

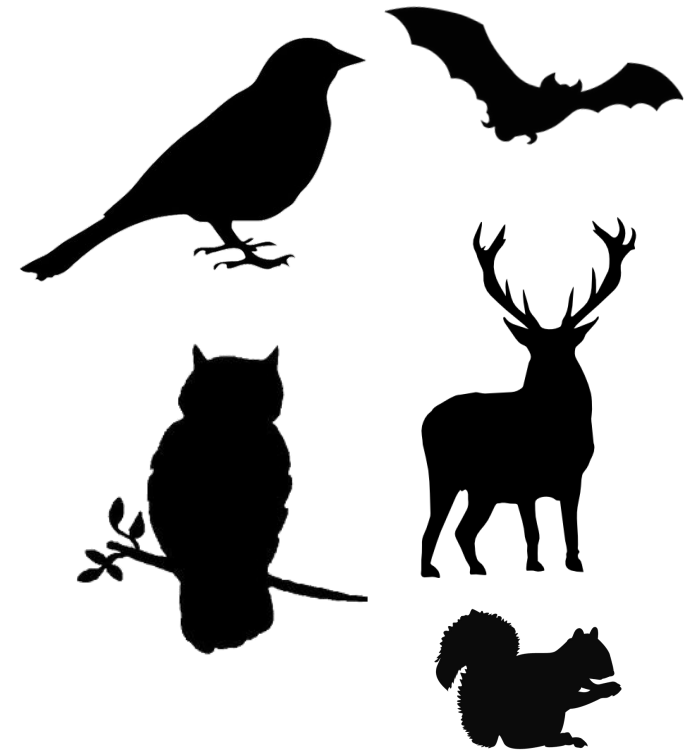
# AURITA: an affordable, autonomous recording device for acoustic monitoring of audible and ultrasonic frequencies

By:

- Andrés Ortegón
- Juan Palomino



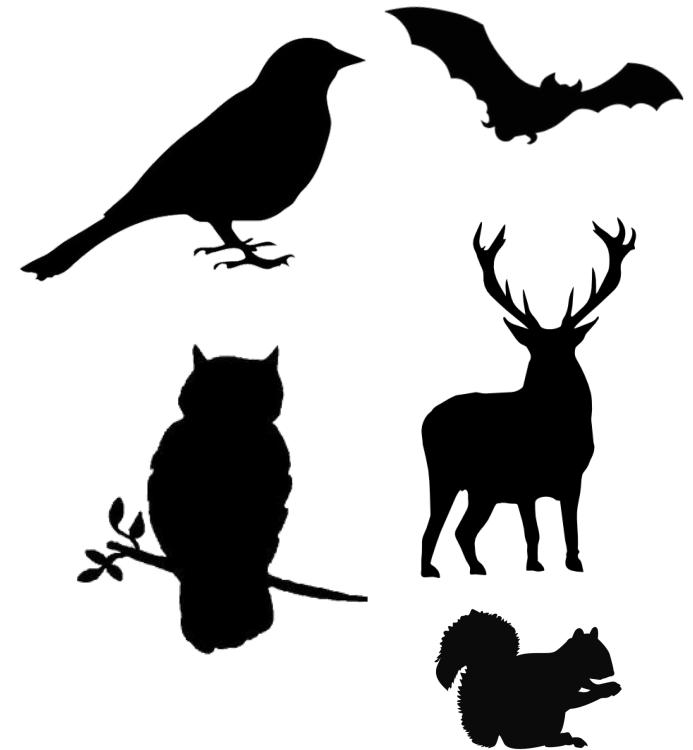
Passive acoustic monitoring can be used for many purposes including biodiversity and habitat assessments. Currently available commercial options are typically expensive and limited to recording either ultrasonic or audible frequencies. Here, we present the AURITA (Audible and Ultrasonic Recording In Tandem) for the autonomous collection of both audible and ultrasonic acoustic data.



