

Darwin Fellowship - Interim Report

Due within one month of the half way point of your Fellowship (*maximum 3 pages*)

Darwin Fellowship reference	DPLUS172
Name of Darwin Fellow	Ioanna Angelidou
Lead organisation	Enalia Physis Environmental Research Centre
Fellow's organisation(s)	Enalia Physis Environmental Research Centre, Joint Services Health Unit (JSHU) in Sovereign Base Areas Cyprus
Fellow's role within the organisation (prior to Fellowship)	<ul style="list-style-type: none"> • Lab assistant at the JSHU, in SBAs (non-paid position). • Insect surveys and identification (non-paid position). • Member of the organising committee for the COST Action CA17122 Alien CSI Bioblitz (non-paid position). • Member of the local organising committee for the 24-hour Bioblitz in Akrotiri peninsula (non-paid position). • Member of the local organising committee for raising awareness events on insect biodiversity and protection (non-paid position).
Start/end date of Fellowship	01 October 2022-30 September 2024
Location of Fellowship	Sovereign Base Areas of Cyprus (SBAs)
Darwin Fellowship grant value (£)	£34,313.00
Type of work (e.g. research, training, if other please specify)	Research
Main contact in lead organisation	[REDACTED]
Author(s) and date	Dr Kelly [REDACTED], Dr Thomas [REDACTED], Prof Helen [REDACTED], Ioanna [REDACTED], 19/4/24

1. Background

- In 2018, I (Mrs Angelidou) worked on DPLUS088 project: Addressing drivers of ecological change in Lake Akrotiri SBA, Cyprus. Two years later, I was awarded the DPLUS101 that looked at the impact drivers of change on ecosystem services provided by Akrotiri wetland. This fellowship complemented the DPLUS088 funded project and provided the opportunity to expand the Flower-Insect-Timed (FIT) Count protocol to other habitats across the SBAs through increased community engagement. Through my participation in DPLUS088 project, and my awarded project (DPLUS101) I have promoted the pollinator monitoring scheme of Cyprus (PoMS-Ký; <https://ris-ky.info/poms-ky>) and the FIT Count via several dissemination events in Cyprus and abroad. In addition, during my previous fellowship, I conducted a literature review to gather evidence of ecosystem services relevant to the Akrotiri wetland. Another literature review was conducted, focused on 29 terrestrial, fresh water and marine alien species that have been introduced or we expect them to come in Akrotiri. This literature review focused on current or potential impacts of the selected invasive alien species on biodiversity, ecosystem services and socio-economy in Cyprus.

- The current fellowship aims to study the effects of drivers of change such as land use, invasive species, and climate change on insect prey of Eleonora's falcon, at feeding hotspots in SBAs and adjacent areas in Cyprus. The main aims and objectives are:
 1. To study the insect prey populations essential for the diet of Eleonora's falcon; this is undertaken at Eleonora's falcon feeding hotspots in Akrotiri peninsula. Hot spots have been identified during previous studies by Dr Hadjikyriakou, using bird transmitters.
 2. To complete structured entomological field surveys to assess insect abundance by using malaise traps and line transects, in combination with citizen science platforms; this aims to identify the insect species that are important prey for Eleonora's falcon.
 3. Using statistical analysis to understand how anthropogenic pressures affect the insect communities and consequently Eleonora's falcon in the different feeding hotspots.
 4. To raise awareness regarding Eleonora's falcon and the importance of insect conservation. Preparation and publication of online resources, publications. Organizing dissemination events.

