Applicant: Tichit, Pierre Organisation: South Atlantic Environmental Research Institute

Funding Sought: £49,724.18

DPLR4\1071

An innovative method to trap invasive ladybirds on South Georgia.

Ladybirds were recently introduced to SGSSI and threaten the terrestrial ecosystem through predation and competition of native species. Rapid response is the least expensive option with the highest chances of mitigating the invasion. We will develop a novel method to capture invasive ladybirds using volatile baits that mimic their prey. We will test this innovative solution in the field to assess the extent of their distribution and assess if traps may be used to mitigate the invasion.

DPLR4\1071

An innovative method to trap invasive ladybirds on South Georgia.

Section 1 - Project Title & Contact Details

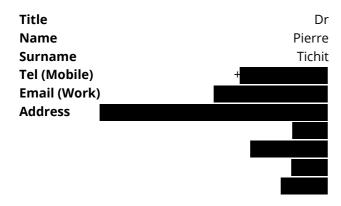
Q1. Project Title

An innovative method to trap invasive ladybirds on South Georgia.

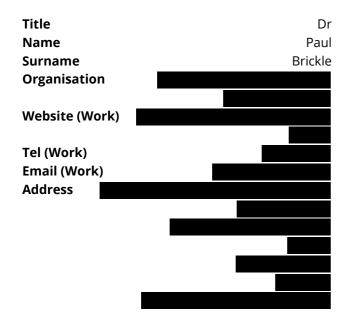
Q2. Please select whether you are applying as an organisation or as an individual (Guidance section 3 and Guidance Glossary)

Organisation

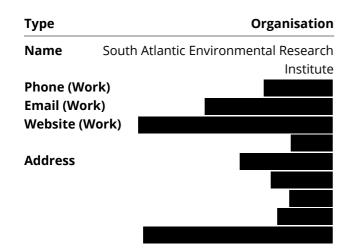
CONTACT DETAILS



CONTACT DETAILS



GMS ORGANISATION



Section 2 - Overseas Territory(ies)

Q3. Please state whether the same (or similar) project proposal has previously been submitted to the UK Government for funding, including through Darwin Plus Local, Defra's other Darwin Plus grant schemes or other UK Government funding mechanisms. Failure to do so may result in the application being ineligible.

Yes

Please provide details including the grant scheme applied for, round number, project and/or application number, whether your submission was successful and in case this is a resubmission, how you have addressed the feedback in your cover letter.

We applied to a Darwin fellowship on Round 12 with reference number DPR12F\1024. The submission was unsuccessful but the advisory group suggested to consider whether Darwin Local might be a more suitable

scheme for the project. However, this is not a resubmission as the present application has little overlap with the former fellowship proposal, a research project that aimed at increasing knowledge of all terrestrial arthropods primarily on the Falkland Islands and to a lesser extent on South Georgia using citizen science.

Q4. Overseas Territory (Guidance section 1.3):

Which UK Overseas Territory(ies) will your project be working in? Please note that in case of a non-permanent resident population you need to demonstrate a clear, meaningful, long-term link to the territory.

☑ South Georgia and The South Sandwich Islands (SGSSI)

* 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 UKOT(s) you have indicated, will your project directly benefit any other UK OT(s) or country(ies)?

Yes

Please list these here and describe how they will benefit:

Falkland Islands: The eleven-spotted ladybird is native to Europe andwas probably introduced to SGSSI via the Falkland Islands where the it has been present since the 1980's. Despite likely negative consequences on the ecosystem, little is known about the species distribution on the Falkland Islands and no control strategies are in place. If successful, the innovative method developed through this project will be transferred to the Falkland Islands to improve monitoring and control of this invasive insect.

More generally, the method developed here could be applied to design volatile-based biosecurity strategies of non-native terrestrial arthropods on other UKOTs and beyond.

Section 3 - Project Partners

Q5. Project partners (Guidance section 3.2)

In this section, please give details of all the partners involved (including the Lead Organisation) and provide a summary of their roles.