## Introduction

3

This enabling it to capture sounds from 60 Hz to 192 kHz in WAV format. The configuration presented costs ~£350 (excluding memory cards and batteries) to produce and can be maintained and repaired in the field. The AURITA proved to be reliable in the field and produced high-quality acoustic data, making it ideal for simultaneous monitoring in both audible and ultrasonic frequencies over continuous periods of time.





*Aurita*

A variety of off-the-shelf recorders are currently available, including the Wildlife Acoustics SM4, Bioacoustic Audio Recorder, Swift and the Anabat Express. However, all of these recorders are designed to monitor either audible or ultrasonic frequencies.



## Problem Statement

5



*Wildlife Acoustics SM4*

Currently available commercial options are typically expensive and limited to recording either ultrasonic or audible frequencies. At present, the only commercially available units capable of recording both audible and ultrasonic frequencies are the Wildlife Acoustics but is so expensive (£ 1453 without microphone) and, when simultaneously recording both sets of frequencies at the same time, is limited to the unit's highest sampling rate.

## Solution raised

6



*Aurita*

AURITA was designed to record frequencies between 60Hz and 192kHz at the same time and at a low cost, from £ 350. This self-contained, modular unit combines an open-source, Raspberry-Pi-based recorder and a commercially available bat recorder, the Peersonic RPA2, enabling it to capture sounds in WAV format. The configuration presented can be maintained and repaired in the field.

## Experiments

7

For the field tests the AURITA team deployed 12 units in Richmond park, London. The maximum operating time achieved was less than 8 days using USB battery banks and 19 days using a car battery, however, SD cards were filled after 7.8 days. Upon completion of recording, all 12 units were successfully recovered in full working order.



*Aurita*



## Results

8

After 5 years of working together the AURITA team delivered a device capable of recording frequencies in a range from 60Hz to 192kHz and priced at £ 350, the equipment can be powered by USB batteries or a car battery .

The batteries are not included but its modular structure allows you to use almost any type of battery, the SD memory is also not included and it is advisable to use a memory of at least 64GB for optimal operation. The field tests yielded very positive results and although the storage capacity was exhausted after 8 days this can be provisionally solved with an SD memory of greater capacity, according to the needs.



*Aurita*



## Conclusions

9

- » With the AURITA system is expected to put the reach of many researchers open source system capable of contributing to studies on wildlife and allow large-scale deployment.
- » Devices available on the market that support recording in audible and ultrasonic frequencies can only do so subject to performance limitations, such as not being able to record both frequency ranges simultaneously or requiring the use of higher sampling rates for both formats, which considerably increases the storage demands. With AURITA, these problems were solved and a low-cost and robust equipment was delivered.



## Possible improvements

10

Although the AURITA equipment for monitoring audible and ultrasonic frequencies reached its main objective, there are still important improvements that could be made, such as memory.

In the field tests it was found that with a car battery, the AURITA operation could be extended to about 20 days but the memory ran out in just 8 days, the majority of stored data is silent so we suggest a sensor that I constantly monitored the frequencies and started the recording process as soon as I detected frequencies within the expected range, in this way the memory capacity could be extended. Another option could be to change the format in which the data is stored, currently using the WAV format which is very heavy and difficult to handle.

*Wildlife Acoustics SM4*



- » Collins J. 2016. Bat surveys for professional ecologists: good practice guidelines. 3rd ed. London: Bat Conservation Trust.
- » Richard D. Beason, Rüdiger Riesch & Julia Koricheva (2018): AURITA: an affordable, autonomous recording device for acoustic monitoring of audible and ultrasonic frequencies, Bioacoustics, DOI: 10.1080/09524622.2018.1463293
- » Ligges U, Krey S, Mersmann O, Schnackenberg S. 2016. tuneR: analysis of music. [accessed 2019 Oct 08]. <http://r-forge.r-project.org/projects/tuner/>.

