SCAR Fellowship Report

Molecular and epidemiological diagnosis of parasitic diseases in Pygoscelid penguins in the context of global climate change

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Introduction

The need to increase knowledge about biological diversity in Antarctica and how it has changed throughout its history is fundamental to understanding future changes. The Antarctic Peninsula is currently one of the areas most affected by climate change and the study of parasitic diversity, its dynamics and possible consequences on penguins are fundamental to understanding their health.

Project Objectives

The objective of this project was focused on the application of new molecular techniques for the study of parasitic diseases in penguins. The extraction of DNA from fecal material for the use of mass sequencing allows us to know what types of parasites penguins present, this will also allow us to develop molecular probes for further studies in other locations on the continent.

Methods, Execution and Results

The development of the research covered different stages. First, a literature study was developed on how molecular biology could best answer our questions. Once this step was advanced we developed a working protocol that involved dissecting and prospecting 17 penguins that were collected in different campaigns. Their parasites were extracted and fecal matter and cloacal swabs were taken. Parasites, cloacal swabs and fecal matter were extracted for amplification of 16S, 18S and COI1 genes with the aim of developing molecular probes that would allow us to detect parasites in any locality through the fecal matter. We are currently waiting for the results from the sequencing company (they take 4 months to be delivered), in order to start working with the sequences. For the moment both my host and I have been fulfilling all our expectations in a pleasant way.

Project Outcomes

In terms of research, the final results are not yet available because we are waiting for the delivery from the sequencing company to start analyzing them and have the final conclusions. In terms of my personal development, the results were significant. The laboratory of the molecular biology of the museum of natural sciences of Madrid has great equipment and with suitable personnel in the applications of the techniques in the investigation. My training ranges from the bibliographic study of scientific publications to my project, as well as all the techniques necessary to carry it out that have to be done in the laboratory. Different techniques of extraction, the use of different primers depending on the genes of study and their subsequent preparation for the correct development of the PCRs for their sequencing. I also learned to use different bioinformatic programs for sequence analysis and phylogenetic tree development that will be applied once we have the results from the sequencing company.

Publications, Presentations and Products

The final results are not yet available for publication. From this grant, there are four articles that are expected to be published. They involve studies of health status in Antarctic penguins, parasitic diversity, microbiotas, gene sequencing of different helminth species, different DNA extraction methodologies. The development carried out for this project could serve as a model for studies in other bird species and localities. In addition, the results will be of interest in order to increase the knowledge of sequences in the Genbank and also for the different groups of the Antarctic scientific community due to the link between parasitic diversity and trophic ecology, and how climate change influences them.

Capacity Building, Education and Outreach Activities

During my stay at the Museum of Natural Sciences in Madrid, I was able to participate in different lectures that were held during the current year. I also had the opportunity to meet many master students to tell them how we were carrying out our research and help them with theirs. Both in Spain and in Argentina, the different organizations involved publicized the granting of my scholarship and the project to be developed.

Future Plans and Follow-ups

Currently, my host has added me as a scientific collaborator in his new project and we have added him to ours. We are still in touch with the intention of doing a stay again in the future. All the techniques learned in these months will be put into practice in the development of my doctoral thesis in which the object of study is the flying birds of Antarctica (Giant Petrel, Storm Petrel and Skuas), to be able to know, as well as the state of health of the same and the parasitic diversity that composes them. These techniques will also be applied in different lines of research carried out in the centers where I am working (Argentine Antarctic Institute and the Centre for Parasitological and Vector Studies).

Personal Impact

The main impact was to be able to see how far we can go in terms of knowledge generation through molecular research. So far my studies in parasitology were carried out from the morphological study with optical microscopy. Having done a training stay in molecular biology allowed me to see the potential of this tool, especially in a place like Antarctica with all the complexities it has to develop the sampling and with the necessary implications to maintain long-term monitoring that allows us to see how the effects of climate change develop in the region.

Financial Statement

The funds from the scholarship were used to pay for plane tickets, study visa papers, 7 months' rent and the purchase of various supplies for the subsequent development of my doctoral thesis research.

Acknowledgements and References

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