COUNTING DEER, NOT TOURISTS, ON THE SUNSHINE COAST

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ABSTRACT

The Sunshine Coast Regional Council (SCRC) Feral Animal Education and Control team has conducted a feral deer monitoring and control program since May 2015. Monitoring consisted of thermal line transect surveys and time lapse cameras. For thermal surveys the SCRC team utilised a vehicle mounted Pulsar HD50 thermal imaging monocular and traversed five transects at 10-15 km/h for three consecutive nights with the survey conducted three times per year. Five fixed time lapse cameras were also located in the deer control area to provide additional information on the deer population. These cameras were set to record early morning and late afternoon deer sightings with a photograph taken every 20 seconds. The photograph counts were averaged to yield an index of the mean daily deer sightings for each month. Between May 2015 and February 2018, 203 feral deer were culled in the Upper Mary River Valley as part of the control program. Thermal line transect monitoring suggests a decline in the number of deer in the monitoring area from approximately 7 deer/km2 to approximately 4 deer/km2. The time-lapse camera monitoring also shows a similar decline, suggesting that control is being effective. The monitoring program is integral in evaluating the effectiveness of the control program and determining how much control is needed. It is also important to help justify the control program and associated costs.

Keywords: control, rusa deer, monitoring, red deer.

INTRODUCTION

Like many other Councils on the east coast of Australia, the Sunshine Coast Regional Council (SCRC) has a population of feral deer that has the potential to become a serious pest problem if left unchecked. Accordingly, the SCRC Feral Animal Education and Control team has been conducting a feral deer control program since May 2015. The efficacy of deer control programs is largely unknown in the Australian context (Davis et al. 2016). Right at the outset of this control program a monitoring component was developed and implemented as recommended by Braysher (1993). Monitoring deer populations is often problematic (Amos *et al.* 2014, Forsyth *et al.* 2017) and the complexity is increased where deer are located in peri-urban or semi-rural areas as not all census methods can be utilised. The area targeted in the first phase of the SCRC control plan was the Upper Mary River Valley where land holdings range in size from small lifestyle blocks to larger rural grazing holdings and the main deer species are Rusa (*Rusa timorensis*) and Red (*Cervus elaphus*).

MATERIALS AND METHODS

Thermal transect surveys

Thermal transect surveys were conducted in April, August and December each year for 2015, 2016 and 2017 and were replicated for 3 consecutive nights. Surveys were conducted by a two person team driving in a vehicle at approximately 10-15 km/h along 5 transects that varied from 3.9 to 10.1 km in length. The observer in the passenger's seat controlled a Pulsar HD50 thermal imaging monocular mounted on a spotlight remote and viewed the image via an external screen mounted on the dash of the vehicle. Data such as the deer species, number of deer in a group, distance from the vehicle, estimated sighting angle and distance along transect as well as date, observer, and weather conditions were recorded for each transect. The raw data from the thermal transect monitoring program was entered into a spreadsheet, with all distances and sighting angles transformed into a perpendicular distance. This data was then analysed in the software package Distance 6.0 as line transects. Density estimates for each season and each transect were obtained from pooling the data from all seasons and using a global detection function. Deer densities were estimated from pooled observations of deer species, not by individual species.

Time lapse cameras

Five PlotWatcher time lapse trail cameras were positioned to take photographs of open areas that deer frequented. The cameras were set to take a photograph every 20 seconds from dawn until 9:00 am and then from 3:00 pm until dusk. This was autocorrected for time of year with a light sensor built into the camera unit. As the cameras were not reliant on a passive infrared trigger, the deer were often captured further from the camera than would be normal with other trail cameras. Photographs were merged into a video using software supplied with the cameras to quickly view all images and speed up processing. The cameras recorded data 365 days a year and were downloaded monthly. The number of individual deer for each incursion into the camera field of view was recorded. This data yielded an index of the average daily deer sightings for each month.

Deer cull

Deer were culled in the study area within the Upper Mary River Valley between May 2015 and February 2018. Most of the culling work was conducted at night on foot under total darkness using a Pulsar XD75 riflescope mounted on a rifle to maximise opportunity of control.

