Sambar deer habitat use and movement study
Alpine National Park (Bogong High Plains)

Introduction

A significant expansion in the area occupied by Sambar Deer and an increase in their abundance and density has been observed in the Australian Alps national parks, including Victoria's Alpine National Park, over the past ten years. This has coincided with increased impacts on catchment health as well as the condition of key environmental assets, including the EPBC listed Alpine Sphagnum Bogs and Associated Fens (hereafter referred to as alpine peatlands).

Sambar are wary, shy and cryptic animals that are difficult to observe. As a result, there is a dearth of information on their movements and what is known is largely anecdotal and unsubstantiated. Improved understanding of habitat use and daily and seasonal movements of Sambar in the alpine/subalpine areas of Australian Alps national parks would significantly enhance the ability of agencies to develop and conduct control programs in areas and at times of the year/day that produce the greatest yield to reduce the impact on key environmental assets.

Parks Victoria, together with the NSW National Parks and Wildlife Service, the ACT Parks and Conservation Service and the Sporting Shooters Association of Australia (SSAA), with funding from the Australian Alps national parks (AANP) program and additional contributions from Parks Victoria and the national and Victorian branches of the SSAA, implemented a project that aimed to fit satellite tracking collars to sambar deer to learn more about their home range and movement patterns in the alpine/subalpine areas to improve and better target future deer control programs.

Study area

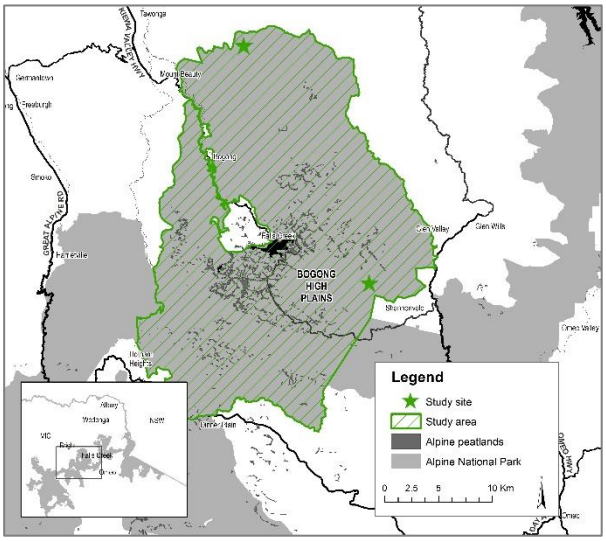
This project was conducted on the edge of the Bogong High Plains, in Victoria's Alpine National Park.

Victoria's Alpine National Park covers an area of over 650,000 hectares of public land, extending from near Mansfield in the west to the New South Wales border in the north.

The Bogong High Plains are 230km north-east of Melbourne and 250km south-west of Canberra. They are located approximately in the middle of the Park.

They are a series of alpine and sub-alpine plateaux covering an area of approximately 120km^2, the largest area of high mountain vegetation in Victoria.

This location was chosen for this project because of the history of deer control in the area and data available from the 50 remote cameras installed in early 2015 as part of Parks Victoria's Alpine National Park Deer Control Trial.



Methods

Given sambar deer had not been captured and collared in the wild in Australia before, the capturing strategy implemented was flexible and the methods used adapted to prevailing environments. Two methods were used - the primary method involved overhead nets and the secondary method, free darting using a dart projector. (Note - following capture in the net, the deer would also be sedated using immobilising drugs delivered either by dart projector or pole syringe). The choice of method was based on an assessment of deer abundance in the area and the predictability of their movements. Both methods were endorsed by the Melbourne Polytechnic Animal Ethics Committee (permit number 14/18). All work was undertaken in accordance with this permit and a research permit issued by DELWP (permit number 10008678).

Overhead nets

Eight nets and projectors were custom built for use in this project. They were deployed usually from trees or from ropes between trees. Nylon nets with square mesh and three or four weighted corners were packed into a canister between three or four barrels containing the weights (Figure 1). Weights were discharged from the angled barrels using the force of a blank 3006 rifle round.

The net diameter was between 6m and 9m depending on vegetation encroaching on the site, with a mesh width of 20 cm (squares 20 cm x 20 cm, maximal stretched length of diagonal 40 cm).

