Applicant: **Roy, David**
Organisation: **UK Centre for Ecology & Hydrology**
Funding Sought: **£151,682.00**

# DPR12S2\1006

**Shining a light on Anguilla's moths using Atificial Intelligence**

Evidence is mounting of declines in wildlife across the globe. We critically lack data on 'the little things that run the world' - insects.

We will use innovative technologies to monitor insects with automated sensors, deep learning, bioacoustics and computer vision. Complementary citizen science projects will collect wildlife observations to train artificial intelligence (AI) models.

With Anguilla Natural Trust we will deploy four automated camera systems across Anguilla and measure outcomes from restoration projects targeted at globally important species.

## PRIMARY APPLICANT DETAILS

| | |
|---|---|
| **Title** | Dr |
| **Name** | David |
| **Surname** | Roy |
| **Website (Work)** | [redacted] |
| **Tel (Work)** | [redacted] |
| **Email (Work)** | [redacted] |
| **Address** | [redacted] |

# DPR12S2\1006

Shining a light on Anguilla's moths using Atificial Intelligence

## Section 1 - Contact Details

### PRIMARY APPLICANT DETAILS

| | |
|---|---|
| **Title** | Dr |
| **Name** | David |
| **Surname** | Roy |
| **Website (Work)** | [redacted] |
| **Tel (Work)** | [redacted] |
| **Email (Work)** | [redacted] |
| **Address** | [redacted] |

### GMS ORGANISATION

| **Type** | **Organisation** |
|---|---|
| **Name** | UK Centre for Ecology & Hydrology |
| **Phone (Work)** | [redacted] |
| **Email** | [redacted] |
| **Website (Work)** | [redacted] |
| **Address** | [redacted] |

## Section 2 - Title & Summary

### Q3. Title:

Shining a light on Anguilla's moths using Atificial Intelligence

### What was your Stage 1 reference number? e.g. DPR12S1\1123

DPR12S1\1051

Please attach a cover letter as a PDF document.

*No Response*

## Q4. Summary of project

**Please provide a brief non-technical summary of your project: the problem/need it is trying to address, its aims, and the key activities you plan on undertaking.**

**Successful Darwin Plus Main projects must demonstrate substantial measurable outcomes in <u>at least one</u> of the themes of Darwin Plus either by the end of the project's implementation or via evidenced mechanisms for post-project delivery.**

**<u>Preference will be given to discrete projects implementing existing identified environmental solutions on the ground.</u>**

**The broad themes of Darwin Plus Main are:**

- **Biodiversity:** improving and conserving biodiversity, and slowing or reversing biodiversity loss and degradation;
- **Climate change:** responding to, mitigating and adapting to climate change and its effects on the natural environment and local communities;
- **Environmental quality:** improving the condition and protection of the natural environment;
- **Capability and capacity building:** enhancing the capacity within UKOTs to support the environment in the short- and long-term.

Evidence is mounting of declines in wildlife across the globe. We critically lack data on 'the little things that run the world' - insects.

We will use innovative technologies to monitor insects with automated sensors, deep learning, bioacoustics and computer vision. Complementary citizen science projects will collect wildlife observations to train artificial intelligence (AI) models.

With Anguilla Natural Trust we will deploy four automated camera systems across Anguilla and measure outcomes from restoration projects targeted at globally important species.

# Section 3 - UKOT(s), Dates & Budget Summary

## Q5. UKOT(s)

**Which UK Overseas Territory(ies) will your project be working in?**

☑ Anguilla

*** if you have indicated a territory group with an asterisk, please give detail on which territories you are working on here:**

*No Response*

**In addition to the UKOTs you have indicated, will your project directly benefit any other Territories or country(ies)?**

⦿ No

## Q6. Project dates

| Start date: | End date: | Duration (e.g. 2 years, 3 months): |
|---|---|---|
| 01 April 2024 | 31 March 2026 | 2 years |

### Q7. Budget summary

| Year: | 2024/25 | 2025/26 | 2026/27 | Total request |
|---|---|---|---|---|
| Amount: | £91,067.00 | £60,615.00 | £0.00 | £ 151,682.00 |

## Q8. Do you have matched funding arrangements?

⊙ Yes

Please ensure you clearly outline your matched funding arrangement in the budget.

## Q9. If you have a significant amount of unconfirmed matched funding, please clarify how you will fund the project if you don't manage to secure this?

UKCEH is providing [redacted] in kind support through reduced overhead rates (40%) for staff costs.

Anguilla National Trust is providing [redacted] in kind support as staff time.

We anticipate in kind support from volunteers providing images of moths to train Artificial Intelligence image classifers. Assuming 10 people each contribute the equivalent of 5 days year, costed at [redacted] per day = [redacted]

## Q10. Have you received, applied for or plan to apply for any other UK Government funding for the proposed project or similar?

⊙ No

## Section 4 - Problem statement

### Q11. Problem the project is trying to address

**Please describe the problem your project is trying to address in the UKOTs, relating to at least one of the themes of Darwin Plus:**

**For example, what are the specific threats to the environment that the project will attempt to address? Why are they relevant, for whom? How did you identify the need for your project? Please cite the evidence you are using to support your assessment of the problem.**

The problem....
The biodiversity crisis: Evidence is mounting of widespread declines of insects, globally (1). This gives stark warning for the perilous state of biodiversity, yet the evidence-base remains biased to a few regions and insect groups it is feasible to monitor. Repeatable sampling methods are urgently needed, closing the knowledge gap for 'the little things that run the world' (2).

Threats...
Insects are threatened by a complex suite of pressures, with potentially interacting factors acting in combination. There is a severe lack of evidence from most parts of the world due to the technical challenge of monitoring insects. Especially for biodiversity hotspots, such as island ecosystems that typically have high conservation value, including endemic species, yet are subject to multiple pressures (particularly invasive non-native species and climate change).

Why are they relevant, for whom?....
Most animals on earth are insects. Insects provide a crucial role in the functioning of ecosystems on which we all depend, both in supplying services such as pollination, pest control, cultural services and as prey, but also disservices such as crop damage and spread of diseases to livestock and humans. More standardised monitoring of insects is relevant to everyone.

Evidence...
The Royal Entomological Society engaged 1600 members to identify 'Grand Challenges in Entomology'. Understanding insect declines was noted as a major priority for entomology (3).

Previous Foreign and Commonwealth Office research via the GB Non-Native Species Secretariat, including the lead applicant, identified the need to enhance baseline information for biodiversity across Anguilla.

Development of automated monitoring was a priority from a workshop on Anguilla in May 2023 (DPlus175). The proposed project would provide synergies with DPlus175 by improving information on the occurrence of native and non-native species. The project is highly complementary to DPLR1\1041: Establishing digital data tools for enhanced conservation management and policy-making (4).

Alignment with Darwin themes...

This project addresses several Darwin Themes:

Biodiversity: improving and conserving biodiversity, and slowing or reversing biodiversity loss and degradation. This project will provide baseline information for insects, specifically moths, which have traditionally proven hard to monitoring due to technical challenges of sampling and identification.

