TELEMETRY TO MONITOR SOUNDS OF CHEWS DURING EATING AND RUMINATION BY GRAZING SHEEP

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Common methods of monitoring eating and ruminating behaviour of sheep in the field are direct observation or simple detectors of jaw movement. Audio recordings of eating and ruminating behaviour have been used in animal house studies (Bray and Reynolds unpublished data; Laca *et al.* 1992) but this technique has not been applied in field studies. Our objective was to be able to monitor eating and ruminating behaviour of grazing sheep, using computer software that would analyse in real-time mode the audio input from microphones on the sheeps' heads.

A wireless microphone system (Chiayo DR-505, distributed by Sontec) was used to monitor the sounds of chewing during eating and rumination. It comprised a small cylindrical microphone (9 mm diameter x 20 mm length) that was connected to a battery-powered transmitter (60 x 105 x 22 mm, S9 g without batteries) and a mains-powered receiver. A rubber block (natural rubber, 60 duro, 40 x 40 x 20 mm) with an L-shaped cavity bored into it was glued using cyanoacrylate ester to the back of the sheep's head onto an area where the wool had been clipped closely. The cavity in the rubber block housed the microphone, and the rubber insulated against external sounds. A flexible metal shower-hose protected the lead between the microphone in the rubber block and the transmitter. The transmitter was packed into a heavy-duty plastic bag and attached to a harness worn by the animal. The line-level audio output from the receiver was connected through a specially-constructed interface to a computer for analysis of the audio signal. Continuous audio recordings were made as back-up by connecting a video cassette recorder between the receiver and the computer interface.

The equipment has been used in field experiments conducted over several days in all weathers summer and winter. Information has been collected simultaneously from 4 sheep grazing at a distance of up to 280 m from the receiver. The software, an artificial neural network, was "trained" to identify and count eating and ruminating chews by exposure to previously categorised examples. An example of the output is given in Table 1. The software is being developed further to detect the number of boli and estimate the number of chews/bolus. This equipment is being used in studies of the physical characters of the forages as constraints to voluntary intake Baker *et al.* (1994).

Table 1. Example of output: chews during eating and rumination by 4 sheep between ca. 1400 and 2200 hours

	Sheep 1	Sheep 2	Sheep 3	Sheep 4
Hours of recording	8.48	8.48	8.48	8.48
Hours spent eating	3.48	2.93	2.56	2.63
Number of eating chews	19172	17425	9156	8146
Hours spent ruminating	0.78	2.52	0.13	1.85
Number of rumination chews	2184	14852	3340	7875

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