Darwin Fellowship - Interim Report

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

Darwin Fellowship reference	DPLUS 198
Name of Darwin Fellow	Katerina Athanasiou
Lead organisation	Hellenic Agricultural Organisation Demeter
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)	• 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 CA21170 Prevention Pragmatick (non-paid position).
Start/end date of Fellowship	01 April 2023 – 30 March 2025
Location of Fellowship	Sovereign Base Areas of Cyprus (SBAs)
Darwin Fellowship grant value (£)	
Type of work (e.g. research, training, if other please specify)	Research
Main contact in lead organisation	Dr Anastasios Saratsis
Author(s) and date	Mrs Katerina Athanasiou, Dr Anastasios Saratsis, Dr Kelly Martinou, 29/04/2024

1. Background

I was a volunteer at the Joint Services Health Unit, British Forces Cyprus, Sovereign Base Area of Akrotiri, for the past three years where I also undertook my BSc thesis which was looking at the impacts of environmental change on mosquito populations at different habitats of the Akrotiri peninsula. I have a strong interest in vectors of animal and human disease and their impacts on biodiversity. My BSc thesis looked at the impacts of different land uses on mosquito population dynamics and how environmental quality affects mosquito populations. I also participated in raising awareness and capacity building projects aiming to increase knowledge about the risks of invasive alien mosquitoes and how human impacts can affect vectors and participated in events aimed at schools, the local population and participated in three international conferences.

The current fellowship aims to to build capacity for the monitoring of established/potentially invasive tick species and the pathogens they transmit. Up to this point, there has been a notable absence of expertise within the SBAs pertaining to the systematic collection and identification of ticks. Furthermore, aims and objectives of the proposed fellowship are:

- to establish and compare methods of tick collection/-density estimation adjusted to the peculiarities of the SBAs
- mapping of the tick fauna (endemic and/or invasive species) at the SBAs using a systematic sampling approach
- the characterization of pathogens circulating in the target SBAs using molecular approaches
- document the level of and raise awareness about ticks and tick-borne diseases (TBDs)

Dr Saratsis and Dr Martinou have Mrs Athanasiou' daily supervision and are hosting her at ELGO-DIMITRA and JSHU respectively. Dr Saratsis trained me on tick collection methods and identification. In addition, I will be visiting Dr. Saratsis during the current year in order to conduct molecular work on pathogen identification.

2. Progress

- A systematic literature review according to PRISMA guidelines on tick species and tick-borne diseases found in Cyprus was conducted.
- Training courses on tick collection methods and identification by Dr Saratsis. For this purpose, Dr Saratsis visited the Joint Services Health Unit three times during the previous year, and I additionally visited Dr Saratsis at ELGO-DIMITRA once.
- Weekly meetings with Dr Martinou and Dr Saratsis.
- Meeting with Dr Martinou and other fellows every two weeks; discussion on progress, problems and helping each other when possible.
- Pilot survey in various areas around SBAs (April-May 2023), with the purpose of identifying sampling sites.
- Structured tick field surveys at six sites with contrasting habitat characteristics (dragging, flagging CO2 trapping), sampling every two weeks, started in May 2023 and continues until the conclusion of this project.
- Tick identification in the JSHU laboratory, using dissecting microscope and taxonomic keys.
- Participation in Helecos 11 Conference (http://helecos11.upatras.gr/wpcontent/uploads/sites/155/2023/12/HELECOS11-abstracts-024.pdf) in Patra, Greece (4-7 October 2023; oral presentation and poster).
- Organized event at Akrotiri Environmental Education Centre about ticks with invited speakers Dr Lidia Chitimia-Dobler and Dr Anastasios Saratsis (22.11.2023). In addition, Dr Saratsis raised awareness about ticks and TBDs within the frame of two further events at Akrotiri Environmental Education Center: a) Biodiversity Studies at the Akrotiri Peninsula and Beyond (30.03.2023) and b) Monitoring Biodiversity and Zoonoses: The One Health Approach (13-14.02.2024). All meetings can be found at the following link:
- Organisation of a training workshop on tick collection methods and identification for military personnel of the Joint Services Health Unit (20.02.2024) and Environmental Health military students (13.03.2024)
- A project dedicated leaflet (in both Greek and English) summarizing tick biology/behaviour, life cycle, identification of the genera found in Cyprus and hints on preventing tick bites was created, uploaded on the dedicated webpage and distributed at all above events (https://martinoulab.weebly.com/ticks.html)
- A practical guideline on appropriate tick removal methods for both humans and animals was created. A questionnaire (assessing dog age/breed/sex, lifestyle, treatment against ticks and past TBS diagnosis) was additionally created and will be soon distributed to local vets in in conjunction with an effort to characterize ticks infesting dogs at the SBAs and Cyprus (https://martinoulab.weebly.com/tick---tick.html)
- A questionnaire (in both Greek and English) was prepared on documenting knowledge, attitudes and practices (KAP) of local citizens regarding ticks and tick-borne diseases after a careful inspection of the respective literature
- I additionally assisted Dr. Saratsis on a Cyprus wide, cross-sectional survey on renewing tick distribution data by means of a dragging approach, which has so far resulted in more than 80 samplings systematically distributed across Cyprus.