The canister was suspended at a height of between 3.5 and 5 m, usually from the lateral limb of a tree, above a well-used deer track. The height of the canister was set according to net size and the amount of vegetation encroaching the site (Figure 2).

Overhead nets were discharged by means of either a trip wire or a pressure sensitive pad. Trip wires were set at heights to exclude non target species such as wombats and wild dogs. In either case, any break in the electrical circuit activated a charge which when detonated projected the net to spread to its full diameter at ground level. Once enabled, mechanisms were left *in-situ* without being unnecessarily revisited to prevent human scent adversely changing sambar deer behaviour.

Considerations in site selection included appropriate high use deer tracks, minimal adjacent trees to potentially tangle the net, freedom from livestock and non-target species and accessibility.

Prior to active deployment of the nets, empty canisters were suspended in situ for periods of two to three weeks to allow deer to acclimatise to changes in the environment.

A means of automatically notifying personnel immediately after the net was fired was built in to the system. Either the canister was illuminated by a white LED designed to be visible for >300m from a non-intrusive position, or an audible alarm sounded, or where possible a SMS signal was generated and sent to a mobile phone. In response to this signal, personnel were positioned to be in attendance of the animal within 10 minutes.

Deer caught in nets are rapidly entangled and immobilised, and found conscious, lying with their head upright through an aperture in the net, and their legs beneath them (Jedrzejewski and Kamler 2004).

The captured animal would then be heavily sedated/anaesthetised using a dart gun at a range not exceeding 35m, or preferably a pole syringe at a distance of 2m. The advantage of a pole syringe is simplicity and surety of correct site of injection.

The proposed anaesthetic regime was Xylazine 2mg/kg mixed with Zoletil 6mg/kg), delivered using either a 3cc syringe and 18g needle, or alternatively a disposable 16g Pneudart delivered by dart projector. This drug regime has a wide safety margin, has one reversible component (Xylazine), can be delivered at a maximal distance of 45m by dart gun, and gives adequate length of anaesthesia.

Personnel will allow 10 - 15-minute induction time before cautious approach, blindfolding, collar application, net removal, drug reversal (Yohimbine 0.2mg/kg I/V, 20g 1" needle) and release.

Animal monitoring by a veterinarian would be constant throughout the procedure. This monitoring would include systematic 10-minute checking and recording of heart rate, respiratory rate, oxygenation and postural considerations to avoid aspiration pneumonia and bloat.

The key considerations in this process were:

(i) a total of eight nets were available with differing mechanisms of attachment to fixed locations. A manageable number of nets (3-4) were deployed in close enough proximity to each other (1 km radius) for personnel to respond to captured animals within 10 minutes. Personnel maintained communications by VHF radio. In the event that more than one net was deployed both animals would be sedated in the first instance to minimise stress and then collared and released;

(ii) net locations were determined based on local knowledge and information, on both sambar deer traffic and the absence of non-target species such as horses and wallabies, from the camera trap data collected during the Alpine National Park Deer Control Trial. Nets were positioned along game trails where sambar traverse in single file so minimizing the possibility of deploying the net over more than one animal;

(iii) trip wires were at heights to exclude wild dogs and wombats;

(iv) the time of greatest stress to the captured animal is when they are conscious and aware of humans in proximity, rather than when they are immobilised by a net without people present;

(v) personnel (including Veterinarian) must be able to respond to net deployment within 10 minutes to avoid sambar deer being immobilised for undue periods;

(vi) personnel were familiar with potentially fatal sequel to capture of cervids - Post Capture Myopathy (PCM). PCM is almost invariably fatal, either acute or over several days. It is best managed through awareness and prevention, key to management is minimisation of stress to the animal.

Between two and seven nets were deployed for a total of 36 nights during 2018 and 2019 (late Winter and early Spring).

Free darting sambar using dart projectors

This technique relies on shooting a drug filled dart fitted with a VHF transmitter into the muscle of a free ranging sambar deer at a range of <45m. Induction times (time for animal to become recumbent), for anaesthesia are 3 - 9 minutes after darting followed by a Stage 4 anaesthesia (animal completely immobile and unaware) lasting 30 - 90 minutes. Anaesthetic drugs and dose rates are as previously described.