Project Leader name (Guidance section 3.1):	Pierre Tichit
Lead Organisation name (if applying as an organisation; Guidance section 3.1):	South Atlantic Environmental Research Institute (SAERI)
Lead Organisation Website (if applicable):	https://www.south-atlantic-research.org/

Is the Lead Organisation based in a UKOT where the project is working (Guidance section 3.1)?	⊙ Yes
	Doctor Paul Brickle, SAERI, Stanley, Falkland Islands.
List other partners involved and where are they based:	Professor Helen Elizabeth Roy, UK Centre for Ecology and Hydrology, Wallingford, UK; University of Exeter, Penryn, UK.
	Associate Professor Velemir Ninkovic, Swedish University of Agricultural Sciences, Uppsala, Sweden.
Summary of roles and responsibilities of each partner in the project:	Pierre Tichit is responsible for the general coordination of the project and the successful delivery of the outputs. During the first half of the project, Pierre Tichit will design and test the novel volatile based ladybirds traps with logistical support and expertise of Velemir Ninkovic on volatile signalling in plants and ladybirds ecology, as well as the expertise of Helen Roy in ladybird ecology and biological invasions. Paul Brickle will coordinate the hiring of two field operators (locally hired in FI) for the deployment of the developed traps. Pierre Tichit will ensure the training of the field operators and coordinate the logistics of field operations. Pierre Tichit will ensure the analysis of results and dissemination of project benefits to stakeholders.
I confirm that all listed partners are aware of this application and have indicated support:	Checked

Attach a Cover Letter for your application (Guidance section 4.2).

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Section 4 - Project Summary & Description

Q6. Project Summary (Guidance section 3.8)

Please provide a brief summary of your project. This may be used in communication activities and/or published online, if your application is successful.

Ladybirds were recently introduced to SGSSI and threaten the terrestrial ecosystem through predation and competition of native species. Rapid response is the least expensive option with the highest chances of mitigating the invasion. We will develop a novel method to capture invasive ladybirds using volatile baits that mimic their prey. We will test this innovative solution in the field to assess the extent of their distribution and assess if traps may be used to mitigate the invasion.

Q7a. Description (Guidance section 2.1 and 6)

Please provide a description of your project, including:

- the overall objective
- the current situation and the problem the project is trying to address
- · what success will look like and how you will measure it.

Please be as specific as possible when describing the project, using quantified data and evidence where available. You may wish to consider: what are the specific threats to the environment that the project will attempt to address, and what should we know about these threats? What does your successful project look like? And how will you demonstrate whether and how your project has been successful?

Main objective: to develop and test an innovative solution to monitor and mitigate the invasion of a ladybird species recently introduced to SGSSI.

Background: as part of the Darwin project DPLUS144, we discovered the presence of the eleven spotted ladybird, a species native to Europe, on South Georgia in February 2023 (Tichit et al., 2023). The species was sighted again in 2024 within a few kilometres of the first record. Little is known about the abundance, extent and ecology of ladybirds on SGSSI, but the available data strongly suggests that this winged insect will persist and expand on SGSSI if no control measures are taken.

Ladybirds could have a strong negative impact on the unique and vulnerable terrestrial ecosystem of SGSSI. In other regions of the world, invasive non-native ladybirds have altered native insect communities and disrupted local food chain (Evans et al., 2011). Due to their historical isolation, arthropod communities on South Georgia are poorly adapted to predation (Houghton et al., 2019) and are thus disproportionately vulnerable to predatory ladybirds. Introduced ladybirds may be the final blow for endemic species such as the wingless Eretmoptera murphyi that are already declining due to increased temperatures (Pertierra et al., 2020) and invasive carabid beetles (Ernsting et al., 1995). By impacting herbivores and detritivores, invasive ladybirds may have cascading effects on ecosystem functions such as litter decomposition, peat formation and nutrient cycling (Houghton et al., 2019). The area currently invaded by ladybirds on South Georgia may become a stepping stone for further introductions to other parts of South Georgia, the Sandwich Island or the Antarctic Peninsula, representing a biosecurity hazard at the regional level.

In order to protect the unique ecosystem of SGSSI, the problem of introduced ladybirds needs to be addressed rapidly, as early actions are proven to reduce costs and increase the probability of successful control (Gallardo et al., 2022). Innovative strategies need to be developed given the remoteness and vulnerability of the Territory. In turn, to develop efficient mitigation strategy, more knowledge about the state of the ladybird invasion is urgently needed.

