PROCEEDINGS OF THE AUSTRALIAN RANGELAND SOCIETY BIENNIAL CONFERENCE
Official publication of The Australian Rangeland Society

Form of Reference
The reference for this article should be in this general form;

Author family name, initials (year). Title. *In*: Proceedings of the *n*th Australian Rangeland Society Biennial Conference. Pages. (Australian Rangeland Society: Australia).

For example:

Anderson, L., van Klinken, R. D., and Shepherd, D. (2008). Aerially surveying Mesquite *(Prosopis* spp.) in the Pilbara. *In*: 'A Climate of Change in the Rangelands. Proceedings of the 15th Australian Rangeland Society Biennial Conference'. (Ed. D. Orr) 4 pages. (Australian Rangeland Society: Australia).

Disclaimer
The Australian Rangeland Society and Editors cannot be held responsible for errors or any consequences arising from the use of information obtained in this article or in the Proceedings of the Australian Rangeland Society Biennial Conferences. The views and opinions expressed do not necessarily reflect those of the Australian Rangeland Society and Editors, neither does the publication of advertisements constitute any endorsement by the Australian Rangeland Society and Editors of the products advertised.

The Australian Rangeland Society

UNDERSTANDING CATTLE BEHAVIOUR IN RIPARIAN AREAS WITH AND WITHOUT ACCESS TO OFF-STREAM WATERING POINTS

G.J. Bishop-Hurley[A], D.L. Swain[A], S. Potin[A], T.Wark[B] and C. Crossman[B]*

[A]CSIRO Livestock Industries, JM Rendel Laboratory, Rockhampton QLD 4702
[B]CSIRO ICT Centre, Queensland Centre for Advanced Technologies, P O Box 883, Kenmore QLD 4069

Email: greg.bishop-hurley@csiro.au

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 (Source: Great Barrier Reef Marine Park Authority). Development of a beef cattle industry in Northern Queensland involved the wide scale clearing of woodland for conversion 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. Currently, regional NRM bodies are using government funding to install off-stream watering points as a management tool to protect environmentally sensitive riparian areas. To date there have been no studies to quantify the direct benefits of off-stream watering as an intervention strategy.

Recent advances in GPS technology (high fix rates) can provide researchers with the tools to accurately determine where the animals are in the paddock (Swain *et al.*, 2007). In addition, the access of animals to riparian areas can be restricted using automated monitoring and control devices (Bishop-Hurley *et al.*, 2007). This paper describes an experiment which investigated the provision of off-stream water on the presence of cattle in riparian areas and discusses this in relation to automated animal control.

MATERIALS AND METHODS

The experiment was conducted at Belmont Research Station (150º 13´E, 23º8´S), located 20 km NW of Rockhampton. The paddock used for this experiment was 61 ha and had a 1 km riparian zone along the Fitzroy River. The water trough was located on the north side of the paddock and the river on the south side of the paddock. The experiment consisted of 4 one week deployments:

- Deployment 1 – 12th June to 19th June 2007
- Deployment 2 – 26th June to 03rd July 2007
- Deployment 3 – 17th July to 24th July 2007
- Deployment 4 – 31st July to 07th August 2007

Brahman steers (*Bos indicus*) fitted with a neck collar containing a GPS device collecting GPS fixes were used in the experiment. A detailed description of the GPS devices used in this experiment is provided in Bishop-Hurley *et al.* (2007). During deployments 1 and 2, a group of fourteen 18-month old Brahman heifers were monitored with a GPS fix rate of 1 Hz (once per second). In deployment 1, the only source of drinking water for the cattle was from the river. In deployment 2, cattle were provided with an additional source of off-stream water in a concrete water trough (Figure 1). For deployments 3 and 4, a new group of thirty 18-month old Brahman steers were monitored with a fix rate of 4 Hz (four times per second). In deployment 3 the cattle had access to water either from the off-stream water source or the river, whereas in deployment 4, access to the off-stream water source was removed. Throughout all deployments cattle had unrestricted access to forage and water.

