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Monitoring and managing the use of riparian areas by cattle

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Abstract

The ability to modify the distribution of grazing livestock is a common desire among farmers, either to protect sensitive areas or to more closely match stocking rate with carrying capacity. Virtual fencing (VF) technology offers an alternative method of controlling both where and when animals graze without the need for physical barriers, which are costly to erect and maintain, particularly along riparian areas. The potential for automated animal control collars to reduce the impact of cattle on riparian areas was evaluated. A replicated experiment was run fro up to three months using four groups of ten cattle. Each group was allocated to a separate 24 ha paddock. Automated animal control collars utilise GPS to monitor position and provide cue (audio) and control (mild electric shock) stimuli to deter animals from entering an exclusion zone.

When the cattle were familiar with the paddock, a duty cycled GPS collar was fitted to each steer for two weeks and background-monitoring data collected. Once the background data had been collected, the coordinates of the exclusion zone were sent to the collars to start the control phase of the experiment that ran a further two weeks. Cattle were observed from a distance regularly and had access to *ad-libitum* grazed forage and trough water throughout the experiment. During the monitoring phase of the experiment cattle spent 6% of their time in the exclusion zone, but less than 0.01% of their time in the exclusion zone after the virtual fence was enabled.

Introduction

There are approximately 4.5 million cattle grazed in catchments along the Great Barrier Reef with the greatest numbers in the Fitzroy and Burdekin catchments. Development of a beef cattle industry in Northern Queensland involved the conversion of woodland to pasture. As a result the Great Barrier Reef is exposed to increased levels of terrestrial sediment and organic matter caused by woodland removal, overgrazing (particularly in drought conditions) and stream bank erosion. Regional NRM bodies are using government funding to install fences and/or off-stream watering points to protect environmentally sensitive riparian areas from overgrazing. Furthermore, the ability to modify the distribution of grazing livestock is a common desire among farmers, either to protect sensitive areas or to more closely match stocking rate with carrying capacity.

Recent advances in GPS technology (high fix rates) can provide producers and researchers with the tools to accurately determine where animals are in the paddock (Swain *et al.* 2007; Wark *et al.* 2007). Automated animal control (AAC) technology offers an alternative method of controlling both where and when animals graze without the need for physical barriers, which are costly to erect and maintain, particularly along riparian areas (Bishop-Hurley *et al.* 2007). This paper describes a replicated experiment, which investigated the effectiveness of automated cattle control collars in reducing the presence of cattle in riparian areas.

Methods

The experiment was conducted at Belmont Research Station (150º 13΄E, 23º8΄S), located 20 km NW of Rockhampton. The four paddocks used for this experiment were each 24 ha and had approximately 262 m of Fitzroy River riparian zone. The water trough was located on the east side of the paddock and the river on the west side of the paddock. Twenty Brahman steers (*Bos indicus*) were fitted with a neck collar containing a CSIRO Fleck™, GPS daughterboard, a daughterboard capable of producing a mild electric shock and a battery pack. A detailed description of the GPS devices used in this experiment is provided in Bishop-Hurley *et al.* (2007). To reduce the power consumption of the AAC collars, the radio and GPS were duty cycled so that they were on 16% of the time. Automated animal control collars utilise GPS to monitor position and provide cue (audio) and control (mild electric shock) stimuli to deter animals from entering an exclusion zone.

Once the cattle had become familiar with the paddock, collars were fitted to the individual animals for two weeks and background-monitoring data was collected. Once the background data had been collected, the coordinates of the exclusion zone were sent to the collars to start the control phase of the experiment. The collars were removed from the animals 4 weeks after being fitted. Cattle were observed from a distance regularly and had access to *ad-libitum* grazed forage and trough water throughout the experiment.

Results

On average GPS collars functioned for a total of 25 days and collected 98% of possible records. Due to the very large quantity of data collected a representative figure is offered to show the difference in cattle distribution between the monitoring phase and the control phase of the experiment (Fig.1). Each map represents the point density of cattle positional data during the experiment by plotting every tenth position obtained.

During the monitoring phase of the experiment cattle spent 6% of their time in the exclusion zone, but less than 0.01% of their time in the exclusion zone after the virtual fence was enabled (Fig.1). With access to the riparian area the cattle were dispersed across the paddock compared to the concentrated distribution of animals in the southeast corner of the paddock when access to the riparian area was removed by sending the virtual fence coordinates and enabling the automated animal control collars.