Climate change: responding to, mitigating and adapting to climate change and its effects on the natural environment and local communities. This project tests an automated approach to monitoring insects at high temporal resolution. Insect respond rapidly to changing climates and can provide an early-warning indicator of the biological impacts of climate change.

Environmental quality: improving the condition and protection of the natural environment. This project is focused on monitoring restoration/rewiliding projects on Anguilla. Insect data will provide an indicator of habitat quality to track how ecosystems change in response to management.

Capability and capacity building: enhancing the capacity within UKOTs to support the environment in the short- and long-term. We will build capacity on Anguilla in novel sensor technology plus data science techniques to analyse large data streams. We will train ANT staff in this technology to build capacity for use beyond the life of this project.

# Section 5 - Environmental Conventions, Treaties and Agreements

## Q12. Environmental Conventions, Treaties and Agreements

**Please detail how your project will contribute to the aims of the national and/or international agreement(s) your project is targeting. What key UKOT Government priorities and themes will it address and how? You should also consider local, territory specific agreements and action plans here. Letters of support from UKOT Government partners/stakeholders should also make clear reference to the agreements/action plans your project is contributing towards.**

This directly supports and contributes to national Anguilla policies, plans and strategies, including:
• Implementing National Biodiversity Strategy and Action Plan (NBSAP): e.g. integrating "conservation and sustainable use of local biodiversity into national plans," gathering and collating "data on the components of biodiversity that are important for conservation and sustainable use," using "guidelines, tools, and processes necessary for identifying, monitoring, regulating, and conserving biodiversity,"
• Implementing National Environmental Management Strategy (NEMS): promoting "environmental education training, capacity building, and awareness, managing "terrestrial resources, organisms, and ecosystems to obtain optimum sustainable productivity while maintaining the integrity of natural and ecological processes,"
• Implementing Anguilla Agricultural Policy: enhancing biodiversity management interventions and increasing public awareness about Anguilla's biodiversity and ecosystem services.

As examples, collaboratively developed datasets and data visualisations planned through this project will underpin contributions to the policies, plans and strategies outlined above. Furthermore, capacity building is core to the project and will equip ANT staff with transferable skills to support biodiversity monitoring more widely across Anguilla.

The project also supports international targets such as measuring progress against SDG15 'Life on land' and UN global assessments such as the Intergovernmental Panels: (i) for Biodiversity and Ecosystem Services (IPBES); (ii) Climate Change (IPCC). Indeed, during IPBES 10th Plenary, in decision IPBES/10/1, the undertaking of the methodological assessment on monitoring biodiversity and nature's contributions to people was approved. This project will provide opportunities for biodiversity experts on Anguilla to contribute, and indeed provide leadership, to global monitoring initiatives.

# Section 6 - Method, Project Stakeholders, Gender, Change Expected, Pathway to Change & Exit Strategy

## Q13. Methodology

**Describe the methods and approach you will use to achieve your intended Outcome and contribute towards your Impact. Provide information on:**

- **how you reflected on and incorporated evidence and lessons learnt from past and present similar activities and projects in the design of this project.**
- **the specific approach you are using, supported by evidence that it will be effective, and justifying why you expect it will be successful in this context.**
- **how you will undertake the work (activities, materials and methods).**
- **how the main activities will be and where these will take place.**
- **how you will manage the work (governance, roles and responsibilities, project management tools, risks etc.).**

This Darwin proposal builds upon a nascent network of automated sensors plus citizen science for insects in Europe, Canada, Argentina. However, none are focused on island ecosystems where the need for standardised monitoring of insects is most acute. We would work in partnership with these existing projects to: (i) share experience in deploying automated monitoring systems and developing citizen science initiatives for collecting labelled images for training regional AI image classification models; (ii) integration of sensor data streams from multiple regions of the world within data science tools shared across projects.

The automated monitoring systems have proven successful for monitoring insects in Europe and North America. Image classifiers have been built for new regions of the globe, using open software and training datasets collected through citizen science approaches plus available image collections (e.g. published through GBIF).

Work package 1. Deployment of automated camera systems (Figure 1). Working with Anguilla National Trust (ANT) we will test the efficacy of deploying automated camera systems in four locations (Anguilla mainland, Sombrero and Dog Islands, Prickly Pear Cays). These sites are regularly monitored by Anguilla National Trust staff as part of active conservation and restoration projects. As part of this restoration work, the ANT is monitoring biodiversity and ecosystem recovery with insects identified as a major gap in their long-term monitoring programmes. Data will be collected regularly and uploaded to secure cloud data storage and processed using a data pipeline developed by UKCEH with international partners (Figure 2).

Work package 2. Image classifier for Anguilla moths, supported by citizen science. We will build an AI image classification model for Anguilla moths. This requires training data, e.g. images labelled with species ID. We will co-develop and implement activities for ANT staff and others including volunteers (citizen scientists) to contribute observations of insects via the Global platform iNaturalist. We will establish iNaturalist projects focused on nocturnal insects (predominantly moths) and promote to ANT staff. This builds upon our (UKCEH team) experience of establishing iNaturalist projects in UK Overseas Territories. We will also label images of moths detected via the AMI systems deployed in Anguilla - this is likely to provide a major improvement in the performance of image classification models.

Work package 3. Knowledge exchange and engagement. We will produce biodiversity report cards from analysis of data collected through the automated camera systems. We will analyse images collected through the iNaturalist, build moth checklists for the four demonstration sites and publish occurrence data via GBIF (Figure 2). ANT staff will be trained by UKCEH data science staff in processing data from AMI systems. We will engage participants by developing an accessible and informative insect guide including their important roles, how to monitor insects and how people can contribute (e.g. submitting observations to iNaturalist or supporting wildlife-positive actions). To disseminate the results of this work more widely, we will hold a final project workshop in Anguilla, involving a range of governmental and NGO stakeholders working on biodiversity, agriculture or conservation project on the territory.

UKCEH will lead the project and hold quarterly project management meetings with ANT staff to review progress and project risks. UKCEH will deliver the insect monitoring systems to Anguilla and train ANT staff to install and maintain them. ANT staff will manage the camera systems and regularly retrieve the image data as part of their visits to offshore islands. UKCEH will be responsible for data management and reporting and will maintain regular informal contact with ANT through email correspondence and ad hoc online meetings.

## Q14. Project Stakeholders

**Who are the stakeholders for this project and how have they been consulted (include local or host government support/engagement where relevant)? Briefly describe what support they will provide and how the project will engage with them**

Demand for biodiversity data has increased significantly in the UKOTs due to synergistic effects of government biodiversity policy, societal concern for the environment, and novel research developments. We see demand

from various stakeholders

Policy makers - All governments have a responsibility to reverse declines in biodiversity under the Convention on Biological Diversity and G7 2030 Nature Compact. These high level agreements translate to the requirement for on the ground monitoring to evidence the change, or not, of biodiversity trends. Our letter of support from the Anguilla Ministry of Sustainability demonstrate their support this project. This builds upon a DPLUS175 workshop that included a range of Anguilla governmental stakeholders who recognised the need for more monitoring data for insects.