RESULTS

On average GPS collars functioned for 6 days in each deployment and collected 97.5% 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 providing the cattle with access to off-stream water and having no access to off-stream water (Figure 1). This figure represents the point density of 5 cattle for

4 days from deployments 1 and 2. Without access to off-stream water the cattle were dispersed across the paddock compared to the concentrated distribution of animals in the northeast corner of the paddock when off-stream water was provided. The presence of the cattle along the riverfront decreased with the introduction of off-stream water during the second deployment (Figure 2).

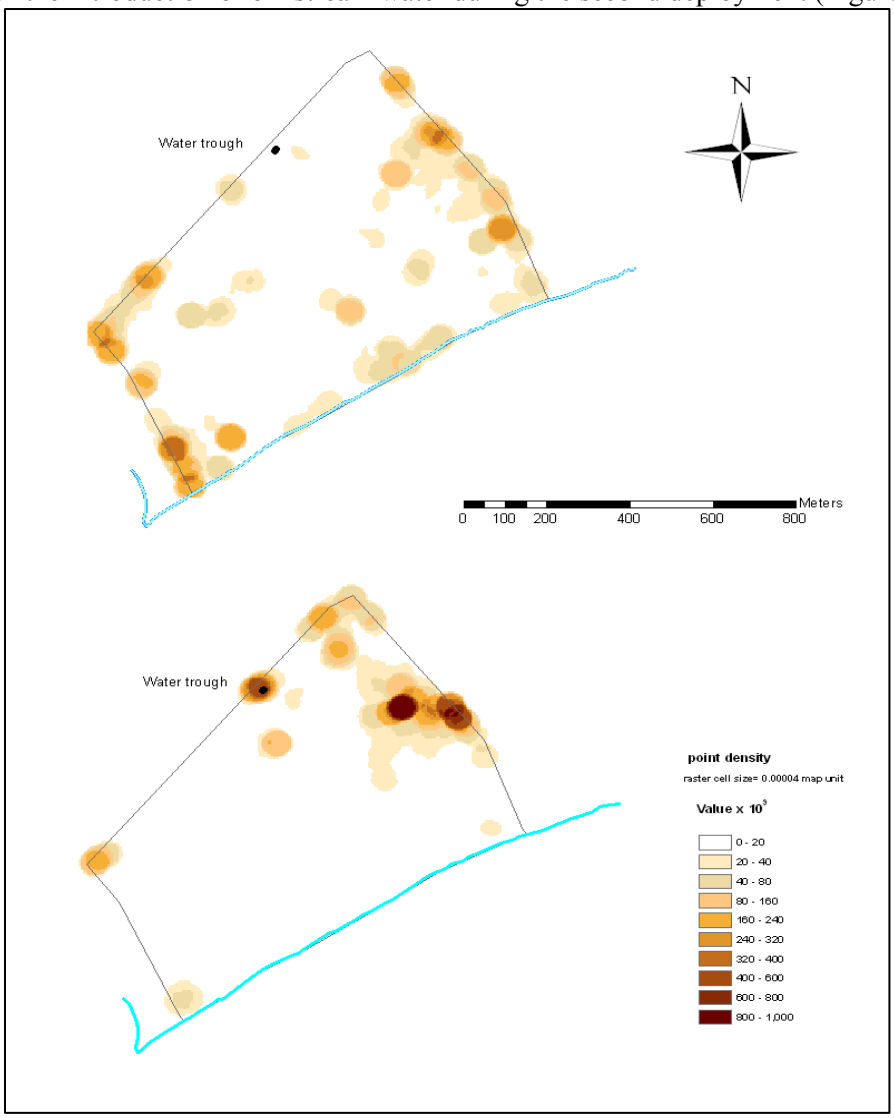

Figure 1: Distribution of 5 steers over 4 days without (top) and with (bottom) access to off-stream water in a 61 ha paddock with 1 km of river frontage.

The use of off-stream watering had a significant impact on cattle behaviour and reduced the proportion of time they spent within 10 m of the river by more than 80% (Figure 2). Furthermore, time spent in riparian areas, defined as a 25 m strip along the river, decreased by 30% when cattle were provided with access to off-stream water.