RESULTS

Thermal transect surveys

<u>Thermal raw data</u>

A total number of 374 field observations of 1740 deer were made during the survey comprising of 1,118 Rusa, 451 Red and 1 Fallow deer (*Dama dama*). These observations were made over 27 nights and 913km of transect surveyed. The highest average observation (average deer/season/pooled transects) was in August 2015 comprising 134 deer and the lowest average observation was in December 2017 comprising of 30 deer.

Thermal density overall

The final model chosen from the distance analysis had a probability of detection of 0.59 and an effective strip width of 146 m. The density results from the analysis displayed variability both in season and year. Overall deer density varied from a high of 10.4 deer/km^2 in August 2015 to a low of 2.7 deer/km^2 in December 2017. A downward trend was observed in the overall deer population density estimates (Figure 1.).

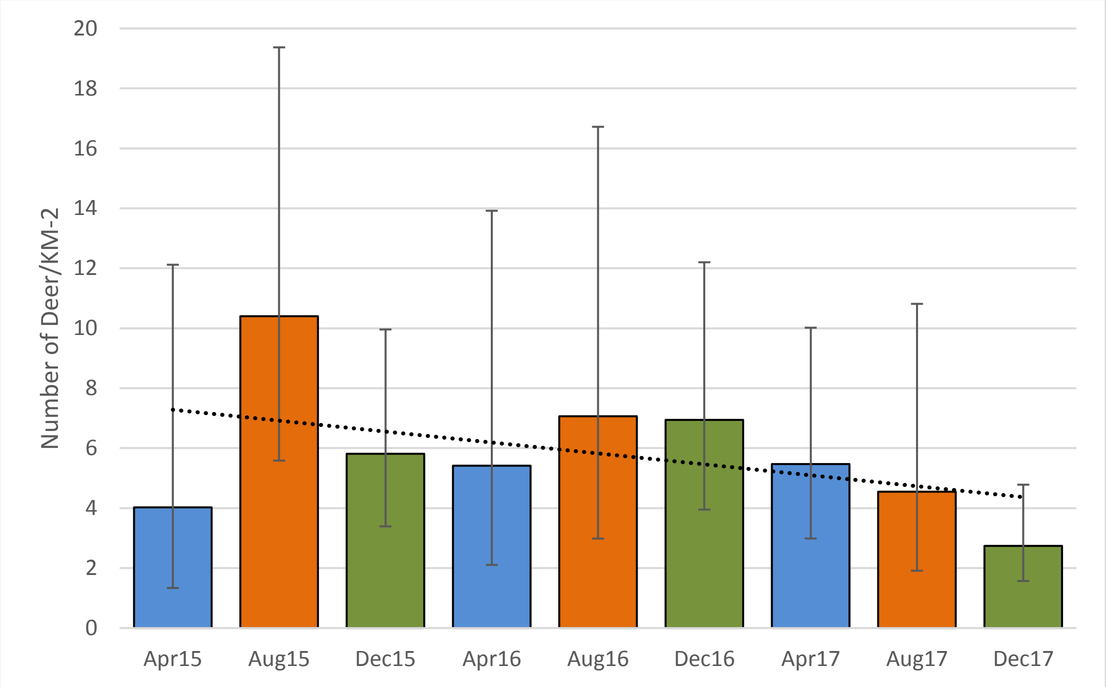

Figure 1. Overall deer density estimates showing 95% confidence intervals and linear trendline.

Thermal deer density by transect.

The density results for individual thermal monitoring transects varied greatly by transect and also from year to year and season to season (Table 1.). During the survey period the EMRR transect showed the highest overall deer densities and also a downward trend in deer density whilst the other transects showed little or no trend and great variation.

Table 1. Deer density (deer/km^2) estimates by transect.

Transect	Apr15	Aug15	Dec15	Apr16	Aug16	Dec16	Apr17	Aug17	Dec17
Ahern	1.18	10.96	4.24	1.30	2.95	4.88	3.92	4.99	4.20
BCrk	2.33	7.23	7.62	0.85	2.34	11.79	3.10	1.97	0.98
EMRR	11.25	17.44	8.46	13.21	15.79	9.31	10.11	7.62	3.53
KBR	0.00	3.60	6.64	3.19	1.46	2.67	4.83	2.46	1.82
Walli	0.00	3.96	1.39	3.91	6.41	4.90	2.13	1.80	0.89

Composition of deer species – thermal survey.