Land managers - Custodians of the natural environment, (e.g conservation charities), have a need for data on how land management decisions that they make are impact biodiversity. Traditional surveys for insects are labour intensive and costly, but new automated camera systems offer an attractive new approach. We have engaged with ANT to meet the need for assessments of insects on their restoration/rewilding sites.

Researchers - Recent research has focussed on the development of hardware for automated monitoring of insects with cameras, and AI algorithms for analysing images. UKCEH led the NERC-funded Easy-Rider project which brought together researchers from Europe and North America to spearhead the development of these technologies. Researchers recognise the need to apply technology in places with high biodiversity value (e.g. island ecosystems).

Public - through engagement and raising awareness

## Q15. Gender equality and social inclusion

**All applicants must consider whether and how their project will contribute to promoting equality between persons of different gender and social characteristics. Explain your understanding of how individuals may be excluded from equal participation within the context of your project, and how you seek to address this. You should consider how your project will proactively contribute to ensuring individuals achieve equitable outcomes and how you will engage participants in a meaningful way.**

This project is designed to reduce and remove any barriers to gender equality or representation. Opportunities to engage in biodiversity conservation and monitoring and AI-related learning and training are based on level and interest, but will be available to all staff of the ANT and the Agriculture Unit and we will ensure that our approaches enable everyone to participate. We will use gender disaggregated data in our monitoring and reporting to enable identification and remediation of any unintended negative gender specific impacts.

In Anguilla women hold prominent positions within both the GOA and leading environmental agencies, including the Minister and the Permanent Secretary responsible for environment, the Directors of the Fisheries and Environment Units of the Department of Natural Resources, and the Director of the ANT.

The proposed project would aim to engage staff across these organisations with the outputs of the automated systems. There is a notable gender (male) bias in the fields of data science and technology and this project has a project team comprised of 7, 5 of whom are female, and the project team will actively work to ensure gender equity in decision-making and project involvement. There will also be opportunities to profile the work by people of diverse gender and social characteristics and raise awareness of the possibilities for engagement of all.

## Q16. Change expected

**Detail the expected changes this work will deliver. You should identify what will change and who will benefit a) in the short-term (i.e. during the life of the project) and b) in the long-term (after the project has ended). Please describe the changes for the environment and, where relevant, for people in the OTs, and how they are linked.**

**When talking about how people will benefit, please remember to give details of who will benefit, differences in benefits by gender or other layers of diversity within stakeholders, and the number of beneficiaries expected. The number of communities is insufficient detail – number of households should be the largest unit used.**

ANT staff will benefit from practical experience of a standardised approach to monitoring insects in remote locations. This will enable ANT to plan future projects on insects (particularly pollinators) using the automated sensor systems. ANT staff willl also benefit from new technical skills in analysing image data and collaborating with researchers in the UK who are leading in this field of innovation. We expect a change in focus of conservation projects, with increased effort to understand insect populations and their status. Additionally ANT staff will be in a position to share their expertise and transfer knowledge.

Short-term, the project will deliver novel automated sensor systems to increase biodiversity observations, including from areas which currently have a deficit of biodiversity information, that will be shared openly through the Global Biodiversity Information Facility (GBIF). Additionally, there will be an increase in awareness of the unique biodiversity of Anguilla amongst various stakeholders including policy makers, land managers and the general public.

Long-term, this technology will deliver data to inform insect trends supporting biodiversity indicators. Standardised data on insect populations will benefit researchers assessing the status of insect populations across the globe, including identifying the key drivers and pressures and to assess the success of conservation measures. Furthermore, there could be wider deployment of the automated sensor systems to other UK Overseas Territories and beyond.

Potential to scale – similar systems can be deployed more widely in biodiversity hotpots, to help build a global network to monitoring insects in a standardised way and to greatly improve the evidence base. This project will benefit researchers (ecologists, data scientists, engineers) aiming to monitor insects in other parts of the world using automated camera systems. Projects in similar situations (geographic area, biomes) will particularly benefit from the first trial of this technology in Caribbean island ecosystems. We will develop dissemination resources, including short recorded on-line presentation to showcase the project and the benefits to understanding of biodiversity on Anguilla which would have relevance to other islands and remote locations.

## Q17. Pathway to change

**Please outline your project's expected pathway to change. This should be an overview of the overall project logic and outline why and how you expect your Outputs to contribute towards your overall Outcome and, in the longer term, your expected Impact.**

Working collaboratively with partners on other UKOTs through other Darwin projects (e.g. DPLUS056 and DPLUS088) and UK Government funded research has demonstrated the need for innovative approaches for biodiversity monitoring (e.g. new technologies and citizen science initiatives) and to increase understanding of the status of insects in order to inform conservation solutions. The proposed project would provide an opportunity to transfer knowledge of innovative infrastructures for monitoring insects, to ultimately enhance flow of information on insect biodiversity. The benefits of automated systems for monitoring insects would be evident from the increase in species observations but also access to resources, including co-developed ID guides, to further increase capacity for monitoring.

The deployment of the automated monitoring systems would be used as an exemplar for other UK Overseas

Territories and biodiversity hotspots with feedback compiled from the system users in Anguilla on ease of use and efficacy of the systems. Project partners from the ANT would play important roles in training and capacity building on other UKOTs in future through new projects that enabling them to share their experiences and expertise. Increase in standardised monitoring data will underpin predictive modelling and ultimately biodiversity planning and mitigation approaches (e.g. across the UKOTs).

## Q18. Sustainable benefits

**How will the project reach a sustainable point and continue to deliver benefits post-funding? Will the activities require funding and support from other sources, or will they be mainstreamed in to "business as usual"? How will the required knowledge and skills remain available to sustain the benefits? If relevant, how will your approach be scaled? How will you ensure your data and evidence will be accessible to others?**

Sustainability will run throughout the project and be acheived by:
- the automated monitoring system is designed to run autonomously and will remain with the ANT after this project has finished and be mainstreamed in "business as usual". The equipment will be integrated within the ANT's ongoing monitoring projects.
- data analysis and processing workflows will be delivered through open source software
- we have built in knowledge exchange between UKCEH and ANT within the project, particularly for data science expertise to work with data from automated biodiversity sensors. This will provide sustainability through ANT knowledge

**If necessary, please provide supporting documentation e.g. maps, diagrams, references etc., as a PDF using the File Upload below:**

