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Preface

Measuring Behavior 2010

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These proceedings contain the papers presented at Measuring Behavior 2018, the 11th International Conference on Methods and Techniques in Behavioral Research. The conference was organised by Manchester Metropolitan University, in collaboration with Noldus Information Technology. The conference was held during June 5th – 8th, 2018 in Manchester, UK.

Building on the format that has emerged from previous meetings, we hosted a fascinating program about a wide variety of methodological aspects of the behavioral sciences. We had scientific presentations scheduled into seven general oral sessions and fifteen symposia, which covered a topical spread from rodent to human behavior. We had fourteen demonstrations, in which academics and companies demonstrated their latest prototypes. The scientific program also contained three workshops, one tutorial and a number of scientific discussion sessions. We also had scientific tours of our facilities at Manchester Metropolitan Univeristy, and the nearby British Cycling Velodrome.

We hope this proceedings caters for many of your interests and we look forward to seeing and hearing more of your contributions.

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Organisation

Measuring Behavior 2018 was hosted by Manchester Metropolitan University in collaboration with Noldus Information Technology

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Sheep nocturnal grazing behavior using infrared point-of-view camera – a preliminary study

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Introduction

Extensive livestock production systems rely largely on forage availability as feed source. Under free ranging conditions, grazing behavior develops circadian rhythmicity. Grazing activity occurs mainly during the day, normally with two important periods around sunrise and sunset [1]. Nevertheless, grazing patterns and herbage intake are constantly affected by environmental factors. In dry climates, such as Mediterranean, precipitation is typically scarce during the hot season. In addition, native vegetation in these areas is dominated by annual species. As a result, pasture becomes poor in quality along the growth cycle, which leads animals to graze for longer periods, including at night, to cover their nutritional needs [2]. Nocturnal grazing may also increase when air temperature during the day is high. In this case, ruminants tend to avoid foraging in the hottest part of the day [3]. For those reasons, the study of sheep grazing patterns and behavioral responses to environmental limitations is essential to achieve successful management practices while improving animal welfare.

The study of livestock foraging behavior is a multidisciplinary field that involves many levels of evaluation, from grazing patterns to forage selection. During the day, behavior recording is relatively simple through live observation. However, observations at night are restricted by limited sight in the dark. Besides, it is difficult to predict whether the presence of an observer may alter the normal behavior, unless we use recording equipment, such as accelerometers that measure grazing by detecting movements of the head [4]. Despite conveiyng information on grazing patterns, accelerometers cannot provide information on forage selection.

In the present study, we evaluate sheep grazing behavior through animal-borne cameras. Animal-borne video and environmental collection systems (AVED) have been used for studies on wild animals habitat and behavior for three decades [5]. Since then, technological development has made the equipment smaller and lighter, allowing the use on smaller species. Depending on the anatomy of the species and the aim of the study, the camera may be attached using different techniques (e.g. epoxy glue, harness or neck collar).

Besides, the weight of commercial cameras is not expected to interfere in the normal behavior. A study on sheep circadian rythm using GPS neck collars representing approximately 2.2% of their body weight found no significant differences between collared and no-collared (control) groups [6]. Finally, another advantage of this method against fixed cameras is the possibility of measuring behavior in large paddocks, since it is attached to the animal.

Animal-borne video has already been used by our team for studies in sheep grazing behavior, and the results were positively correlated with observations of flock behavior [7]. However, despite the accuracy of this method, the nocturnal camera has recorded only five hours of video footage. Thus, it was not possible to evaluate grazing behavior from dusk to dawn.

The aim of this preliminary study was to test a filming equipment to record grazing behavior from the sheep's point of view all through the night.

R.A Grant et al. (Eds.): Measuring Behavior 2018, ISBN 978-1-910029-39-8
Manchester, UK, 5th-8th June 2018

Materials and methods

The study was conducted in the region of Alentejo, Portugal, 12 km south-west of Évora, within the University of Évora's Mitra Experimental Station (38º31'44"N, 8º01'00"W). The climate is typically Mediterranean, with long dry summers and mild winters.