The composition of deer species were not distributed evenly on the various transects with the EMRR transect being dominated by Rusa and the others by Red deer. The composition of deer by transect pooled for all years and seasons is shown in Table 2.

Table 2. Species composition by transect from thermal surveys.

Transect	Species Unsure	Red deer	Rusa deer
Ahern	28.2%	51.9%	19.9%
BCrk	6.1%	93.9%	0.0%
EMRR	4.8%	4.0%	91.2%
KBR	6.0%	80.0%	14.0%
Walli	0.0%	100.0%	0.0%
Overall Average	9.5%	26.0%	64.5%

Time lapse cameras

The overall trend from pooling all the camera data suggests that deer sightings has decreased over the monitoring period (Figure 2). Monthly trends within the camera data are irregular but sightings were greatest in October for all three years.

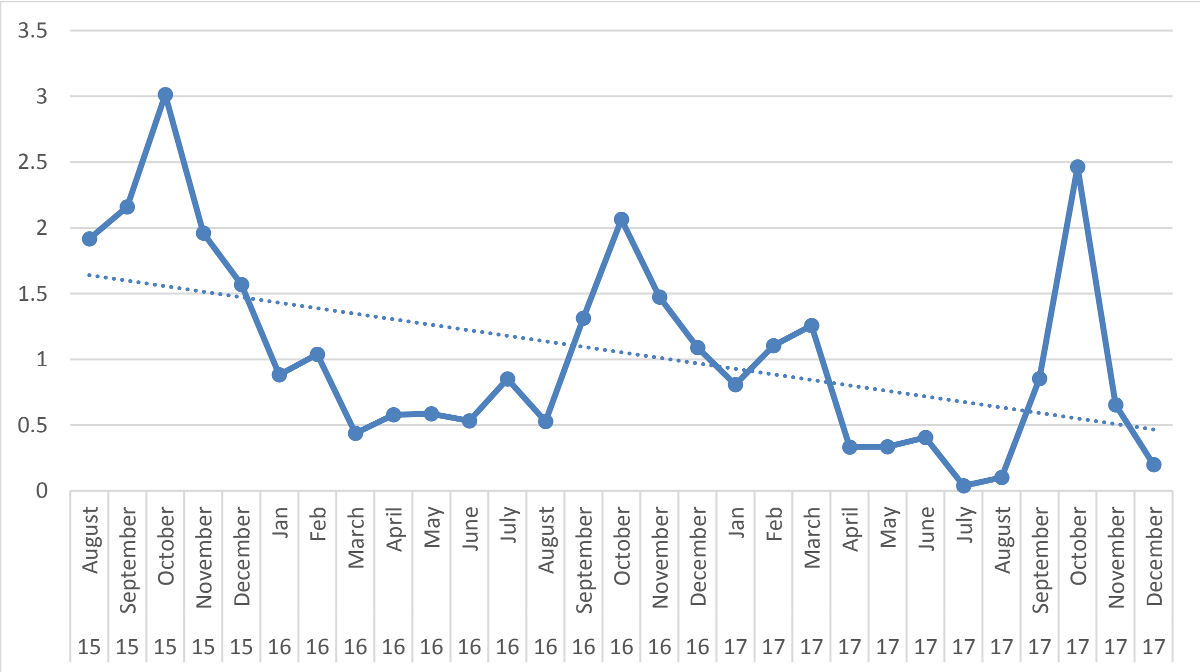

Figure 2. Average daily deer sightings from all fixed cameras August 2015 to December 2017 showing linear trendline.

Deer cull

Between May 2015 and February 2018 a total of 203 deer were culled as part of this program, comprising 111 Rusa, 91 Red, and 1 fallow deer. From the start of 2016 an average of 7.3 deer were culled per month. Figure 3. shows that the average number of deer observed during the thermal surveys fell as culling continued throughout the program.