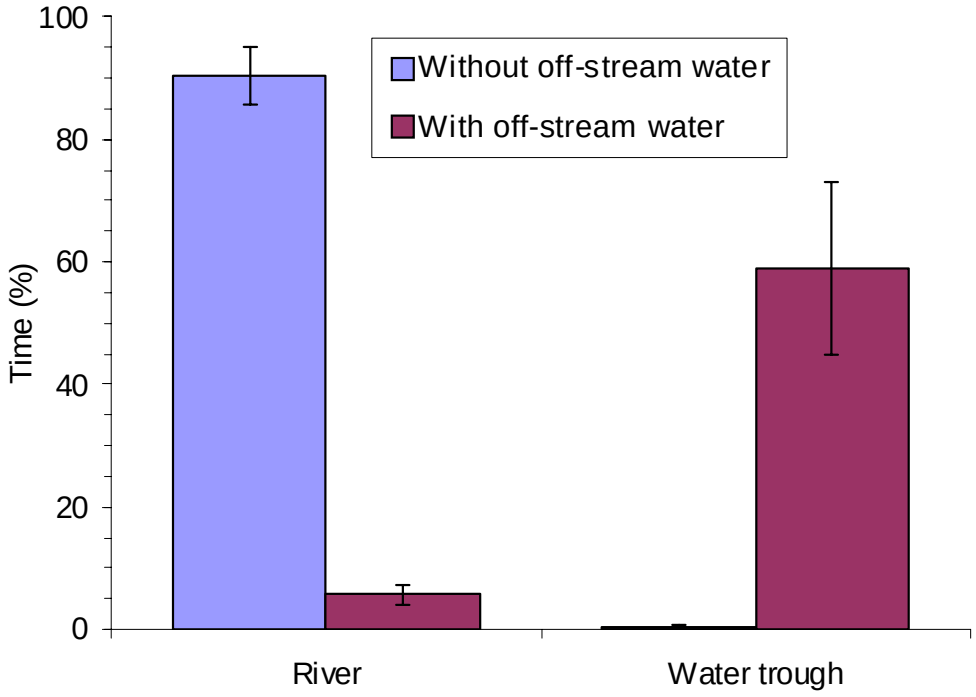

Figure 2: Percentage and standard error of time cattle spent within 10 m of the river and 10 m of the water trough.

DISCUSSION

The use of high fix rate data (up to 4 Hz) for studying animal behaviour is unique to the work being carried out in Rockhampton and provides a new insight into how cattle utilise their environment (Swain *et al.*, 2007). The results showed that the cattle used the riparian area less when provided with off-stream water and they tended to concentrate their activity in a relatively small area of the paddock. According to Godwin and Miner (1996), off-stream watering areas are an effective alternative to stream fencing to lure animals away from the river bank. The concentration of cattle activity in a small part of 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 off-stream watering points 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. If automated animal control devices are to be used to prevent cattle from accessing drinking water from the river then the cattle will need an alternative water source. Work is ongoing using automated control devices in conjunction with off-stream watering points to determine if cattle activity can be eliminated from riparian areas and reduce the need to fence riparian zones.

REFERENCES

Bishop-Hurley, G.J., Swain, D.L., Anderson, D.M., Sikka, P., Crossman, C. and Corke, P., (2007). Virtual fencing applications: Implementing and testing an automated cattle control system. **Computers and Electronics in Agriculture**, 56: 14-22.

Godwin D.C. and Miner J.R., (1996).The potential of off-stream livestock watering to reduce water quality impacts. **Bioresource technology**, 58, 1996, p. 285-290

Swain, D.L., Wark T. and Bishop-Hurley G.J., (2007). Using high fix rate GPS data to determine the relationships between fix rate, prediction errors and patch selection. **Ecological Modelling**, 212: 273-279.

Wark T., Corke P., Sikka P., Klingbeil L., Guo Y., Crossman C., Valencia P., Swain D. and Bishop-Hurley G., (2007). Transforming agriculture through pervasive wireless sensor networks. **Pervasive computing**, April-June 2007, p.50-57.