One black merino from a flock of 37 adult non-lactating ewes was selected to bear a camera. The flock was kept under continuous grazing in a 2.3 ha paddock of permanent native sward without any other feed supplement distribution.

We used one infrared night vision PatrolEyes® (PatrolEyes. Ada Township, Michigan USA; Figure 1B) attached to a neck collar to record from the animal's point of view. A protective case was manufactured with a transparent plastic soapbox and water-resistant with tape (see Figure 1A). In order to extend the recording, a portable power bank was plugged into the camera. In total, the filming equipment weighted 400.2 g, representing approximately 0.6 % of the sheep's body weight.

The recording was made in the night of May 18th to 19th, starting at 9:00 pm. Sunset was at 8:39 pm and sunrise at 6:17 am. Weather was clear with wind speed from 4.5 to 6 m/s. Lowest temperature was 8.2 ºC and highest was 22.6ºC on the 18th during the day.

Figure 1. (A) Photograph of a sheep fitted filming equipment; (B) Photograph of PatrolEyes® infrared night vision camera.

The video footages were analyzed through the software Behavioral Observation Research Interactive Software (BORIS®; www.boris.unito.it). Screen captures are shown in Figure 2. Grazing duration and number of bouts were analyzed.

All the procedures used on animals were approved by the ICAAM board under a license from DGAV (Direcção Geral de Alimentação e Veterinária).

R.A Grant et al. (Eds.): Measuring Behavior 2018, ISBN 978-1-910029-39-8
Manchester, UK, 5th-8th June 2018

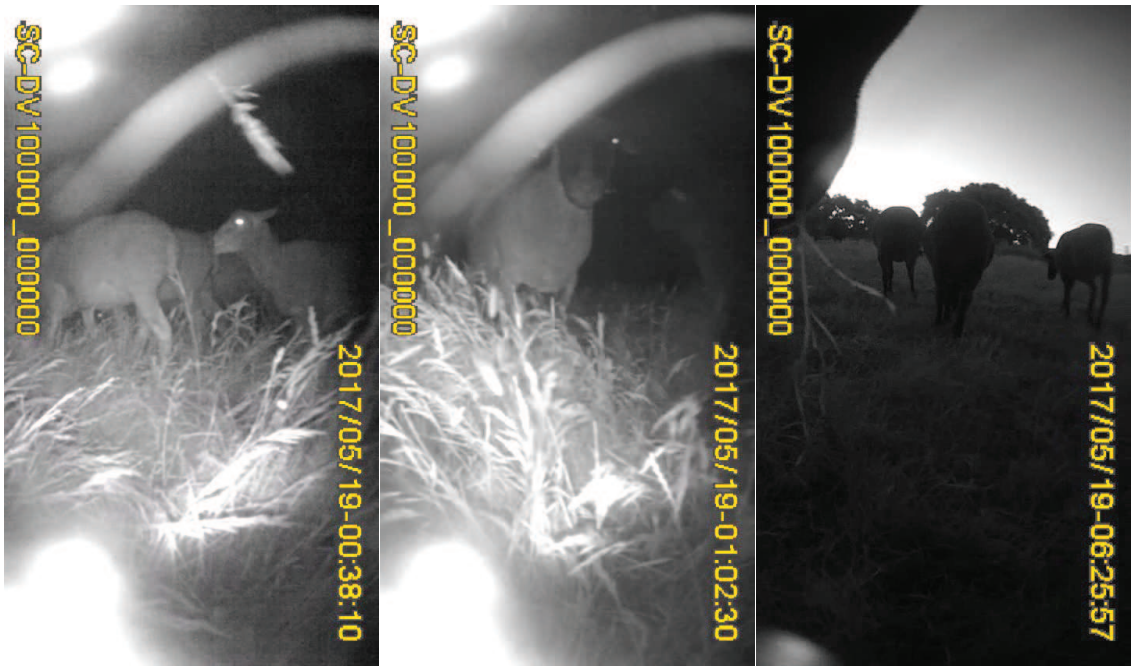

Figure 2. Screenshots of the video footage.