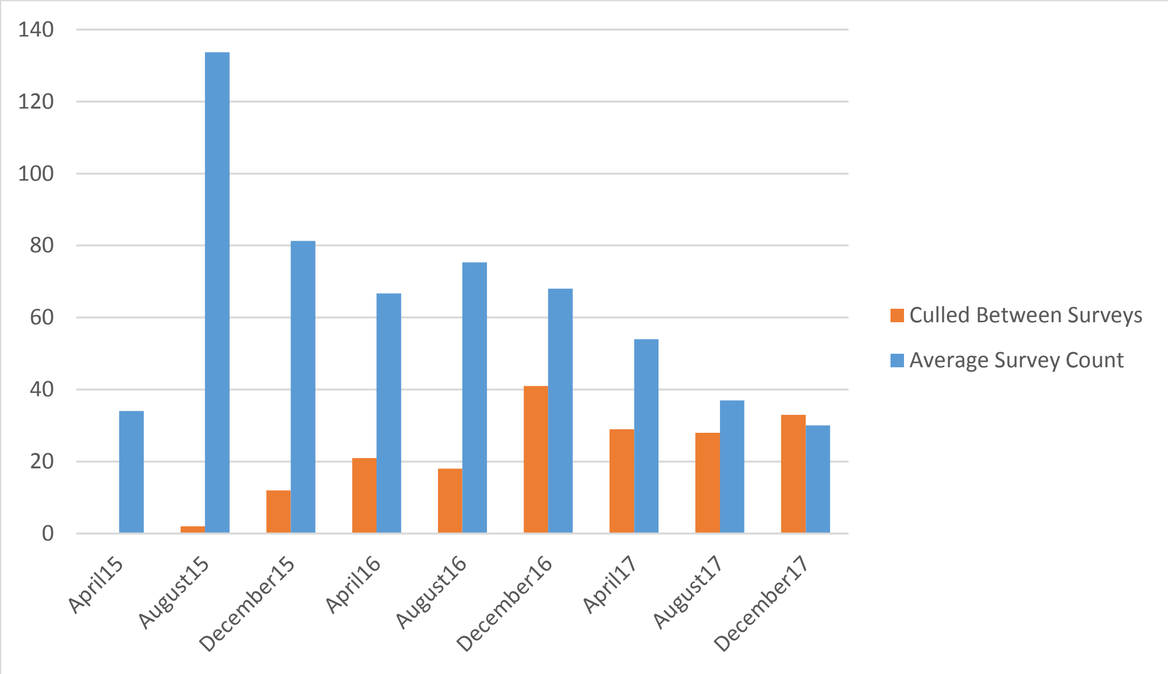

Figure 3. Average deer observed per thermal survey vs deer culled between surveys.

DISCUSSION

The efficacy of deer control methods are largely unreported in Australia (Davis *et al.* 2016), but this program is showing early signs of success. The overall monitoring data shows a downward trend in deer numbers during the monitoring period in the survey area. As the overall deer numbers are relatively low, it is not expected that the population density is limiting population expansion (Sinclair *et al.* 2006). Therefore, in the absence of disease, drought or some other external limiting factor the population would be expected to be expanding, not contracting (Sinclair *et al.* 2006). For example, the rusa deer in Royal National Park near Sydney had a mean density of between 16 and 19 deer/km^2 in the period 1999 to 2001 which is similar to the upper results from the EMRR transect and still displayed population growth of 9.6% and 4.2% respectively in 2000 and 2001 (Moriarty 2004). The overall results indicate the program is being effective at the local scale in the Upper Mary River Valley.

The control program has comprised a sustained effort over the program duration. It is expected that the harvest rate would increase as the efficiency of the control officer peaks due to factors such as familiarity with gear, deer habits and the local terrain – and this may have occurred during the latter half of 2016. It is also expected that if deer numbers get controlled down to a certain critical number, the harvest rate will fall off as the deer become harder to find and harvest (Sinclair *et al.* 2006). This does not have appeared to have occurred yet.

The line transect method of distance sampling used is very sensitive to observer bias (Buckland *et al.* 2001), but the main observer has remained the same during the program for consistency's sake. However as both the methodology and the equipment were new to the team in April 2015 it is expected that the results for this sampling event could be biased low and not wholly representative of the deer density at that point in time.

This program stands out as being well organised, well implemented and effective. Many similar control programs do not have a formal monitoring component, which is often forgotten but yet forms a crucial aspect of a control program to determine its effectiveness (Braysher 1993). In addition, a formal monitoring component to a control program helps justify the existence of the program and associated program costs.

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