

## FINAL REPORT ON PROJECT SUPPORTED BY PADDY PALLIN SCIENCE GRANT

### Instructions to Project Leaders for Completing This Form

*Progress reports are required to be submitted 12 months after the start of the project, and then at 18-24 months as a final report. Grants usually begin on the 30<sup>th</sup> October in the year in which the grant was awarded. Payment of the second grant installment is contingent upon the receipt of this material. Updates are to be provided during the tenure of the grant, and at the time the final report is submitted. Payment of the final grant installment is contingent upon receipt of the final summary which is to summarize the outcomes of the project during the tenure of the grant.*

### 1. PROJECT IDENTIFICATION

#### 1.1 PROJECT TITLE

The influence of fine-scale environmental variation and anthropogenic stresses on the foraging ecology of marine mesopredators in south-east Tasmania.

#### 1.2 ADMINISTERING ORGANISATION

Institute for Marine and Antarctic Studies, University of Tasmania, Hobart, Tasmania, Australia.

#### 1.3 PROJECT LEADER AND PARTICIPANTS

Project Leader: Olivia Dove<sup>1</sup>

Supervisory team: Mary-Anne Lea<sup>1</sup>, Julie McInnes<sup>1,2</sup>, Mark Hindell<sup>1</sup>

<sup>1</sup> Institute for Marine and Antarctic Studies, University of Tasmania, Hobart, Tasmania, Australia

<sup>2</sup> Australian Antarctic Division, Hobart, Tasmania, Australia

### 2. PROJECT DESCRIPTION & OBJECTIVES

#### 2.1 100- Word Project Summary

This project aims to disentangle the factors driving species variability in the context of anthropogenic stresses by investigating the possible effects of marine heatwaves and fisheries on mesopredators foraging in Storm Bay, southeast Tasmania. Over two breeding seasons, bio-loggers that record GPS, accelerometry, and pressure will be deployed and retrieved from little penguins and short-tailed shearwaters breeding on Wedge Island, to enable a three-dimensional assessment of habitat use and behaviour in relation to environmental and anthropogenic factors. This grant application was submitted for the purchasing of CatTracks (GPS bio-loggers) and a weather station for collecting fine-scale environmental data.

#### 2.2 Summary of original objectives (150 words max)

Specifically, this project aimed to:

- 1) Quantify the overlap in habitat use of three, key coastal mesopredators (little penguins, short-tailed shearwaters, and Australian fur seals) in Storm Bay using existing tracking information.
- 2) Determine the fine-scale environmental drivers of the movement patterns for the two sympatric seabird species.
- 3) Assess whether the habitat use and foraging behaviour of the three, key marine mesopredators changes in response to environmental variability between years (e.g. between 20/21 and 21/22 breeding seasons or during marine heatwaves) and/or in response to the introduction of new offshore aquaculture installations (cf. data in aim 1).

### 3. PROJECT OVER DURATION OF FOUNDATION GRANT

#### 3.1 Have there been any changes to the project? If yes give details

*This could include changes to the research Project resulting from funding from the Foundation being at a lower level than requested. By indicating changes to the budget, aims and research plan in the Report, you are requesting approval from the Foundation for a revision of the Project. A 'satisfactory' assessment of the Report and the Project by the Paddy Pallin Grants Committee means that the revision has been approved.*

We have made two changes to the project:

- We changed the order of the objectives to best reflect the availability of the data and logical progression of the thesis. The first objective has been repositioned as the final chapter when new data will be available for analysis by that stage.
- Australian fur seals (*Arctocephalus pusillus doriferus*) have been removed from the study to instead focus the PhD on only seabirds. Only one year of data was available for the seals and we have much higher fine detail tracking data for the seabirds. The outcome from my project will still include three papers to be submitted to high impact journals, but will focus only on seabirds.

**3.2 What were your research plans and objectives for the period covered by this report? (150 words max)** (*The answer to this question should be consistent with the original Application or the preceding Progress Report*).

My research plans covered by this report were to continue to work towards all three of the objectives listed above. Since the progress report last year, I have:

- Undertaken another fieldwork trip, during which I collected data that will be used in all three objectives, including downloading the data from the weather station that is deployed on Wedge Island.
- Carried out substantial analysis to quantify the dive behaviour of the short-tailed shearwaters, which was to contribute to Objective 2.

