

Darwin Fellowship - Interim Report

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

Darwin Fellowship reference	DPLUS202
Name of Darwin Fellow	Evangelos Koutsoukos
Lead organisation	Enalia Physis Environmental Research Centre
Fellow's organisation(s)	Joint Services Health Unit, RAF Akrotiri, BFC Enalia Physis Environmental Research Centre National and Kapodistrian University of Athens, Greece
Fellow's role within the organisation (prior to Fellowship)	Collaborated with JSHU on various projects (publications, conference presentations), and during COST (CA17122)
Start/end date of Fellowship	01/07/2023 – 30/06/2025
Location of Fellowship	Akrotiri UK SBA
Darwin Fellowship grant value (£)	49,500.00
Type of work (e.g. research, training, if other please specify)	research, training, awareness raising
Main contact in lead organisation	Marios Papageorgiou
Author(s) and date	Evangelos Koutsoukos (28/04/2024)

1. Background

Prior to this Fellowship I worked on a COST (CA17122) Short Term Scientific Mission (STSM), titled as “The presence of leaf pests in fig trees of Cyprus: Raising awareness and monitoring their presence and impacts with the help of citizen science”, in collaboration with Joint Services Health Unit Cyprus, BFC RAF Akrotiri. During this project, I collected various species of the superfamily Chalcidoidea within Akrotiri and other areas of Cyprus, and discovered two new species of wasps, both associated with the introduced fig tree *Ficus microcarpa*. Based on my findings and the lack of local experts on parasitic wasps of the superfamily Chalcidoidea, I drafted the proposal for this Fellowship in order to enrich our knowledge regarding the island's chalcid wasp species richness.

The ongoing Fellowship aims to supplement our knowledge and underline the ecological significance of a poorly studied insect superfamily in Cyprus. The main objectives of this Fellowship are to: a) provide a baseline of Chalcid wasps in the Akrotiri Peninsula to enhance scientific research around the region's fauna, by conducting structured monthly surveys across man-made and natural habitats in Akrotiri Peninsula to assess the native and non-native Chalcid fauna along with their impacts, b) raise public awareness, pool, supplement, and summarize our knowledge of the Chalcid wasp fauna of Cyprus with the creation of an online information portal about the “Chalcid wasps of Cyprus”, c) establish the basis of a long-term project regarding the whole Chalcid wasp fauna of Cyprus. Additionally, non-native Chalcid species that will be collected, will serve to future research regarding the introduction pathways of alien species in Europe, with the integrated use of morphological and molecular tools.

Creating the “Chalcid wasps of Cyprus” website is mostly an office-based job, discussing with the project's principals ideas, data to be included, and the site's layout. Research on the species richness of chalcid wasps involves material sampling in the region as well as the communication with biodiversity experts (chalcid wasp specialists, museum curators) to retrieve data and specimens collected by others from Akrotiri and adjacent areas.

I am responsible for undertaking the research under the supervision of Dr Angeliki Martinou (JSHU). The supervisor and I meet on regular intervals to assess progress and discuss next steps. I also maintain a constant communication with expert chalcidologists Dr Stephen Compton (University of Leeds, Leeds, United Kingdom), Dr Mircea Mitroiu (Alexandru Ioan Cuza University, Iasi, Romania) and entomologist Dr Christos Georgiadis (National and Kapodistrian University of Athens, Athens, Greece) discussing chalcid wasp taxonomy and ecology, sending/receiving specimens for identification and learning about Chalcidoidea systematics and their associations with other insects or plants, from professionals in the field. Lastly, Enalia Physis is responsible for the economic management of the project and we are constantly in communication in order to ensure a smooth collaboration and workflow. Furthermore, communication with Enalia Physis' social media experts provides further dissemination of publications and events on social media, maximizing our work's impact.

