

Can audio recording replace human observers to survey nightjars (*Caprimulgus europaeus*)?

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Objectives

To compare traditional survey methods with bioacoustic sound recorders for counting nightjars and to establish whether they could be used as an alternative to traditional surveys.

Introduction

- Ecological surveys are critical to the effective management of sites for various reasons. For example, nature reserve managers need to know what species are present and in what abundance, and land developers must ensure they are not damaging the habitat of protected species.
- One such protected species is the nightjar, (*Caprimulgus europaeus*). Nightjars are a nocturnal bird and difficult to detect during the day as they are well camouflaged. Consequently surveys must be conducted at night by experienced ornithologists able to recognise the call in order to monitor this species.
- However, this method of surveying is time consuming and resource heavy. As is the trend in modern day, the search for alternatives to reduce man's workload has led to new methods of surveying, one example of which is audio recording.
- This project aims to explore the potential use of audio recording equipment as an alternative to traditional site surveys by humans, using the example species, the nightjar.

Method

- The research took place at two sites in Northumberland during June and July. Each site was surveyed four times at dusk by walking a transect (Figure 1) and listening for the calls of nightjars.
- The locations of the nightjars were recorded on handheld GPS devices and uploaded onto ArcGIS to give a map of the area and positions of the nightjars (Figure 1). The surveying method used follows the guidelines set by C Cadbury (1981).
- In addition, three SongMeter SM2 sound recorders, (Figure 2) were placed strategically at both sites to allow maximum recording coverage without overlap (Figure 1).
- These were set to record automatically each night between dusk and dawn throughout summer, when nightjars are active.



Figure 2. One of the three SongMeter SM2 sound recorders used at the study site in Sweethope.

- The sound data was collected on SD cards, transferred to computers and processed using the program SongScope. This allows the user to make 'recognisers' for the desired call using known sound clips of the call. The recogniser can then be run over large amounts of data to identify when the particular call occurs (Figure 3).

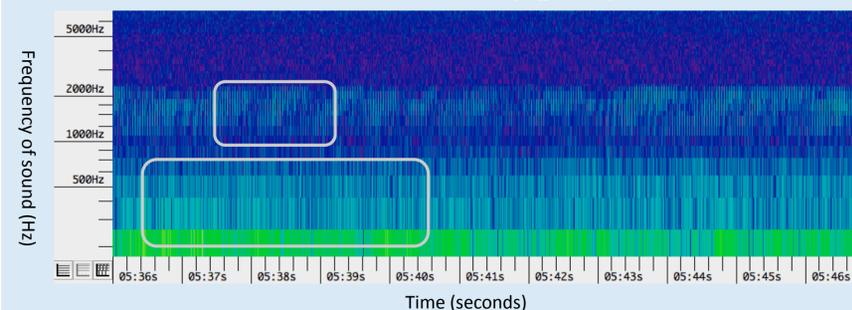


Figure 3. A screen shot of the program SongScope with visual representation of a nightjar churring at a frequency of 1000-2000 Hz (FFT 128) for 10 seconds, shown by the small box and background noise, highlighted by the larger box.

Results

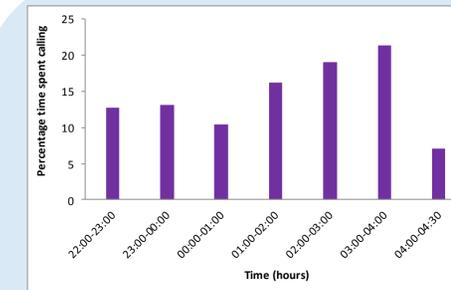


Figure 4. A graph showing the mean percentage of time spent calling in hour intervals during the night by nightjars detected by the recorders at both field sites, throughout summer. (chi-sq 10.2369 p 0.115)

Table 1. A table showing six recorder locations and the number of nightjars detected near each location by humans on each of the four visits and recorders. Recorder units refer to calling activity as detected by SongScope not number of nightjars.

Recorder Location	1	2	3	4	5	6
Visit 1 Humans	0	0	0	0	0	N/A
Visit 1 Recorders	97.5	3	16	18.6	0	N/A
Visit 2 Humans	0	0	1	0	0	3
Visit 2 Recorders	531.1	27.4	35.9	0.75	0	4.8
Visit 3 Humans	0	0	1	0	0	0
Visit 3 Recorders	57.9	0.63	20.9	6.4	0	0.75
Visit 4 Humans	0	1	4	0	1	0
Visit 4 Recorders	20	0.75	11	11.3	0	17

- The results of the nightjar activity (Figure. 4) show that there are differences between the levels of calling (and therefore activity) throughout the night at hour intervals. There is more activity between 2:00am and 4:00am than the other categories. However the differences between the categories are not significant (chi-square test $P > 0.1$).
- In the comparison of the audio recording and human survey methods (Table 1) the recorders detected the presence of nightjars more often than the human surveys did.
- However near recorder 5, human surveys detected a nightjar that the recorder didn't but near recorders 1 and 4, humans didn't detect any nightjars but the recorders did over all visit periods.

Conclusions

- Bioacoustic recording with SongMeters and SongScope is a more effective method of surveying nightjars than humans for detecting nightjar presence.
- SongMeters and SongScope greatly reduced human effort for surveying.
- The results of the autonomous bioacoustics surveys challenge the current recommendations for the crepuscular timing of conventional survey methods.

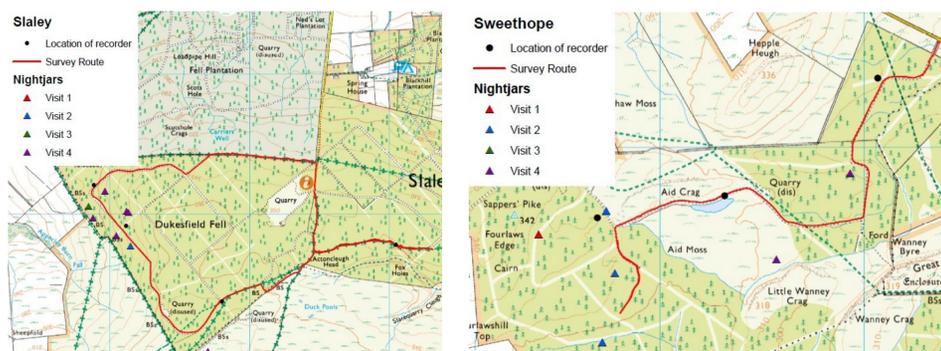


Figure 1. Maps of study sites and legends showing the recorder locations, survey route and nightjars detected during the four human led surveys.

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