**Getting accurate counts from acoustic data**

Contact: [marcus.rowcliffe@ioz.ac.uk](mailto:marcus.rowcliffe@ioz.ac.uk)

Whilst there has been rapid developments in the techniques available for analysis of ecoacoustic data, the ability to estimate the species density or abundance has been limited by an inability to estimate the distance from which individuals are vocalizing. However, a recent study (Darras et al, 2018) has developed a method for calibrating human estimation of distance in audio recordings using vocalizations of the target species at known distances. This method could allow the use of distance-sampling techniques on autonomously collected audio data, thus greatly increasing what can be learnt from such data, and allowing population estimates of species that can be difficult to survey accurately using traditional distance sampling techniques.

One such species is the hihi, an endangered New Zealand endemic passerine whose habitat preference and behaviour make it extremely challenging to survey, and who ZSL have been working closely with to reintroduce at a variety of locations across New Zealand, most recently Rotokare Scenic Reserve. Our recent research (Metcalf et al, 2019) developed a method using ecoacoustics to monitor territory formation in a population of hihi whilst settling on to a new site post-translocation. However it relies on assumptions that the population stays stable, something only obtained from intensive traditional surveying for colour-ringed birds. Futhermore the hihis main population, on Little Barrier Island, is only roughly estimated due to the remote and inhospitable nature of the island. It would therefore be highly beneficial to develop a method to accurately assess hihi population size using acoustic data.

We collected ~1tb of audio data from a grid across the reserve for the Metcalf et al 2019 paper, and we have a good idea of the hihi population size (35-40 individuals) throughout the 1 month survey period. This is therefore an ideal scenario to test the applicability of the Darras method to the hihi, and the project has the potential to either involve fieldwork in New Zealand (although this would need to be self-funded), or be entirely desk-based. Possible areas of interest might the applicability of the Darras method using wild birds instead of caged individuals for acquiring calibrating data, and how much calibrating data is required, which distance-sampling techniques and sampling units are most appropriate, or a combination of the two. The research has broad conservation benefits, and the methods developed here would have wide scope to be applied to many species in New Zealand and beyond.

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https://scholar.google.co.uk/scholar?hl=en&as\_sdt=0%2C5&q=darras+2018+methods+ecology&oq=darras+2018+methods+eco#d=gs\_qabs&u=%23p%3DzX1EQHS83wYJ

**Deriving wildlife densities from Unmanned Aerial Vehicles counts, using a random encounter models**

Contact: [marcus.rowcliffe@ioz.ac.uk](mailto:marcus.rowcliffe@ioz.ac.uk)

Unmanned Areal Vehicle (UAV) use is becoming increasingly widespread for the mapping and study of marine wildlife. Currently, estimates of marine wildlife density or abundance has been primarily derived from photo ID, and mark recapture. These approaches either require individual recognition of animals, or handling, which is not possible from UAV surveys. Random Encounter Models (REM), modified from idealised gas laws, enables animal densities to be estimated from unrecognized individuals, with a known travel speed, and sensor detection parameters. The student will develop a random encounter model, in order to derive densities from UAV animal counts. Rate of contact of marine wildlife (dolphins, crocodiles, manatees, seabirds, sharks) will be derived from georeferenced images, stemming from fixed-wing UAV surveys in the Turneffe Marine Reserve (Belize), and in the British Indian Ocean Territory. The student will test the accuracy and precision of this generalised REM using simulations of different combination of camera width, UAV altitude, flight speed, and proportion of time spent at the surface by the animal, as reported in previous studies.