2. Progress

Up-to-date, work undertaken and progress against the programme of work:

1) Providing a baseline of chalcid wasps in the Akrotiri Peninsula:

Sampling in the Akrotiri peninsula was initially carried out in March and April 2022 prior to the Fellowship to identify the species in the area. Subsequent to this, we conducted opportunistic material surveys throughout Cyprus, with structured material surveys in Akrotiri starting in October 2023. We employed three collection methods: sweeping, the beat sheet technique, and rearing. Additionally, we collaborate with my co-fellow Jakovos Demetriou (DPLUS200), who generously provides us with any chalcid wasp specimens trapped in pitfall traps he uses during his Fellowship. Our plan is to continue sampling monthly to gather data at various time intervals.

2) Raising public awareness and creating the "Chalcid wasps of Cyprus" website:

During the first year of the Fellowship, my focus was on building the "Chalcid wasps of Cyprus" website. This involved researching potential platforms for its creation, searching and accumulating scientific literature, studying similar platforms to design the website's layout, and sharing my findings with other project members. The website is now live at [REDACTED] and will be promoted at scientific conferences and on social media platforms. We are currently drafting a scientific article to establish an official citation source for the website. The website features a dynamic checklist, species profiles, downloadable occurrence records, distributional maps, photographic material, educational resources, links to publications and identification keys, as well as information on alien species.

3) Establish the basis of a long-term project regarding the whole Chalcid wasp fauna of Cyprus:

During the past months, I have visited numerous localities throughout Limassol and Paphos districts, covering lots of different habitat types, with an elevation range from sea level to 1200m. We made collecting efforts within both urban, semi-urban, natural and protected (such as Troodos mt., Akrotiri and Akamas peninsula) areas. During these efforts, hundreds of specimens of chalcid wasps were collected, with representatives from many families. Among these, I found dozens of new species and genera that were previously not known for Cyprus, some of which might be even new to science.

These specimens, are currently treated according to laboratory protocols and identified. Some of these, have already been sent to numerous specialists in various European countries in order to confirm identifications made by me. Following this treatment, these findings will be published in peer-reviewed journals. During March 2024, I visited the Natural History Museum of London (NHML), and made a thorough research on the vast chalcid wasp collection stationed there. I focused on already identified specimens by chalcid wasp authorities such as Zdenek Boucek and Christer Hansson, and gathered unpublished data for more than 50 species from Cyprus, with more than 40 of them being new records to the country. A scientific article, is currently being prepared in order to present these findings.

At the outset of the project, we encountered an issue when the "ScratchPads" platform, initially chosen to host the "Chalcid wasps of Cyprus" website, was discontinued. Although it was later announced that ScratchPads would resume operations for the next few years, we opted to explore alternative solutions. After conducting research, I chose Google Sites as our platform due to its user-friendly interface and compatibility with other Google services. This included using MyMaps for creating distributional maps, Google Analytics to monitor page visits, and Google Drive, which offers 15 GB of free cloud storage. The decision was well-received by other project members, and we are pleased with the final website that was produced.

Additionally, the DEST project "Collection methods and identification of parasitic wasps, with special emphasis on Chalcidoidea (Hymenoptera)" was not conducted during 2023, and will be done during September 2024, so we decided to switch the visit to Romania, with the visit to Natural History Museum (London), in order to better suit the project's needs. In conclusion, each issue was easily dealt, contributing to the development of the Fellow's skills and the outcomes of this Fellowship.

Achievements and Outcomes

Presentations in conferences:

- **Koutsoukos E**, Demetriou J, Georgiadis C, Mitroiu MD, Compton SG, Martinou AF (2023) Alien Chalcidoidea of Cyprus. HELECOS 11 - 11th Hellenic Conference of Ecology (poster presentation) (04-07 Oct 2023).
- Martinou AF, Angelidou I, Athanasiou K, **Demetriou J**, Josephides A, Koutsoukos E, Mavrovounioti N, Tzirkalli E, Varnava A, Hadjikyriakou T, Kammenou S, Michail K, Papageorgiou M, Hadjistylli M, Steffan-Wyn T, Charilaou P, Roy HE (2023) Citizen science and raising awareness efforts for

safeguarding biodiversity and human health in Cyprus. HELECOS 11 - 11th Hellenic Conference of Ecology (poster presentation) (04-07 Oct 2023).

