapid transformation of Redonda from a bare rock to a carpet of vegetation. As plants and animals continue to rebound, this could truly be a showcase sanctuary for wildlife."

# Redonda Facts

- Redonda harbours a number of endemic species that occur nowhere else in the world, including at least five species of reptiles, such as the Redonda ground dragon (*Pholidoscelis atrata*). In 2015 all of the surviving reptile species on Redonda were evaluated by the IUCN as Critically Endangered, meaning they faced an extremely high risk of extinction in the wild.
- Redonda has regionally and globally significant colonies of seabirds, including brown boobies, masked boobies, red-footed boobies, Magnificent Frigatebirds and red-billed tropicbirds. It was internationally recognized as an Important Bird Area in 2009.
- The black or ship rats (*Rattus rattus*) that invaded Redonda were among the largest recorded members of this species and were observed hunting and killing the island's lizards and seabirds. Diet analyses have shown they also consumed enormous quantities of plants and invertebrates.
- Christopher Columbus named the island in 1493 and claimed it for Spain. Redonda was later transferred to the British Crown and around 7,000 tonnes of seabird guano was harvested annually from 1865 to 1914. It is believed that rats were introduced to the island during this period. The mining community was disbanded during World War I, after which the island was uninhabited. In 1967, Redonda became a dependency of Antigua & Barbuda.
- The Redonda Restoration Programme is supported by, among others, the Darwin Initiative through UK Government funding, National Fish & Wildlife Foundation, Global Wildlife Conservation, Betty Liebert Trust, US Fish & Wildlife Service NMBCA and Syngenta Crop Protection AG.

The Redonda Restoration Programme is part of a larger effort to protect global biodiversity. Most highly threatened vertebrates are found on islands, with invasive species introduced to islands being a leading cause of extinction. Removing invasive species from islands is an effective and proven way to save many of our world's most vulnerable species. To date, there have been more than 400 successful projects to remove invasive rodents from islands. The pace, scale and complexity of these efforts are increasing in recognition of the threat invasive species pose to biodiversity.

- The Aichi Biodiversity Targets form an integral part of the Strategic Plan for Biodiversity 2011-2020, adopted by signatories to the Convention on Biological Diversity at a 2010 meeting in Nagoya, Japan. They comprise a series of strategic goals that aim to halt biodiversity loss, maintain ecosystem services and protect the variety of life on the planet that is essential to human well-being.
- The rat eradication and goat removal work was completed by June 2017, and Redonda was officially declared rat-free in July 2018, after an intensive three-week survey failed to uncover any signs of rodents anywhere on the island. This aligns with customary best practice, which is to wait at least one year before declaring a rat eradication operation successful. The entire population of black rats was eradicated using Klerat, a bitter, waxy rat bait containing the active ingredient brodifacoum that has been used successfully to remove rats from dozens of Caribbean islands since the early 1990s. This was readily eaten by the rats on Redonda but ignored by the native reptiles, mammals and birds. The bait was distributed at intervals of not less than 40 metres, even down the high cliffs, to be certain of reaching every rat. The rat eradication team lived on the island for more than two months to monitor bait uptake and remove rat carcasses. The goat operation took more than six months and aimed to bring the healthiest animals back to Antigua alive at the request of the Department of Agriculture. Recent genetic tests indicate the goats, which have unusually long horns, are of Spanish origin. Most of the goats were successfully captured by hand after being shepherded along temporary fence lines, but some were caught using live snares. All of the goats were found to be very thin and stunted due to the lack of food on Redonda, but have since gained weight and have begun breeding on Antigua.

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