Results

The length of the video footage was of ten hours, from 9pm to 7pm. Total grazing and number of bouts are presented in Figure 3. The first hour, which corresponds from 9pm to 10pm, had the longest grazing duration (49 minutes and 54 seconds). Subsequently, grazing duration dropped to 11 minutes and 28 seconds in the second hour and zero in the third hour. There was a small peak of 14 minutes 39 seconds of grazing from midnight to 1am, followed by 3 minutes of grazing in the next hour. There was not any grazing from 2am to 5am, and a new peak of 12 minutes 36 seconds is observed from 6am to 7am, in the hour when the sun rose. Number of bouts followed the same pattern as grazing duration, the highest peak being at the first hour.

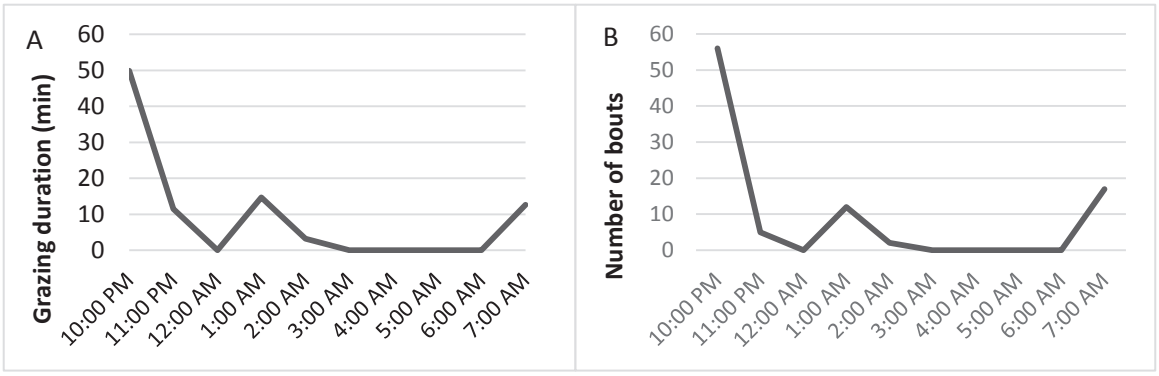

Figure 3. (A) Grazing duration per hour; (B) Number of bouts per hour

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Discussion

Our filming equipment was able to record from the animal's point of view from dusk to dawn, permitting access to grazing, among other behaviors. Behavior studies through video footage allow a deep and concentrated analysis of the material. Furthermore, it spares researchers from long hours of behavior observation in the field and eliminates the observer effect.

In our preliminary study, we observed a grazing pattern that was very similar to previous results [8]. Although grazing was intense after sunset, most of the night it did not occur at all, except for midnight to 1am, when there was a small peak. Then, our ewe resumed grazing around dawn. Air temperature was mild in the day that preceded the evaluation, suggesting that this grazing activity is a regular pattern and not a response to heat stress during the day.

When the footage is in high definition, as it was in our trial, animal-borne video could also serve as a tool for studies on feed selection. A previous study on white-tailed deer evaluated grazing selection continuously using neck collar infrared cameras and were able to identify the plant species 84% of time [9]. Therefore, this method is an accurate and practical tool for studies on livestock grazing species, such as cattle, sheep, goats and horses. It is particularly useful in native swards where biodiversity is high.

Battery duration is still the main limitation for using animal borne cameras. This leads to frequent manipulation of the animals, apart from a need to have multiple devices since the batteries need to be charged. External power banks may therefore be a good solution to minimize human interference and to obtain longer footages, but they require manufacturing protective cases. There are many advantages of the animal-borne video method. However, further studies are necessary to reinforce its validity, reliability and feasibility.

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