References
02/10/2023
19:59:52
pdf 55.4 KB

DPR12S21006 Figures
02/10/2023
19:59:46
pdf 707.47 KB

# Section 7 - Risk Management

## Q19. Risk Management

**Please outline the 6 key risks to achievement of your Project Outcome and how these risks will be managed and mitigated, referring to the Risk Guidance. This should include at least one Fiduciary, one Safeguarding, and one Delivery Chain Risk.**

| Risk Description | Impact | Prob. | Inherent Risk | Mitigation | Residual Risk |
|---|---|---|---|---|---|
| **Fiduciary (Financial)** Financial mismanagement | High | Unlikely | Medium | UKCEH and ANT have robust policies on financial management. All expenses will require receipts and be agreed in advance. Project lead will regularly review project expenditure against plans. | Low |

| | | | | | |
|---|---|---|---|---|---|
| **Safeguarding**<br>Failure to safeguard project staff and collaborators | High | Rare | Medium | UKCEH and ANT have robust policies on health and safety, welfare and other elements of safeguarding. All project activities will have a risk assessment – e.g. field work, travel, office work – as part of standard organisational practice. | Low |
| **Delivery Chain**<br>The primary risk to project delivery is disruption to deployment of automated sensors | Medium | Unlikely | Low | Avoid times of year at risk of weather disruption. Include contingency for days of poor weather during UKCEH visit to Anguilla | Low |
| **Risk 4**<br>Damage to field equipment, affecting data capture. | Medium | Unlikely | Low | Work with ANT staff to choose field locations that are secure. Regular review of equipment during regular field sampling visits by ANT staff. | Low |
| **Risk 5**<br>Lack of images to train image classifier, to maximise value of data from automated camera systems | Medium | Likely | Medium | Work with existing image collations for moths of the Caribbean. Collect new images through targeted citizen science initiatives. | Low |
| **Risk 6**<br>Risk 6<br>Lack of engagement from governmental and wider organisations on Anguilla and across the Caribbean | Medium | Likely | Medium | Use network developed through other projects with similar aims, e.g. DPLUS175. Plan 2 months in advance of workshop with engagement plan. ANT is well connected with governmental organisations in Anguilla and across the wider Caribbean | Low |

## Q20. Project sensitivities

**Please indicate whether there are sensitivities associated with this project that need to be considered if details are published (detailed species location data that would increase threats, political sensitivities, prosecutions for illegal activities, security of staff etc.). Please note your response to this question won't influence the outcome of your application.**

⦿ No

# Section 8 - Workplan

## Q21. Workplan

**Provide a project workplan that shows the key milestones in project activities. Complete the Word template as appropriate to describe the intended workplan for your project.**

BCF_Workplan_Template_2023-24_FINAL DPR12S1_1051
29/09/2023
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pdf 121.18 KB

# Section 9 - Monitoring and Evaluation (M&E)

## Q21. Monitoring and evaluation (M&E) plan

**Describe how the progress of the project will be monitored and evaluated, making reference to who is responsible for the project's M&E.**

**Darwin Plus projects will need to be adaptive and you should detail how the monitoring and evaluation will feed into the delivery of the project including its management. M&E is expected to be built into the project and not an 'add' on. It is as important to measure for negative impacts as it is for positive impact. Additionally, please indicate an approximate budget and level of effort (person days) to be spent on M&E (see Finance Guidance).**

The project leader will oversee the monitoring and evaluation, in collaboration with the project team (project staff, partners and stakeholders). A monitoring and evaluation plan has been uploaded alongside the implementation timetable. This plan will be regularly updated recognising the need to be adaptive. The project team will monitor project progress at the formal project meetings (every two - three months including an agenda and minutes with actions) reviewing the indicators and outputs using SOFT (Success, Opportunities, Failures, Threats) reporting.

The following approaches will be used for monitoring and evaluation:
Project team meetings – on-line meetings including representation from the two funded project partners (UKCEH and ANT) and other stakeholders as appropriate every three months. Agenda items will invite feedback on all tasks and outputs.

Workshops – feedback forms provided at the beginning and after the main project workshop to assess understanding and relevance of the content. Additionally feedback will be invited throughout the workshop through provision of a flipchart to add post-it notes too. Time will be allocated at the start of each session for discussion of the comments and a summary will be provided in the workshop report.

Opportunities to provide on-line feedback through jamboards, if the internet connection within the workshop venues allows. Specific focus during the workshops will be on what is working and what is not to allow adaptive approaches.

Workshop reports and other publications – all outputs will be produced collaboratively with the project team and stakeholders providing feedback iteratively leading to a final draft.

Articles and on-line reports will be promoted through press releases and social media. Relevant metrics will be

monitored such as download statistics but also altmetrics. These will be documented through project reports.
Feedback form – circulated to all stakeholders at beginning and end of project to monitor and evaluate expectations, what is working and what is not, alongside key benefits to the stakeholders and ensure that these align broadly with the project plan.

Structured evaluation of the implementation of the automated systems – ANT staff will be invited to share their experiences of implementing and maintaining the automated systems. The feedback will be compiled into guidance for future deployment of automated systems in island or other remote locations.
Risk register – will be developed at the start of the project and updated regularly. Particular focus will be on monitoring whether the assumptions underpinning the project hold.

| | |
|---|---|
| **Total project budget for M&E (£)**<br><br>**(this may include Staff and Travel and Subsistence Costs)** | [redacted] |
| **Total project budget for M&E (%)** | 11 |
| **Number of days planned for M&E** | 19 |

## Section 10 - Logical Framework

## Q23. Logical Framework (logframe)

**Darwin Plus projects will be required to monitor and report against their progress towards their Outputs and Outcome. This section sets out the expected Outputs and Outcome of your project, how you will measure progress against these and how we can verify this.**

BCF_St2_and_Single_Stage_Logical_Framework_Template_Apr23 DPR12S21006 Anguilla Moths
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pdf 89.96 KB

Impact:

Demonstrable benefit of automated technology for more effective monitoring of insects as indicator species, to evaluate the outcomes from conservation action for Anguilla's island ecosystems which support globally important species

Outcome:

Automated, camera-based monitoring of insects on Anguilla island ecosystems established and used to assess insect populations as indicators of habitat recovery in sites being managed for globally important species

| **Project Outputs** |
|---|
| **Output 1:**<br>Automated camera (AMI) systems operating in four locations across Anguilla, at sites with active conservation management by the Anguilla National Trust |

**Output 2:**

Image classification model for Anguilla moths published online

**Output 3:**

Knowledge exchange and engagement with a range of stakeholders interested in insect monitoring and new technologies

**Output 4:**

*No Response*

**Output 5:**

*No Response*

**Do you require more Output fields?**

**It is advised to have fewer than 6 Outputs since this level of detail can be provided at the Activity level.**

⦿ No

### Activities

**Each activity is numbered according to the Output that it will contribute towards, for example, 1.1, 1.2, 1.3 are contributing to Output 1.**

1.1 Deploy four camera systems, capturing metadata entries for each camera system location, including precise location, habitat descriptions, photos
1.2 Image data regularly captured from four locations
1.3 Biodiversity data from camera systems summarised within accessible visualisations
2.1 iNaturalist project created for capturing images (and location information) for moths occurring on Anguilla
2.2 Image training dataset available and tagged by citizen scientists and moth experts
2.3 Image Classification Model built using information from iNaturalist and the image training dataset
3.1 Co-develop an accessible and informative online guide to insects and their important roles to people and nature, how to monitor insects using novel technologies and how people can contribute (e.g. submitting observations of wildlife to iNaturalist or supporting wildlife-positive actions).
3.2 One biodiversity report card developed with data and analysis from automated camera systems
3.3 End of project workshop for Anguilla stakeholders

# Section 11 - Budget and Funding

## Q24. Budget

**Please complete the appropriate Excel spreadsheet which provides the Budget for this application and ensure the Summary page is fully completed. Some of the questions earlier and below refer to the information in this spreadsheet.**

BCF_Budget_over_100k_MASTER_Aug23 DPR12 S21006 Anguilla Moths
02/10/2023
16:27:11
xlsx 98.67 KB

## Q25. Alignment with other funding and activities

**This question aims to help us understand how familiar you are with other work in the geographic/thematic area, and how this proposed project will build on or align with this to avoid any risks of duplicating or conflicting activities.**

### Q25a. Is this new work or does it build on existing/past activities (delivered by anyone and funded through any source)?