After darting, personnel allow 10 minutes before using a radio receiver fitted with a Yagi antenna to identify a VHF signal and locate the darted animal on foot, using triangulation.

Once the darted animal is located, the approach, collaring, monitoring and release of the deer is as previously noted.

This method would utilise night vision optics mounted on a dart gun in high traffic sambar deer areas usually at night, or opportunistically during the day.

Limitations to free darting are the limited number of opportunities for near encounters with unaware sambar. Also, the variable and uncertain induction time between darting and recumbency means animals may move considerable distances in difficult and complex terrain following darting. Many previous dart projects report this limitation even in simple terrain during daylight.

Six nights were allocated to darting.

Using food attractants to lure sambar

On farms adjacent to the Alpine National Park cattle are attracted to salt which is fed from open containers in cleared paddocks and it was plausible that deer maybe similarly attracted to salt if it were offered in more secluded areas. Salt, as well as a range of fruit and vegetables were offered in appropriate sites with cameras for observation.

Sambar are attracted to various horticultural crops in a semi-predictable manner most notably during periods of slow plant growth in late winter. We ploughed a one-hectare site in an area of private land adjacent to the ANP and sowed and irrigated turnips. Portable fencing was used to exclude rabbits and funnel deer beneath net sites.

Results and discussion

No sambar were captured and collared as a result of the project.

The timing of capture efforts during 2018 coincided with an extension of the widespread drought. Deer consequently did not concentrate at lower elevations but remained dispersed in low densities throughout areas beneath the snow line.

At the same time, resident deer near the farm fringe were targeted by professional meat hunters for the first time.

The outcome for capture was that sambar were in low numbers and those that were present were shot or harassed resulting in no application of collars.

During this pilot every effort was made to test the methods and the technology.

In total more than 40 nights were spent either attending nets or darting or both.

No sambar was netted nor were any off-target species. Individual nets remained in place for periods of days but invariably beyond that time wind or fallen branches caused them to discharge.

Several deer were successfully darted but not recovered. Darted animals ran to thick bush and efforts to locate them using telemetry failed. Analysis of telemetry failure in daylight showed that signals in locations where vegetation was dense, with stems exceeding about $3/m^2$ were not directionally accurate within about 400m of the dart. Although VHF signals in 'line of sight' and light vegetation were precise and directionally accurate in thick vegetation direction could not be narrowed beneath approximately 180 degrees.

The turnip crop showed potential in attracting deer but due to environmental conditions, non-target species and venison harvest no deer were attracted regularly enough to allow capture.

Neither were deer attracted to either salt nor other food attractants.

Although no collared sambar resulted from this initial study there remains a need for land managers to know more about the ecology of this little-known species. Of the six deer species introduced to Australia sambar are the most numerous, most rapidly expanding and widely distributed but least studied.

Despite the long-term increase in the distribution and abundance of sambar in Victoria the density of sambar is not high by the standards of other ungulates. The accepted theory that dispersion of sambar is density dependent (Harrison 2010) means that in most instances sambar densities are low. Also contrasting other ungulate species and making capture more challenging is the elusive, wary and nocturnal nature of sambar. Remote cameras on deer trails both with and without nets show that sambar behaviour changes for a period of ten or more days following human disturbance. Camera data from this study showed that sambar would not use a trail they previously used daily for days following a camera or net being set. Further, sambar could not be induced to come to food attractants despite being left for more than three weeks. These behaviours are in contrast with chital, fallow and red deer which are predictable and readily attracted to food.

With the need for research remaining, improvements are required to methods currently available. Overhead nets used in this project show potential for success and have been used on ungulate species elsewhere in the world. In order to increase the likelihood of capture using nets, a greater emphasis needs to be placed on selecting sites (i) with populations of deer large enough to make capture of several individuals realistic; (ii) where sambar movements are predictable and patterned through camera studies; and (iii) where animal disturbance by hunters and the public is minimal.

Anaesthetic drugs available overseas including derivatives of etorphine would likely produce faster and more reliable immobilisation. Further, darting attempts should be restricted to areas compatible with VHF transmission to improve prospects for locating darted animals.

The notable lesson learned from this study is that collaring sambar requires an expanded approach with respect to methods and commitment. Building on the present study; more time, professionals and commitment will improve the chances of a successful future outcome.

Acknowledgements

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