To do this, we designed a pilot project at the interface between conservation research and practice with the following goals:

- 1) to develop a novel method to capture ladybirds that is efficient, accessible and harmless to the native environment. We will build traps containing volatiles such as methyl salicylate that mimic aphid activity to attract ladybirds. Volatile-based designs have proven successful to recruit ladybird species for biocontrol of aphids (Verheggen et al., 2007). The efficiency of these novel traps methods will be tested in comparison to conventional trapping methods in the laboratory in October-November 2024.
- 2) to test the novel trapping method on SGSSI with the dual objective of assessing the invasion state, and to evaluate possibilities to control or eradicate the species. Traps will be deployed in February 2025 at, around and beyond known locations of ladybird presence to estimate the species distribution. The number of individuals captured at each location will be investigated across time in comparison to hand searches to estimate the trapping efficiency of the method and its potential to reduce population sizes.
- 3) to disseminate and build capacity among local stakeholders and international actors to utilize the novel

method (see long-term sustainability).

Measurable indicators of success: (1) volatile traps are designed, (2) trapping efficiency relative to other methods (= detection probability) in the lab and on South Georgia is quantified, (3) knowledge of the invasion state of ladybirds is improved, (4) possibilities to use the method for control is assessed, (5) results of the pilot project are disseminated to stakeholders.

Q7b. Long-term sustainability (Guidance section 2.1 and 6)

Please describe the long-term benefits of the project and the change it will bring about. How will the outcomes of the project be sustained after the funding is finished?

The pilot project will produce benefits (improved knowledge of the invasion state, new accessible method for detection or control) that will be transferred to the Government of SGSSI by the end of the project, allowing the Government of SGSSI to refine the biosecurity strategy for ladybirds, and possibly to include the new traps within existing (e.g. monitoring scheme for early detections on non-native invertebrates) or future (e.g. ladybird control) biosecurity strategies.

The results of this pilot project will be published in an open access peer-reviewed journal to ensure their long-term broad dissemination. This will be key for actors that may develop similar methods with volatiles, for example UKOTs where introduced ladybirds are present (e.g. harlequin ladybird on Saint Helena). If the novel method is promising, we will ensure its dissemination to stakeholders operating in neighbouring UKOTs (Falkland Islands Government, British Antarctic Survey) where improved ladybird monitoring would enhance biosecurity and environmental quality. In cooperation with IAATO and Antarctic Cruise Operators, we will assess the possibility to rely on the novel traps to detect ladybirds on cruise ships. This would represent a direct long-term benefit for SGSSI by lowering the risk of new ladybird introductions from the Falkland Islands.

(Optional) Please upload any additional and supporting materials or files (such as maps of project sites, etc) below. Maximum of 5 sides of A4, and is combined as a single PDF:

- & References
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- pdf 61.46 KB

Section 5 - Project Outcome(s)

Q8. Project Outcome(s) (Guidance section 1.2)

Successful Darwin Plus Local projects must demonstrate measurable outcomes in <u>at least one of the</u> <u>themes of Darwin Plus with a clear focus on biodiversity and the natural environment</u>, either by the end of the project or soon after through a credible plan.

Please note: Any proposals including research or monitoring are required to demonstrate a clear link to tangible outcomes for conservation of biodiversity and the natural environment. Please explain how any new research will be applied to drive environmental outcomes on the ground.

Please confirm that your project has a clear focus on biodiversity and the natural environment.

Checked

Biodiversity: improving and conserving biodiversity, and slowing or reversing biodiversity loss and degradation;

Please tick which additional theme(s) of Darwin Plus your project contributes to (if relevant):

Unchecked	Climate change: responding to, mitigating and adapting to climate change and its effects on the natural environment and local communities;
Checked	Environmental quality: improving the condition and protection of the natural environment
Checked	Capability and capacity building: enhancing the capacity within OTs, including through community engagement and awareness, to support the environment in the short- and long-term.

Please justify your selection. Please use quantitative information where possible here.