Programme:

- Literature review on insect fauna prey for Eleonora's falcon during pre-breeding season.
 - Training courses for Mrs Angelidou and volunteers on recording Eleonora's falcon presence and activity by Dr Hadjikyriakou.
 - On-site visits and selection of the 15 study areas. Sampling sites are natural (*Juniperus* forest) and anthropogenic areas (agricultural areas and forest with invasive non-native species such as *Eucalyptus spp.* and *Acacia saligna*) in areas the Eleonora's falcons have been recorded using GPS transmitters, possibly for foraging purposes.
 - Structured entomological field surveys (malaise traps, line transects). Sampling every two weeks.
 - Insect identification.
 - Data curation and analysis of the collected data to identify how anthropogenic pressures affect insect communities and Eleonora's falcon.
 - Creation and updating of project website and social media pages.
 - Data collection based on citizen science platforms.
 - Support by Professor Helen Roy (UKCEH) to design the study and plan dissemination events.
- Dr Martinou and Dr Hadjikyriakou have Mrs Angelidou' daily supervision and are hosting her at JSHU and Akrotiri Environmental Education Centre (AEEC). Dr Martinou trained on insect identification. Dr Hadjikyriakou trained Mrs Angelidou on recording Eleonora's falcon presence and activity. Prof Roy (UKCEH) is responsible for the design of the study and the planning of dissemination events.

2. Progress

- Working on the literature review on insect fauna prey for Eleonora's falcon during pre-breeding season.
- Training courses by Dr Hadjikyriakou.
- Weekly meetings with Dr Martinou and Dr Hadjikyriakou.
- Meeting with Dr Martinou and other fellows every two weeks; discussion on progress, problems and helping each other when is possible.
- On-site visits and selection of the 15 study areas.
- Structured entomological field surveys (malaise traps, line transects; April 2023-mid August 2023). Sampling every two weeks. Field work started again this year (in April) and will be finished in August 2024.
- Bird presence recording during the same period. Eleonora's falcon recording in the 15 sites during pre-breeding period.
- Insect identification in the laboratory, using dissecting microscopes and taxonomic keys.
- March 2023. Met and discuss with Prof Roy to design and organise dissemination events.

- Participation in the workshop “Akrotiri Peninsula - Biotic & Abiotic Monitoring, Status & Trends”, that took place at the AEEC, in the framework of the Darwin Plus Project DPLUS141: Habitat Restoration & Wise Use for Akrotiri & Cape Pyla, on the 8th of December 2022; the workshop was organized by the Darwin Plus Project Team and Project Partners i.e., Birdlife Cyprus, Terra Cypria and the SBAA Environment Department. In this workshop. Presentation of the subject of this fellowship.
- 30th of March 2023. Co-organisation a dissemination event “Biodiversity studies at the Akrotiri Peninsula and beyond” in AEEC. Eleven people presented their work (including me) and 30 people from Ministries, NGOs from Cyprus and the SBAs were invited (including Professor Helen Roy, and stakeholders from SBAs and the Republic of Cyprus).
- 4-7 October 2023. Participation in Helecos 11 Conference (<http://helecos11.upatras.gr/yповoli-ergasias/>) in Patra, Greece (oral presentation and poster).

- Presentation abstract: Eleonora’s falcon (*Falco eleonoraë*) is an aerial predator that feeds on large flying insects (e.g., Coleoptera, Lepidoptera, Hemiptera, Hymenoptera) and switches its diet to primarily small passerine species during nesting. In Cyprus, all colonies are within Natura 2000 sites and need continuous monitoring, especially as insect feeding grounds of the species are subject to intensive anthropogenic pressures. As this trans-equatorial migrant bird species requires conservation measures to ensure its survival and reproduction, the study aims to evaluate the effect of land use type on foraging areas of Eleonora’s falcon at their breeding grounds as well as the human-induced pressures that affect spatial distribution of the species across the Akrotiri peninsula. Spatiotemporal activity and correlation of Eleonora’s falcon presence with the prevailed insect prey along with the significance of habitat characteristics in relation to food resources (insects) are examined within the framework of DPLUS172 funding. In total 15 plots (three per land use type) were selected, all used by Eleonora’s falcon as foraging areas in the recent past (2013-2016) according to telemetry tools. The land use types included: a) Citrus spp. plantations with young plants, b) Citrus spp. plantations with older plants, c) plots that in the past hosted citrus plantations, d) forest plantation north of the Akrotiri Salt Lake primarily composed by non-native species (*Acacia saligna*, *Eucalyptus camaldulensis*, *Eucalyptus gomphocephala*, *Casuarina cunninghamiana*), e) Pinus Forest (*Pinus brutia*). This study aims to increase our understanding regarding Eleonora's falcon trophic interactions with insects by adopting the following insect sampling methods: (i) Malaise traps, (ii) transect counts or ‘Pollard walks’, (iii) area-time counts, (iv) Cicadas’ surveys. Preliminary results on insect fauna biodiversity in Eleonora’s falcon foraging areas are reviewed in terms of the different sampling methods adopted and the management challenges arising in applying these methods to different land use types.