**3.3 Did the research project proceed as planned? What have you achieved over this period? Outline the research findings to date (200 words max)**

Since the progress report submitted last year, I have conducted another fieldwork trip to collect data fundamental to the PhD and project. This resulted in the successful completion of 5/6 field trips associated with this project. On this latest trip, 17 short-tailed shearwaters were tagged successfully with GPS biologgers; 5 of which were with CatTracks bought using funds from this grant. The data collected on each trip are to be used in each of the objectives listed above to understand the fine-scale foraging behaviour of shearwaters and penguins. The weather station that was purchased using funds from this grant is still functioning at full capacity on Wedge Island, and is maintained during each trip with the data downloaded from it each time. This data is to be used to achieve Objective 3.

The shearwater data, along with previously collected data from collaborators, have been used in a clustering analysis using an expectation maximization approach. This data analysis is ongoing but shows highly promising results. We have found that dive behaviour can be classified computationally using a clustering function in R, which makes future analyses of accelerometer data achievable in high quantities at very high resolutions. These analyses have led to a preliminary draft of Chapter 1 of my PhD.

**3.4 Have you experienced any difficulties that have affected the progress of the research project? If yes give details (150 words max)**

No.

**3.5 What are your research plans and objectives, including publication plans, for the coming year? (150 words max)** (*Please note that in your next Report you should report progress against these plans and objectives*)

My objectives for the next year are as follows:

- 1) Conduct the final fieldwork trip to Wedge Island in October/November 2022 to collect GPS tracks and dive information for 10 to 15 little penguins.
- 2) Maintain the weather station deployed on Wedge Island to ensure it is still functioning as expected and download the data from it that has been collected since the last fieldwork trip.
- 3) Complete the paper on quantifying the dive behaviour of short-tailed shearwaters and submit it for publication in a peer-review journal.
- 4) Write a paper on the diving movement patterns for two sympatric seabirds (short-tailed shearwaters and little penguins) in relation to their spatial movements.
- 5) Write a paper on whether the habitat use and foraging behaviour of the two seabirds changes in response to environmental variability or anthropogenic stressors.

- 6) Write and submit the papers listed above within my PhD thesis, which is due for submission September 2023.

#### **4. ACADEMIC OUTPUTS**

##### **4.1 Publications and other academic outputs directly related to this project. (Please list all publications and those manuscripts accepted for publication, for the period covered by this report)**

No publication has been submitted to peer-review journals over the past year, but progress has been made on a paper focusing on quantifying the dive behaviour of short-tailed shearwaters. I gave a speed talk and presented a poster at the BLS7 Biologging Conference run by the International Bio-logging Society, which was held virtually online in October 2021.

##### **4.2 Evidence of scholarly impact and contribution. Is there evidence that this research project is having/had an impact in the research field or the broader public domain? Include examples of formal training (PhD /Masters) as well as other training.**

Yes.

**If yes, give details (For instance, standard citation data on articles published in ISI journals, citations to books, re-publication, translations, reviews, invited keynote addresses, other invitations, newspaper/media/expert commentary).**

This project has given fieldwork opportunities to multiple Honours, Master's, and PhD students and helped to upskill them in the data collection involved with bio-logging studies. Maintaining the weather station and using the data that it collects has been undertaken by multiple students, too.

##### **4.3 End-user interaction and other project outcomes If there are examples of the impact of this research Project not covered in item 4.2 above please provide details. For example, introduction or modification of standards/protocols within an industry sector, preparation of proposals for funding from other agencies as a result of outcomes from this project.**

None.

#### **5. ATTACHMENTS & OTHER MATERIAL**

*Please provide, as separate files, any figures, graphs, images and other material that cannot be included in this form. Please also provide updated material (text and images) that can be used to revise your project summary on the Foundation's web site. Please provide text in Microsoft Word format and images in JPEG format with a minimum size of 600 x 400 pixels. If this is the final project report, the web page summary must be updated to reflect the outcomes of the project. Is any material being forwarded as additional attachments?*

Submitted along with this report is the requested video summarising the project, as well as a photo of the weather station purchased with the funds from this grant.