⦿ Development of existing work

**Please provide details:**

This is a new initiative for Anguilla. However, the project will build on approaches being developed for this technology in Europe and North America. Specifically, approaches for building image classification models for new regions and data pipelines for analysing image data collected through the automated systems being used in this project. If successful for Anguilla, we will aim to extend the approaches for all the remaining UKOTs.

### Q25b. Are you aware of any current or future plans for work in the geographic/thematic area to the proposed project?

⦿ Yes

**If yes, please give details explaining similarities and differences, and explaining how your work will be additional, avoiding duplicating and conflicting activities and what attempts have been/will be made to co-operate with and share lessons learnt for mutual benefit.**

While this project is novel for the Caribbean, it complements an on-going ANT-led Darwin Plus-funded project that focuses on increasing the resilience of Anguilla's pollinators (birds, bats, insects) through an evidence-based approach to re-wilding. The project also includes the development of a National Pollinator Strategy. The Strategy which was drafted in June 2022, recognises the need for on-going pollinator research and monitoring to assist with strategy implementation and monitoring of pollinator recovery.

This project directly complements this work by potentially providing a low-input, high-output approach to data collection and analysis that could be scaled up to include other pollinator species as well as other species of conservation concern.

Recognising the value of learning from others' experiences and sharing knowledge and technical expertise, project partners are committed to sharing methodologies, results, and lessons learned. We will use existing networks and regional meetings to provide updates and share results within the region. We will also share the outputs and feedback on experiences from this project with others in relevant networks to maximise the benefits for all.

## Q26. Balance of budget spend

**Defra are keen to see as much Darwin Plus funding as possible directly benefiting UKOT communities and economies. While it is appreciated that this is not always possible every effort should be made for funds to remain in-Territory.**

**Explain the thinking behind your budget in terms of where Darwin Plus funds will be spent. What benefits will the Territory/ies see from your budget? What level of the award do you expect will be spent locally? Please explain the decisions behind any Darwin Plus funding that will not be spent locally and how those costs are important for the project.**

The budget includes equipment costs for four Automated Monitoring Insects (AMI) systems allocated to UKCEH. Although the main system will be built in the UK, equipment for running systems (e.g. batteries and solar panels) will be purchased in Anguilla.

UKCEH staff time is to support the Anguilla National Trust to deploy the AMI systems in the four restoration sites, train ANT staff in data process of images from AMI systems and to co-develop project engagement material (e.g. insect guide and citizen science approaches). A substantial budget is also allocated for travel and subsistence to enable UKCEH to work with ANT to deploy AMI systems in Anguilla.

UKCEH therefore have the majority of the funding allocation due to the need to purchase equipment and to transfer specialist knowledge (e.g. new technologies and advanced data science methods) to the Anguilla National Trust.

Budget to be spent locally includes staff time for ANT to manage data locally and to collect data from AMI systems during their deployment. We also allocate [redacted]0 for local moth experts to build up labelled image datasets to support development of AI image classifiers. We also include boat transport cost to be spent locally.

## Q27. Value for Money

**Please describe why you consider your application to be good value for money including justification of why the measures you will adopt will secure value for money.**

This project is cost-effective as it aligns with ongoing conservation projects in Anguilla by the Anguilla National Trust and recognises priorities for enhancing information on insects.

This project benefits from the initial development of automated camera systems through other projects run by UKCEH. Trouble-shooting and bug fixing of camera systems will be provided by UKCEH engineers as part of ongoing support of the infrastructure.

The project will benefit from data science work to development a data processing pipeline for analysis of moth images from automated camera systems.

Use of iNaturalist as an existing, well-supported, global system for collection of images and identification by a wide community of experts.

The outcomes from the project, including feedback on deployment of the systems, will be beneficial for implementation on other islands or remote locations.

## Q28. Capital items

**If you plan to purchase capital items with Darwin Plus funding, please indicate what you anticipate will happen to the items following project end. If you are requesting more than 10% capital costs, please provide your justification here.**

Four automate camera systems, [redacted]

These systems will remain in the host country (Anguilla) once the project has completed. They will remain available to the local partners, communities and/or stakeholders, to support ongoing work.

High performance laptop for image processing = [redacted] (based on online prices as of September 2023)

This laptop will remain in the host country (Anguilla) once the project has completed. They will remain available to support future projects that require high processing power (e.g. for analysis of image or audio data using AI models).

## Section 12 - Safeguarding and Ethics

# Q29. Safeguarding

**All projects funded under the Biodiversity Challenge Funds must ensure proactive action is taken to promote the welfare and protect all individuals involved in the project (staff, implementing partners, the public and beneficiaries) involved in the project from harm. In order to provide assurance of this, projects are required to have specific procedures and policies in place.**

**Please upload the following required policies:**

- **Safeguarding Policy:** including a statement of commitment to safeguarding and a zero tolerance statement on bullying, harassment and sexual exploitation and abuse.
- **Whistleblowing Policy:** which details a clear process for dealing with concerns raised and protects whistle blowers from reprisals.
- **Code of Conduct:** which sets out clear expectations of behaviours – inside and outside the workplace – for all involved in the project and makes clear what will happen in the event of non-compliance or breach of these standards.

**If any of these policies are integrated into a broader policy document or handbook, please upload just the relevant or equivalent sub-sections to the above policies, with (unofficial) English translations where needed.**

**Please outline how (a) beneficiaries, the public, implementing partners, and staff are made aware of your safeguarding commitment and how to confidentially raise a concern, (b) safeguarding issues are investigated, recorded and what disciplinary procedures are in place when allegations and complaints are upheld, (c) you will ensure project partners uphold these policies.**

**If your approach is currently limited or in the early stages of development, please clearly set out your plans address this.**

All UKCEH Policies and Procedures are reviewed annually, and an audit programme is in place to ensure they are fit for purpose. UKCEH also has a Due Diligence Process where suppliers and sub-contractors are required to follow any mandatory UKCEH Policy and Procedure that they may not have in place. This is written into the contract and monitored through correspondence and written acknowledgement of the mandatory Policy and Procedures.

## Q30. Ethics

**Outline your approach to meeting the key principles of good ethical practice, as outlined in the guidance.**

UKCEH has relevant policies and procedures that align with the expectations of Darwin's key principles of good ethical practice outlined in the guidance notes. As an example the UKCEH Safeguarding Policy states UKCEH is committed to following the principles and practices for safeguarding as set out in the 'International Development Funders statement on Safeguarding' 'UKCDR', insofar as the statement is applicable to its activities and practices as a research delivery organisation.