- Poster abstract: Understanding biodiversity changes and the subsequent impact on human health requires monitoring programmes that can often be deficient due to limited funding and lack of engagement of trained personnel. Thus, raising awareness about biodiversity and human health under the One Health concept and encouraging citizens to join scientific efforts in biological recording are essential more than ever before. Citizens’ contribution can highly support authorities’ work and provide records on native and non-native species that can be used as early warning indicators and help in understanding the impact of anthropogenic pressures. Herein, we present the latest work of our group aiming at raising awareness on important biodiversity issues such as conservation of pollinators, flagship species monitoring, biological invasions, and insect vectors, focusing on the Akrotiri wetland complex in Cyprus and the wider region. To that end, we are using simplified approaches such as the production of information material, but also new interdisciplinary approaches based on computer science, such as videos and interactive games to attract younger audiences who might not be familiar with the natural environment. Some of the material produced is targeted on local people while some has a wider European application. Furthermore, challenges in adopting citizen science initiatives for recording groups of organisms such as pollinators or invasive species e.g., FIT Count App, Mosquito Alert and bioblitzes are discussed. This work is funded mainly by the Darwin Plus Initiative and COST Action Alien CSI. We also highlight the

relevance of the IPBES Thematic Assessment on Invasive Alien Species and their control to our work.

3. Achievements and Outcomes

The main achievements and Outcomes to date are:

- Literature review on insect fauna prey for Eleonora's falcon during pre-breeding season (in progress).
- Training courses on recording Eleonora's falcon presence and activity by Dr Hadjikyriakou.
- On-site visits and selection of the 15 study areas (including *Juniperus* forest, agricultural areas and the forest with *Eucalyptus spp.* and *Acacia saligna*; 5 sites per habitat).
- Structured entomological field surveys (malaise traps, line transects); surveys took place from April – mid August 2023, every two weeks. New round of surveys started this April (2024).
- Insect identification.
- Data analysis, statistical analysis.
- Visit by Prof Roy (UKCEH) to design the study and plan dissemination events.
- Advertising the project and raising awareness through Enalia Physis Environmental Research Centre (<https://enaliaphysis.org.cy/2023/05/09/3446/>)
- Participation in events, conferences.
- Creation of information sources to raise public awareness (in progress).

4. Impact of COVID-19 on Fellowship

- N/A

5. Safeguarding

Please tick this box if any safeguarding or human rights violations have occurred during this financial year.

If you have ticked the box, please ensure these are reported to ODA.safeguarding@defra.gov.uk as indicated in the T&Cs.

6. Next Steps

- Weekly meetings with Dr Martinou and Dr Hadjikyriakou.
- Continue the structured entomological field surveys (malaise traps, line transects; April - mid August 2024). Sampling every two weeks in the same 15 sites.
- Bird recording during the same period.
- Insect identification in the laboratory.
- Data analysis, statistical analysis of the data will be collected this year.
- Data collection based on citizen science platforms.
- Meeting and engaging with stakeholders from the SBAs and the Republic of Cyprus.
- Creation of information sources to raise public awareness (in progress).
- Preparation of a peer reviewed manuscript and additional popular science articles.
- Final report