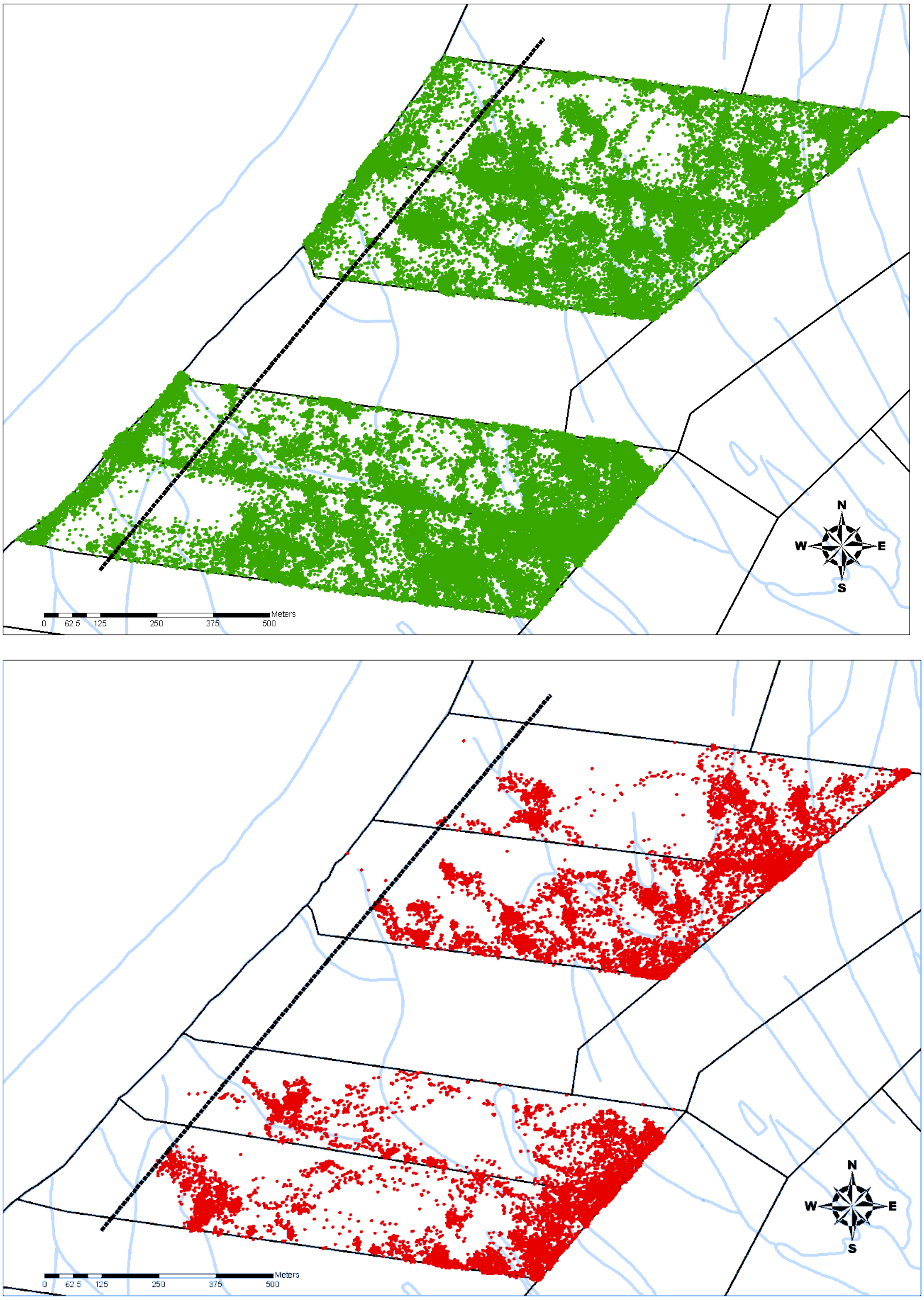

Fig. 1. Distribution of animals before (top) and after (bottom) the automated animal control devices were activated. The thick line represents the location of the virtual fence line and removes the animal's access to the riparian area.

Discussion

The results showed that cattle used the riparian area less when the automated cattle control collars were turned on. The concentration of cattle activity in the paddock needs to be investigated further to determine the effect on pasture cover and utilisation across the entire paddock, The data collected in this study provided an opportunity to evaluate the benefits of using automated animal control collars to keep cattle away from riparian areas.

This work is part of a larger project investigating the use of automated animal control devices to protect environmentally sensitive areas. When using automated animal control devices to prevent cattle from accessing drinking water from the river they must be provided an alternative water source.

The amount of time cattle spent in the riparian zone was significantly reduced by the use of automated animal control collars. However, due to the GPS units taking longer than expected the obtain lock and the unsuitability of the current control collars for long duration trials, the goal of 3 months of exclusion from the riparian area was not achieved. Work is ongoing to reduce power consumption and extend the length of time the automated animal control collars are operational.

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