UKCEH recognises and works towards the principles of non-discrimination, equal treatment, transparency, mutual recognition and proportionality of the Public Procurement Regulations 2015 which incorporates consideration of sustainability principles for suppliers and contractors in all of its purchasing activities. Since December 2019, procurement is undertaken by UKCEH under a Procurement Policy which identifies these core values as key to our purchasing processes. UKCEH works closely with partners across the public sector to improve its processes, policies and procedures with a particular emphasis on sustainability, ethics and competition.

UKCEH people are expected at all times to demonstrate respect, courtesy and cooperation towards everyone they interact with at work internally and externally.
There are no human rights and/or international humanitarian law risks.

# Section 13 - Project Staff

## Q31. Project staff

**Please identify the core staff (identified in the budget), their role and what % of their time they will be working on the project.**

| Name (First name, Surname) | Role | % time on project | 1 page CV or job description attached? |
|---|---|---|---|
| David Roy | **Project Leader** | 7 | Checked |
| Farah Mukhida | Co-Lead | 1 | Checked |
| Tom August | Data Science lead | 4 | Checked |
| Jenna Lawson | Field deployment and data analysis | 10 | Checked |

**Do you require more fields?**

⦿ Yes

| Name (First name, Surname) | Role | % time on project | 1 page CV or job description attached? |
|---|---|---|---|
| Devon Carter | Field deployment and data analysis | 5 | Checked |
| Alba Gomez | Data Science | 14 | Checked |
| Helen Roy | Entomologist | 4 | Checked |

| | | | |
|---|---|---|---|
| *No Response* | *No Response* | 0 | Unchecked |
| *No Response* | *No Response* | 0 | Unchecked |
| *No Response* | *No Response* | 0 | Unchecked |
| *No Response* | *No Response* | 0 | Unchecked |
| *No Response* | *No Response* | 0 | Unchecked |

**Please provide 1 page CVs (or job description if yet to be recruited) for the project staff listed above as a combined PDF.**

cvs
02/10/2023
16:41:59
pdf 453.83 KB

**Have you attached all project staff CVs and job descriptions?**

⦿ Yes

# Section 14 - Project Partners

## Q32. Project partners

**Please list all the Project Partners (including the Lead Partner who will administer the grant and coordinate delivery of the project), clearly setting out their roles and responsibilities in the project including the extent of their engagement so far.**

**This section should demonstrate the capability and capacity of the Project Partners to successfully deliver the project. Please provide Letters of Support for all project partners or explain why this has not been included.**

| | |
|---|---|
| **Lead partner name:** | UK Centre for Ecology & Hydrology |
| **Is the Lead Partner based in a UKOT where the project is working?** | ⦿ No |
| **Please explain why this project is led from outside the UKOT** | UKCEH is leading due to the innovate aspects of novel techology, how to process data using Artificial Intelligence and how to integrate with other monitoring approaches, e.g. citizen science. UKCEH will share knowledge to build capacity in Anguilla National Trust to develop these approches in future. |

| | |
|---|---|
| **Why is this organisation the Lead Partner, and what value to they bring to the project? (including roles, responsibilities and capabilities and capacity):** | UKCEH will bring its expertise to lead this project, adding value through<br>- building Automated Insect Monitoring (AMI) sytems. UKCEH has built AMI systems that are active across 10 European countries, UK, Canada, USA, Argentina and Australia.<br>- deploying AMI systems in the field. Experience from deploying AMI systems across a network of farms in England will be translated to Anguilla<br>- developing insect monitoring capacity in biodiversity hotspots. Through the AMBER project, UKCEH is deploying AMI systems in Costa Rica and Singapore, together with capacity building in local partners.<br>- data science experience in building Artificial Intelligence image classifiers for new regions of the world, working with data science experts in Canada (Mila) and the UK (Alan Turing Institute)<br>- connecting to other projects. UKCEH is co-ordinating a global network of researchers who are developing applications of automate camera systems for insects. We will include ANT within this growing network, to demonstrate applications to measure the outcome of restoration projects. There are no current projects with this focus. |
| **Allocated budget (proportion or value):** | [redacted] |
| **Representation on the Project Board (or other management structure)** | ⦿ Yes |
| **Have you included a Letter of Support from the Lead Partner?** | ⦿ Yes |

**Do you have partners involved in the Project?**

⦿ Yes

| | |
|---|---|
| **1. Partner Name:** | Anguilla National Trust |
| **Website address:** | https://axanationaltrust.com/ |
| **What value does this Partner bring to the project? (including roles, responsibilities and capabilities and capacity):** | ANT will have the following roles and responsibilities:<br>- Provide access to offshore islands of Anguilla which are actively managed to reduce the impacts of invasive non-native species.<br>- With UKCEH, deploy automated monitoring systems in four locations across Anguilla (offshore islands and mainland)<br>- Regular visit equipment to check status and download data<br>- Transfer data to secure storage area to enable processing<br>- Develop skills to analyse data from automated monitoring systems, using analysis pipelines to derive biodiversity metrics<br>- Help develop promotional material on the importance of insects<br>- Enlist entomologist who can help identify insects from images collected through automated camera systems to help train AI image classifiers<br>- Run engagement events in Anguilla to promote interest in insects and how to contribute to monitoring their status |

| | |
|---|---|
| **UKOT-based/other Partner** | ⦿ UKOT-based |
| **Allocated budget (proportion or value):** | [redacted] |
| **Representation on the Project Board (or other management structure)** | ⦿ Yes |
| Have you included a Letter of Support from this organisation? | ⦿ Yes |

| | |
|---|---|
| **2. Partner Name:** | *No Response* |
| **Website address:** | *No Response* |
| What value does this Partner bring to the project? (including roles, responsibilities and capabilities and capacity): | *No Response* |
| **UKOT-based/other Partner** | ⦿ Other |
| **Allocated budget (proportion or value):** | £0.00 |
| **Representation on the Project Board (or other management structure)** | ◯ Yes<br>◯ No |
| Have you included a Letter of Support from this organisation? | ◯ Yes<br>◯ No |

| | |
|---|---|
| **3. Partner Name:** | *No Response* |
| **Website address:** | *No Response* |
| What value does this Partner bring to the project? (including roles, responsibilities and capabilities and capacity): | *No Response* |
| **UKOT-based/other Partner** | £0.00 |
| **Allocated budget (proportion or value):** | ⦿ Other |
| **Representation on the Project Board (or other management structure)** | ◯ Yes<br>◯ No |
| Have you included a Letter of Support from this organisation? | ◯ Yes<br>◯ No |

| | |
|---|---|
| **4. Partner Name:** | *No Response* |
| **Website address:** | *No Response* |
| **What value does this Partner bring to the project? (including roles, responsibilities and capabilities and capacity):** | *No Response* |
| **UKOT-based/other Partner** | ⦿ Other |
| **Allocated budget (proportion or value):** | £0.00 |
| **Representation on the Project Board (or other management structure)** | ○ Yes<br>○ No |
| **Have you included a Letter of Support from this organisation?** | ○ Yes<br>○ No |

| | |
|---|---|
| **5. Partner Name:** | *No Response* |
| **Website address:** | *No Response* |
| **What value does this Partner bring to the project? (including roles, responsibilities and capabilities and capacity):** | *No Response* |
| **UKOT-based/other Partner** | ⦿ Other |
| **Allocated budget (proportion or value):** | £0.00 |
| **Representation on the Project Board (or other management structure)** | ○ Yes<br>○ No |
| **Have you included a Letter of Support from this organisation?** | ○ Yes<br>○ No |

| | |
|---|---|
| **6. Partner Name:** | *No Response* |
| **Website address:** | *No Response* |

| | |
|---|---|
| **What value does this Partner bring to the project? (including roles, responsibilities and capabilities and capacity):** | *No Response* |
| **UKOT-based/other Partner** | ⦿ Other |
| **Allocated budget (proportion or value):** | £0.00 |
| **Representation on the Project Board (or other management structure)** | ◯ Yes<br>◯ No |
| **Have you included a Letter of Support from this organisation?** | ◯ Yes<br>◯ No |