- **Demetriou J**, Koutsoukos E, Georgiadis C, Roy HE, Martinou AF (2023) Alien bees, wasps and ants of Cyprus: current knowledge, research gaps and what's next. ENTO23' - Royal Entomological Society (poster presentation) (05-07 Sep 2023).

Participation in workshops/citizen-science events:

- Invited speaker at the "One Health" workshop organised by the Joint Services Health Unit in the framework of Darwin Plus Local projects "Raising awareness about the importance of arthropods" (DPL00014) and "Hedgehog conservation initiative at the Western SBAs Cyprus" (DPL00056). Presentation on the "Potential health impacts of invasive alien insects" (13-14/02/2024) in collaboration with Jakovos Demetriou (DPLUS200).
- Prepared the online article "Wasp guardians for food production", in order to raise awareness about the role of chalcid wasps in food production security in Cyprus and in general, for the Darwin Plus Newsletter (08/01/2024).

Articles in peer reviewed journals:

- **Koutsoukos E**, Demetriou J, Martinou AF, Compton SG, Avtzis DN, Rasplus J-Y (2024) Playing both fig sides: the presence and host-switch of *Pleistodontes imperialis* (Hymenoptera: Agaonidae) is confirmed in Greece and Cyprus. *Phytoparasitica* 52, 39. <https://doi.org/10.1007/s12600-024-01158-2>

Other outputs (interactive learning tools, videos, leaflets etc.):

- "Chalcid wasps of Cyprus" website: [REDACTED]
- Leaflets on the "alien invasive insects of Cyprus" and "alien insects and ornamental plants" created in the framework of DPL00014 "Raising awareness about the importance of arthropods" (including data on chalcid wasps present in Cyprus).

Presentations in conferences, workshops, citizen-science events as well as the creation of interactive learning tools, videos, leaflets etc. have been utilized to further communicate our work and raise awareness of chalcid wasps, their species richness and abundance in both man-made and natural habitats. During our material surveys we have uncovered many new genera and species that were previously unknown from Cyprus, as well as many new alien species that will be published in peer-reviewed journals in the near future.

3. Impact of COVID-19 on Fellowship

Covid-19 did not impact the Fellowship in any way.

4. Safeguarding

5. Next Steps

The following scientific articles will be submitted in peer-reviewed journals in the near future, in order to disseminate our first findings of this Fellowship:

- The Chalcid wasps of Cyprus website
- The Cypriot Chalcidoidea collection of the Natural History Museum of London
- Alien Chalcidoidea of Cyprus
- The presence of the alien wasp *Megastigmus transvaalensis* and its native parasitoids in Cyprus.
- The chalcid wasp fauna associated with Eucalypts in Cyprus.
- The chalcid wasp fauna associated with *Vachelia farnesiana* in Cyprus.
- Fig wasps associated with *Ficus benjamina* in Cyprus.
- Parasitoids associated with *Robinia pseudoacacia* in Cyprus.
- Parasitoids associated with gall-midges of *Atriplex halimus* in Cyprus.
- Parasitoids associated with *Ephedra* spp. in Cyprus.

- Parasitoids associated with Asphodels in Cyprus.

Additionally, species that have been already collected or will be collected and do not fit in one of the above separate sub-projects, will be integrated in the imminent publications of Chalcidoidea of Cyprus, and Chalcidoidea of Akrotiri Peninsula. Finally, I will continue with specimen treatment, identifications, data mining from museum databases that could contain Cypriot records. Collecting efforts will continue until December 2024, and will once again start by February 2025.