3. Achievements and Outcomes

The main achievements and outcomes to date are:

- The systematic literature review on ticks and TBDs in Cyprus revealed the presence of 15 different tick species and 17 different pathogens (bacteria and parasites) carried by ticks and/or animals in

Cyprus. In addition, there is a noticeable scarcity of studies focusing on viruses transmitted by ticks, as evidenced by the literature search.

- Training courses on tick collection methods and species identification, led by Dr. Saratsis, have been successfully completed. I have attained self-sufficiency in both collecting ticks and identifying their species.
- Pilot sampling in various areas around SBAs completed (3 different questing tick species were collected during the period of April-May 2023). Samplings sites were identified.
- Structured tick field surveys (dragging, flagging, CO2 traps) still ongoing; surveys took place every two weeks since May 2023.
- Tick identification has so far resulted in the identification of 3 different questing tick species (belonging to the genera *Ixodes* and *Rhipicephalus)* at the SBAs through the above methods. One of them is a previously unreported *Ixodes* species for both the SBAs and Cyprus. Its identity was confirmed by both morphological and molecular means. We hypothesise that this tick species was introduced by migratory birds at the SBAs. The Cyprus wide survey (see above) did not reveal its presence elsewhere in Cyprus so far. Adults are the predominant tick developmental stage collected for all species so far, with *Rhipicephalus* spp ticks predominating. Few specimens of two additional species were identified by means of a citizen science approach (belonging to the genera *Rhipicephalus* and *Hyalomma*) at the SBAs. Therefore, a total of 5 different species were identified at the SBAs so far. Two further species (belonging to the genus *Haemaphysalis* and *Ixodes*) previously reported from Cyprus were found only outside of the SBAs within the frame of the Cyprus wide survey. Flagging and dragging resulted in the collection of most ticks so far.
- Dr Lidia Chitimia-Dobler gave a talk about ticks and also trained Ms Athanasiou in tick-identification.
- Creating information sources to raise public awareness and participating at three dissemination events at the Akrotiri environmental was completed.
- Participation in Helecos 11 Conference (http://helecos11.upatras.gr/ypovoli-ergasias/) in Patra, Greece (4-7 October 2023; oral presentation and poster).
- Mrs Athanasiou became a Management Committee Member at COST Action CA21170 - Prevention, anticipation and mitigation of tick-borne disease risk applying the DAMA protocol (PRAGMATICK).
- Advertising the project and raising awareness through Enalia Physis Environmental Research Centre (https://enaliaphysis.org.cy/2023/05/09/3439/).

4. 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.

5. Next Steps

- Weekly meetings with Dr Martinou and Dr Saratsis.
- Continue the structured tick field surveys (dragging, flagging, CO2 traps). Sampling every two weeks in the same 6 sites and tick identification.
- Data comparison, descriptive and statistical analysis will be performed upon completion of the field survey.
- Data collection on ticks parasitizing dogs/sheep in collaboration with local vets. This will allow comparison of field collected data (flagging/dragging/CO2 traps), with ticks parasitizing domestic animals.
- Further meeting and engaging with stakeholders from the SBAs and the Republic of Cyprus/KAP questionnaire currently pilot tested and soon to be distributed to target groups.
- At least one further dissemination event at the AEEC.
- Visit at ELGO-DIMITRA and molecular analysis of ticks for the presence of pathogens.

Preparation of one peer reviewed manuscript and a popular science article