**Please provide a combined PDF of all letters of support.**

LoS
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16:44:51
pdf 567.46 KB

# Section 15 - Lead Partner Capability and Capacity

## Q33. Lead Partner Capability and Capacity

**Has your organisation been awarded Biodiversity Challenge Funds (Darwin Plus, Darwin Initiative or Illegal Wildlife Trade Challenge Fund) funding before?**

⦿ Yes

**If yes, please provide details of the most recent awards (up to 6 examples).**

| Reference No | Project Leader | Title |
|---|---|---|
| DPLUS175 | Helen Roy | Enhancing monitoring and prevention of invasive non-native species across UKOTs |
| DPLUS123 | David Roy | Fellow: Mrs Elli Tzirkalli |
| DPLUS151 | Jodey Peyton | Building knowledge on invasive non-species in Diego Garcia |
| DPLUS088 | Jodey Peyton | Addressing drivers of ecological change in Lake Akrotiri SBA, Cyprus |
| DPLUS101 | Helen Roy | Ioanna Angelidou Fellowship |
| DPLUS056 | Helen Roy | Assessment of current and future Invasive Alien Species in Cyprus |

**Have you provided the requested signed audited/independently examined accounts?**

⦿ Yes

# Section 16 - Certification

## Certification

**On behalf of the**

Trustees

**of**

UK Centre for Ecology & Hydrology

**I apply for a grant of**

£154,683.00

**I certify that, to the best of our knowledge and belief, the statements made by us in this application are true and the information provided is correct. I am aware that this application form will form the basis of the project schedule should this application be successful.**

**(This form should be signed by an individual authorised by the applicant institution to submit applications and sign contracts on their behalf.)**

- **I enclose CVs for key project personnel, a cover letter, letters of support, a budget, logframe, Safeguarding and associated policies, and project workplan.**
- **Our last two sets of signed audited/independently verified accounts and annual report (covering three years) are also enclosed.**

Checked

| | |
|---|---|
| **Name** | Jack O'Brien |
| **Position in the organisation** | Head of Contracts |
| **Signature (please upload e-signature)** | Cover Letter Anguilla moths<br>02/10/2023<br>17:07:50<br>pdf 228.33 KB<br><br>Darwin Letter<br>02/10/2023<br>17:03:26<br>pdf 174.68 KB |
| **Date** | 02 October 2023 |

**Please attach the requested signed audited/independently examined accounts.**

AnnualReportAccounts2021_Short
02/10/2023
15:14:44
pdf 2.1 MB

UKCEH-Annual-Report-Accounts-2022-3
02/10/2023
12:00:53
pdf 2.08 MB

**Please upload the Lead Partner's Safeguarding Policy as a PDF**

UKCEH Policy - Safeguarding
02/10/2023
11:55:39
pdf 223.81 KB

# Section 17 - Submission Checklist

## Checklist for submission

| | Check |
|---|---|
| **I have** read the Guidance**, including the "Guidance Notes for Applicants", "Monitoring Evaluation and Learning Guidance", "Standard Indicator Guidance", "Risk Guidance", and "Finance Guidance".** | Checked |
| **I have read, and can meet, the current** Terms and Conditions **for this fund.** | Checked |
| **I have provided** actual start and end dates **for the project.** | Checked |
| **I have provided my** budget based on UK government financial years **i.e. 1 April – 31 March and in GBP.** | Checked |
| **I have checked that our** budget is complete, **correctly adds up and I have included the correct final total at the start of the application.** | Checked |
| **The application been** signed by a suitably authorised individual **(clear electronic or scanned signatures are acceptable).** | Checked |
| **I have attached the below documents to my application:**<br>• **a** cover letter from the Lead Partner**, outlining how any feedback received at Stage 1 has been addressed where relevant and referencing any potential conflicts of interest, as a single PDF.** | Checked |
| • **my** completed logframe **as a PDF using the template provided and using "Monitoring Evaluation and Learning Guidance" and "Standard Indicator Guidance".** | Checked |
| • **my budget (which meets the requirements above) using the template provided.** | Checked |
| • **a signed copy of the last 2 annual report and accounts for the Lead Partner, or provided an explanation if not.** | Checked |
| • **my completed workplan as a PDF using the template provided** | Checked |
| • **a copy of the Lead Partner's Safeguarding Policy, Whistleblowing Policy and Code of Conduct (Question 28).** | Checked |
| • **1 page CV or job description for each of the Project Staff identified at Question 30, including the Project Leader, or provided an explanation of why not, combined into a single PDF.** | Checked |

| | |
|---|---|
| • **a letter of support from the Lead Partner and partner(s) identified at Question 31 and relevant OT Governments, or an explanation of why not, combined into a single PDF.** | Checked |
| **My additional supporting evidence is in line with the requested evidence, amounts to a maximum of 5 sides of A4, and is combined as a single PDF.** | Checked |
| **(If copying and pasting into Flexi-Grant) I have checked that all my responses have been successfully copied into the online application form.** | Checked |
| **I have checked the** Darwin Plus website **immediately prior to submission to ensure there are no late updates.** | Checked |
| **I have read and understood the Privacy Notice on the** Darwin Plus website**.** | Checked |

**We would like to keep in touch!**

**Please check this box if you would be happy for the lead applicant (Flexi-Grant Account Holder) and project leader (if different) to be added to our mailing list. Through our mailing list we share updates on upcoming and current application rounds under the Darwin Initiative and our sister grant scheme, the IWT Challenge Fund. We also provide occasional updates on other UK Government activities related to biodiversity conservation and share our quarterly project newsletter. You are free to unsubscribe at any time.**

Checked

## Data protection and use of personal data

Information supplied in the application form, including personal data, will be used by Defra as set out in the **Privacy Notice**, available from the Forms and Guidance Portal.

This **Privacy Notice must be provided to all individuals** whose personal data is supplied in the application form. Some information may be used when publicising the Darwin Initiative including project details (usually title, lead partner, project leader, location, and total grant value).

