1. INTRODUCTION

- Ghost crabs of the genus *Ocypode* are semiterrestrial invertebrates commonly found on subtropical and tropical shores and are great biological indicators to measure the effects of human disturbance or ecological impacts of climate change on sandy beaches. 
- This cryptic species construct deep and complex burrows with the top of these breaching the sand surface as a clearly visible hole ranging from 8 mm to 50 mm in diameter (Fig. 1).
- Obtaining precise abundance values, however, typically requires physical collection of animals through extraction of individuals from their burrows which can be physically difficult and damaging to both organisms and their habitats (Fig. 2).
- Alternative, non-invasive techniques can be used to count surface-active individuals or use the number and dimensions of burrows as proxies for abundance and body size of individuals inhabiting the burrows.
- Burrow profiles are widely used in environmental impact assessments and ecological studies but do not always predict abundance and size accurately, in addition to being labour intensive and time-consuming.

2. AIMS AND OBJECTIVES

Aims:
To develop a semi-automated approach to mapping and classifying burrows from ghost crabs on sandy beaches at the landscape scale (10² - 10³ m²) based on UAS-derived imagery.

Objectives:
- Collect imagery from a consumer-grade UAS (DJI Phantom 2 Vision+) carrying a 14-megapixel 1/2.3-inch CMOS sensor (Fig. 3).
- Develop image orthomosaics.
- Elaborate semi-automated object-based image classification workflow.

3. METHODS

- Given the sensor characteristics (6.17 mm sensor width, 5 mm focal length, 14.4 Mpx, 3 sec/image) and desired ground sampling distance of 4 mm with 70% forward and pass overlap, the flight height was set up at 14 m and speed at 1.5 m/s.
- The flight mission resulted in 13 passes, taking approximately 10 minutes and collecting a total of 208 images per 50x50 m area (Fig. 4).
- The orthomosaic was derived using Agisoft Photoscan software. Ground control points (~9) surveyed with an RTK-GPS were used to remove non-linear distortions and for georeferencing.
- The orthomosaic was segmented using eCognition software and brightness, texture, and areal features were used for building the classification ruleset.

4. RESULTS AND FUTURE WORK

The Phantom 2 Vision+’s sensor is not ideal for Structure-from-Motion applications due to its large field of view and poor lens quality which introduces unwanted distortion, particularly when reconstructing complex terrain. However, the quality of the derived orthomosaics from low-altitude flights is very satisfactory and suitable for the semi-automated classification of very small objects (Fig. 5).

Despite the flight mission constraints (i.e., low altitude, very slow speed), mapping ghost crab burrows from UAS-derived orthomosaics is considerably more cost-effective than conventional field work.

Ongoing work is being undertaken to validate the accuracy, precision and robustness of the semi-automated classification, particularly on challenging imagery (Fig. 6).

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