This pilot project will produce knowledge, develop methods and support strategies towards solutions to address the new problem of non-native ladybirds on South Georgia. This represents a direct improvement of the condition of the natural environment because introduced ladybirds could, if left unchecked, have a strong negative impact on native species, terrestrial communities and ecosystem functioning. By transferring a newly developed method to monitor and control introduced ladybirds to the Government of SGSSI (and other OTs), we will also increase the long-term capability within SGSSI to protect the environment from invasive non-native species.

Section 6 - Workplan

Q9. Workplan (Guidance section 2.2)

<u>Please provide anticipated dates for the start and end of your planned project here.</u> Please use the <u>Darwin Plus Local Project Workplan</u> (available at: https://darwinplus.org.uk/apply/local-applications/) to provide a list of the individual activities you have planned for this project, a brief description of what each activity entails, and the months in which the activities will be carried out. If the project involves only one activity (e.g. a purchase), please still provide project start and end dates (noting estimated times for procurement). Please note that your project must start after 1 October 2024 and be completed by 31 March 2025.

Start date:	End date:	Duration (e.g. 3 months):
01 October 2024	31 March 2025	6 months

Please upload the completed Darwin Plus Local Project Workplan with your proposed project activities here

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Section 7 - Costs

Q10. Costs (Guidance section 2.2 and please read the Finance Guidance)

Please provide a breakdown of costs to be funded through Darwin Plus Local (in GBP). Are you seeking any matched funding for this project?

No

Budget line	Explanation	Cost in GBP
Staff costs:	Full time salary for two field operators for 30 days in the field, 10% part time salary for project leader Pierre Tichit, 5 % salary for three other partners.	£
Consultancy costs:	n/a	£0.00
Overhead costs:	Overheads from SAERI and partner organisations (35 %)	£
Travel & subsistence costs:	Travel and subsistence in Sweden for Pierre Tichit and Velemir Ninkovic for two visits at respective institutions to enable trap design & testing (1200 GBP for train travel and T&S). Travel to/from and within SGSSI for two field operators (3000 GBP for boat berths and T&S). Food and lodging on SGSSI for two field operators (5000 GBP based on previous field surveys in DPLUS144).	£
Operating costs:	Dispatch of traps and samples to and from FI (400 GBP), jetboat travel within South Georgia (5000 GBP), consumables for field work on SGSSI (100 GBP).	£
Capital equipment:	Equipment for trap design & testing and field work on SGSSI (1900 GBP), field gear (800 GBP).	£
Other Costs	Publication fee for open access scientific paper	£
Total:		49,724.18

This section provides more information on the budget to help evaluators understand how you will use the funds you are requesting. You do not need to list all costs, but please list and detail costs of more than £1,000 per item below, under the appropriate budget line.

Details of staff costs over £1,000 (if relevant)
Details of everybood costs every \$4.000 (if not everyb).
Details of overhead costs over £1,000 (if relevant):
Details of travel and subsistence costs over £1,000 (if relevant):
Details of operating costs over £1,000 (if relevant):
Details of capital equipment costs over £1,000 (if relevant):
Details of consultancy costs over £1,000 (if relevant):
No Response

Details of other costs over £1,000 (if relevant)

If your project budget was prepared in another currency and converted to GBP, please provide the exchange rate, its source, and the date it was accessed:

Other currency:	Exchange rate:	Source of this exchange rate:	Date exchange rate accessed:
No Response	No Response	No Response	No Response

Darwin Plus Local has been created to build capacity and contribute to local economies in-territory.

What % of the total will be spent in the OTs?



If less than 80% of the total project spend is to be spent within the OT(s), please explain why.

While we aim at maximising the financial involvement of the project in the OTs (SGSSI and FI), for instance by hiring two field operators based in FI, this project requires international expertise in biological invasions and insect ecology (provided by Pierre Tichit and Helen Roy) and knowledge in olfaction and behavioural ecology (Velemir Ninkovic) that are not currently available in the OTs.

Section 8 - Local and National Priorities

Q11. Local and national priorities

Please explain how this project aligns with local and national priorities? You may wish to consider the project in the context of national environmental laws, objectives, strategies, territory specific agreements, action plans or policies.