Project Title:

## Workplan. DPR12S1_1051. Shining a light on Anguilla's moths using Artificial Intelligence

| | Activity | No. of months | Year 1 (24/25) | | | | Year 2 (25/26) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 |
| Output 1 | | | | | | | | | | |
| 1.1 | Deploy four camera systems, capturing metadata entries for each camera system location, including precise location, habitat descriptions, photos | 18 | | | | | | | | |
| 1.2 | Biodiversity data from camera systems summarised within accessible visualisations | 15 | | | | | | | | |
| 1.3 | Image data summarised within accessible visualisations | 12 | | | | | | | | |
| Output 2 | | | | | | | | | | |
| 2.1 | iNaturalist project created for capturing images (and location information) for moths occurring on Anguilla | 12 | | | | | | | | |
| 2.2 | Image training dataset available and tagged by citizen scientists and moth experts | 24 | | | | | | | | |
| 2.3 | Image Classification Model built using information from iNaturalist and the image training dataset | 18 | | | | | | | | |
| Output 3 | | | | | | | | | | |
| 3.1 | Co-develop an accessible and informative online guide to insects and their important roles to people and nature, how to monitor insects using novel technologies and how people can contribute (e.g. submitting observations of wildlife to iNaturalist or supporting wildlife-positive actions). | 18 | | | | | | | | |
| 3.2 | One biodiversity report card developed with data and analysis from automated camera systems | 12 | | | | | | | | |
| 3.3 | End of project workshop for Anguilla stakeholders | 6 | | | | | | | | |

Project Title:

| Project Summary | SMART Indicators | Means of Verification | Important Assumptions |
|---|---|---|---|
| **Impact:**<br>Demonstrable benefit of automated technology for more effective monitoring of insects as indicator species, to evaluate the outcomes from conservation action for Anguilla's island ecosystems which support globally important species | | | |
| **Outcome:**<br>Automated, camera-based monitoring of insects on Anguilla island ecosystems established and used to assess insect populations as indicators of habitat recovery in sites being managed for globally important species | 0.1 Indicators of habitat recovery based on insects (e.g. post restoration/rewilding on offshore cays and Anguilla Fountain National Park) used to inform conservation management of globally important vertebrate species.<br><br>0.2 Insect diversity data derived from automated monitoring systems in four Anguilla sampling locations<br><br>0.3 Image classifiers for Anguilla's moths developed by Year 1 Quarter 4 with 100 species reporting more than 80% accuracy of classification by AI models<br><br>0.4. Raised awareness amongst Anguilla government stakeholders of the value of | 0.1 Indicators of habitat quality based on insects, are used by ANT and Anguilla government and within their biodiversity reporting<br><br>0.2 Data captured in Year 1 Quarter 3 through to Year 2 Quarter 3. Processed through machine learning data pipelines to derived insect diversity metrics.<br><br>0.3 Image classifier for Anguilla moths published through open repository, including model evaluation metrics<br><br>0.4 A biodiversity report card and insect guide distributed to 20 government stakeholders, | Working with the Anguilla National Trust and with government support to access land, with permission, to deploy camera traps.<br><br>Inclusive engagement of diverse group (recognising the importance of gender balance) of stakeholders with breadth of expertise will maximise availability and relevance of information on insects to inform predictive conservation evaluation<br><br>Information on insects site undergoing active management will increase understanding of conservation success |

| | | | |
|---|---|---|---|
| | insects as indicators of habitat quality | with evaluation to capture their feedback. | The project team includes the necessary skills to deploy automated monitoring systems, deliver data, build AI models and engage the governmental and NGO communities of Anguilla. This will ensure access to inclusive resources and capacity to underpin the outcome and outputs |
| **Outputs:**<br>**1. Automated camera (AMI) systems operating in four locations across Anguilla, at sites with active conservation management by the Anguilla National Trust**<br>Delivered through WP1 | 1.1 Metadata entries for each camera system location, including precise location, habitat descriptions, photos<br>1.2 Image data regularly captured from four locations<br>1.3 Biodiversity data from camera systems summarised within accessible visualisations | 1.1 Project website page to show location information for four traps deployed.<br>1.2 Data regularly collected from four camera system hard drives and uploaded on shared project data store.<br>1.3 Summaries of information collated provided on project website, e.g. number of images captured, number of sampling nights | Working with the Anguilla National Trust and with government support to access land, with permission, to deploy camera traps. |
| **2. Image classification model for Anguilla moths published online**<br>Delivered through WP2 | 2.1 iNaturalist project created for capturing images (and location information) for moths occurring on Anguilla, by end of 2nd Quarter year 1. | 2.1 Project active on iNaturalist for citizen science involvement. Engage 20 contributors | |

Project Title:

| | | | |
|---|---|---|---|
| | 2.2 Image training dataset available and tagged by citizen scientists and moth experts, by end of 4th Quarter year 1.<br><br>2.3 Image Classification Model built using information from iNaturalist and the image training dataset, by end of 1st Quarter year 1. | 2.2. Number of images available in total, summarised by individual moth species. Engage 5 experts to confirm species identification (e.g. tag images for training datasets)<br><br>2.3 Image classification model published and openly available via a dedicated code repository (e.g. GitHub) | |
| **3. Knowledge exchange and engagement with a range of stakeholders interested in insect monitoring and new technologies**<br><br>Delivered through WP3 | 3.1 Co-develop an accessible and informative online guide to insects and their important roles to people and nature, how to monitor insects using novel technologies and how people can contribute (e.g. submitting observations of wildlife to iNaturalist or supporting wildlife-positive actions), by end of 3rd Quarter year 1.<br><br>3.2 One biodiversity report card developed with data and analysis from automated camera systems, by end of 2nd Quarter year 2. | 3.1 Online guide available on the project website<br><br>3.2 Publish biodiversity report card online<br><br>3.3 Number of attendees and range of organisations represented. Evaluation of project success and future potential | Workshops are not cancelled due to COVID-19 restrictions and virtual approaches are available if in-person meetings are restricted<br>Co-development of guide and biodiversity report card with project team and other Anguilla stakeholders will ensure appropriate timing and format to maximise impact |

| | | | |
|---|---|---|---|
| | 3.3 End of project workshop for Anguilla stakeholders, by end of 4th Quarter year 2. | | |
| **4**. | | | |

**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. Each activity should start on a new line and be no more than approximately 25 words.)

**Note to ensure value for money the field deployment and regular collection of data from camera systems will be combined with other ANT fieldwork on offshore islands (Sobrero and Dog island, Prickly Pear Cays) and Fountain National Park reserve on Anguilla main island.**

**Inclusive communication best practice will be implemented throughout the development of all resources.**

1.1 Deploy four camera systems, capturing metadata entries for each camera system location, including precise location, habitat descriptions, photos

1.2 Image data regularly captured from four locations

1.3 Biodiversity data from camera systems summarised within accessible visualisations

2.1 iNaturalist project created for capturing images (and location information) for moths occurring on Anguilla

2.2 Image training dataset available and tagged by citizen scientists and moth experts

2.3 Image Classification Model built using information from iNaturalist and the image training dataset

3.1 Co-develop an accessible and informative online guide to insects and their important roles to people and nature, how to monitor insects using novel technologies and how people can contribute (e.g. submitting observations of wildlife to iNaturalist or supporting wildlife-positive actions).

3.2 One biodiversity report card developed with data and analysis from automated camera systems

3.3 End of project workshop for Anguilla stakeholders