This project aligns with the national priorities of SGSSI as defined within the stewardship framework for SGSSI 2021 – 2025 whose main purpose is to achieve "Environmental recovery and resilience through world-leading evidence-based sustainable management". Biosecurity is one of seven priority area for SGSSI, and our project aligns entirely with this area by increasing capacity to "protect ecosystems through active management and monitoring". In particular, the Government of SGSSI aims at protecting "the Territory from new invasive species and target existing ones to ensure they do not spread". Moreover, this project coincides with the thematic strategy of the Government of SGSSI. This biosecurity strategy entitled "Environmental Resilience" provides a set of biosecurity policies that are regularly reviewed to ensure the protection of SGSSI against the introduction and spread of non-native taxa.

Will the project take place on Government owned land or water or involve biocontrol, invasive alien species control or eradication?

Yes

Please attach evidence that you have Government support for this project i.e. a Letter of Support. Applications which indicate that they do not take place on Government land or water, but which propose work that appears to the reviewers would be difficult/impossible to carry out without working on government land or waters may be ineligible if no Letter of Support is provided.

- 盘 20240620 Letter of Support P. Tichit(1)
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Section 9 - Project Risks

Q12. Project Risks

Please demonstrate your consideration of any risks involved in this project and how you intend to manage them. Please note the importance of health and safety and environmental risk assessment in the design of your project. If there is any possibility that your project may have negative impacts on the environment or human health, it is important that you provide a comprehensive analysis of potential environmental and human health risks, and the prevention measures you will take to ensure the work does not cause harm.

Depending on your project, you may wish to consider:

- Biosecurity risks particularly for projects involving external equipment.
- Safeguarding risks particularly for projects involving vulnerable groups such as children, older people or people with disabilities.

Risk	Mitigation
Biosecurity risk: transport and spread of introduced species or pathogens during travel to and within SGSSI.	All field activities within the project will be scrutinised and approved by the Government of SGSSI in accordance with biosecurity policies. The project operators on the field will have experience of field work on the Territory and strictly follow biosecurity guidelines. All material including traps will be inspected and disinfected prior to being deployed.
Health and Safety risk: hazards and injuries during field work on South Georgia.	The project operators on the field will have experience of field work on the Territory and coordinate their activities with operators of the government of SGSSI. They will be trained for field first aid emergencies, undergo a medical and dental check and establish a risk assessment in accordance with guidelines of SGSSI.
Environmental risk: collection of non-target species in volatile traps.	Volatiles that are normally emitted by feeding aphids are very unlikely to attract a broad range of invertebrates that are mostly herbivorous on South Georgia. It is possible that the predatory carabid beetles are be significantly attracted, but these species are also non-native to the Territory, and are thus a tolerable "by-catch".

Do you require more fields?

Yes

Risk	Mitigation
Logistics risk: recruitement of one field operator is not succesful	We will realocate budget lines in order to support transport of Pierre Tichit to FI and SG alongside with a hired field operator in order to allow field work to be done.
No Response	No Response

Section 10 - Terms & Conditions

Q12. Terms and conditions (Guidance section 3.10)

By applying for Darwin Plus Local you are adhering in full to the grant Terms and Conditions in full (available at: <u>Darwin Plus website</u> and as referenced in the Guidance at section 3.10). For information, the Terms and Conditions include requirements for all applicants to (amongst other requirements as per the full Terms and Conditions):

- Uphold a zero tolerance for inaction approach to tackling sexual exploitation, abuse, and harassment.
- Where appropriate, make all reasonable and adequate efforts to address gender inequality and other power imbalances.
- Notify all cases of fraud and theft (whether proven or suspected) relating to the project to the Grant Administrator as soon as they identified.

Please indicate you have read, and understood, and will adhere to the Terms and Conditions.

Checked

Supporting documents list (please have these ready to attach with application)

- Cover Letter of no more than two A4 pages. (Guidance section: 4.2 has information on what this cover letter should include).
- If the project takes place on public land or water or is addressing invasive alien species, a Letter of support from OT Government.
- Project Workplan in the template provided for Darwin Plus Local (available at: https://darwinplus.org.uk/apply/local-applications/).
- Map and additional information (optional) maximum five additional pages.

If your application is successful

If your project application is successful, the Fund Administrator (NIRAS) will ask you to provide some financial evidence for due diligence checks before you receive your project grant. (Please see section 3.3 of the Darwin Plus Local Finance Guidance). Please be ready to provide this evidence promptly.

- **Financial evidence for organisations**: Year-end financial statements, the latest management accounts or audited accounts (if you have these).
- **Financial evidence for individuals**: Proof of identity such as a passport, ID card or driving licence and solvency (such as bank statements) and a police check.

Section 11 - Certification

Certification

I certify that, to the best of my knowledge and belief, the statements made in this application are true and the information provided is correct.

Checked

I have the authority to submit an application on behalf of my organisation.

Checked

Name:	Dr Paul Brickle
Position in the organisation: (if applicable)	CEO
Signature (please upload e- signature)	 ♣ Paul sig ★ 24/06/2024 ♠ 20:49:19 ♠ jpg 11.98 KB
Date:	24 June 2024

Section 12 - Submission Checklist

Checklist for submission

	Check
I have read the Guidance documents, including the "Darwin Plus Local Guidance" and the "Darwin Plus Local Finance Guidance".	Checked
If my proposed project takes place on public lands or water or is addressing alien invasive species, I have uploaded a Letter of Support from Government.	Checked
I have uploaded a cover letter that details the information requested in the guidance (Guidance section 4.2 has information on what this cover letter should include).	Checked
I have read, and can meet, the current Terms and Conditions for this fund (found at: https://darwinplus.org.uk/apply/local-applications/) for this fund.	Checked
I have provided actual start and end dates for my project that fit this Round.	Checked

I have provided my summary budget based on UK government financial years i.e. 1 April - 31 March and in GBP in the application form.	Checked
I have uploaded my project workplan using the specific template provided (available at: https://darwinplus.org.uk/apply/local-applications/).	Checked
I have uploaded all supplementary documents if I have any.	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
The application has been signed by a suitably authorised individual (clear electronic or scanned signatures are acceptable).	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 Darwin Plus. We also provide occasional updates on other UK Government activities related to biodiversity conservation and share project news. You are free to unsubscribe at any time.

Unchecked

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 <u>Forms and Guidance Portal</u>.

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 Darwin Plus including project details (usually title, lead partner, project leader, location, and total grant value).

Project Title:

Darwin Plus Local

Provide a **Project Implementation Timetable** that shows the key milestones in project activities. Complete the following table as appropriate to describe the intended workplan for your project. Round 4 is for a **maximum of 6 months** with activities starting from 1 October 2024. All activities must be completed by 31 March 2025.

Please add/remove columns to reflect the length of your project. For each activity (add/remove rows as appropriate) indicate the number of months it will last, and shade only the months in which an activity will be carried out. The workplan can span multiple pages if necessary.

	Description (max 25 words)	No. of months	UK Financial Year 2024/25						
Activity #			Calendar Year 2024			Calendar Year 2025			
			Oct	Nov	Dec	Jan	Feb	Mar	
Trap conception	Building pilot volatile traps to capture ladybirds	1.5	X	X					
Trap testing	Testing traps in the lab with behavioural assays with different concentrations and types of volatiles to optimise capture.	1.5		Х	X				
Field operator recruitment	Two field operators with experience in the sub- Antarctic will be hired to dispatch and collect traps on the field.	0.5		X					
Permits and logistics for field work	Permits applications and logistics of field work on South Georgia are sorted out.	3	X	х	X				
Field operator training	The recruited field operators will be instructed and trained by Pierre Tichit to display the volatile traps prior to field work.	1				X			
Traps tested in the field	Traps are deployed, emptied and collected for 3 weeks on South Georgia. Ideally in coordination with invasive plant eradication team.	1					X		

Project Title:

	Description (max 25 words)	No. of months	UK Financial Year 2024/25					
Activity #			Calendar Year 2024			Calendar Year 2025		
			Oct	Nov	Dec	Jan	Feb	Mar
Wrap-up	Results analysed. Final report to stakeholders and dissemination of projects benefits. Draft of scientific manuscript.							X