Thermal imaging survey

Cochrane Ecological Institute and Wildlife Reserve Society

L. McCall[*][a]

[a] School of Biological Sciences, University of Tasmania, Hobart, Australia

[*] Corresponding author: lamccall@utas.edu.au

Objective: Thermal heat imagery displaying coloured isotherms attached and flown from drone at approximately 100m elevation. This is proposed as an alternative to behavioural disrupting radio transmitting collars for species roaming over habitat range and ear tags for hibernating species as a tool for animal monitoring telemetry.

Project Outline: Field testing of thermal imaging camera in enclosed pen to investigate size and specificity of species able to be identified over varied interval distances.

Background Theories

The value of thermal imaging as a technique for animal detection is profound in the safe monitoring for evaluator and non-invasive for species observed thus reducing stress levels. Thermal imaging technology is additionally able to detect injuries that incur inflammation (Cilulko et al. 2012). Thermal imagery detects isotherms and displays them in colours. A healthy animal would show an even distribution of heat. Physiological processes can affect the internal temperature (Cilulko et al. 2012).

The uses of infrared thermal imagery include employment to investigate thermoregulation and analyse the impacts of environmental factors impacting their ability to thermoregulate and behavioural patterns (Cilulko et al. 2012). Additional employment of thermal imaging technology is to survey an area for species assessing their habitat range, to seek out an individual and determine a population size.

Thermal imagery possesses other uses for wildlife including disease diagnosis, reproductive control and thermoregulation (Cilulko et al. 2012). For the detection of animals and estimation of population size, temperature measurements are taken from a distance, the animals will appear as warm spots against a cool background (Cilulko et al. 2012). The research question therefore is at what distance to animals become a warm spot of varying size and indistinguishable shape from the point of being able to identify the species. A previous study by Graves et al. (1972) on white tailed deer, successful, dented the animals at an altitude of 300m with spare vegetation in overcast conditions (Cilulko et al. 2012).

Limitations to the effectiveness of thermal imagery technology that should be taken into account include weather conditions such as solar flares; energy from the sun heats the surface of the skin, varying due pigment of coat colour and possibly causing errors in the accuracy of internal body temperature (Cilulko et al. 2012). Distance between the object and thermal imaging camera can cause inconsistency in readings. Physical properties of the animal coat or feather coat such as the thickness and colour attributed to the phenotype of the species; for example an animal with a thick coat or excess blubber is more insulated and thus causes low readings and are weakly visible on thermograms (Cilulko et al. 2012). Finally the cost of the technology could be considered a limitation.

Equipment:

1. Measuring Tape
2. Marking ties
3. Bait (grain)
4. FLIR Thermal Imaging Camera
5. JVC high definition camera to record and take stills for comparison
6. Laptop with program FLIR Camera Controller 2012

Method: (set up)

1. Measure transect of a 100 metres, with 25m intervals.
2. Position thermal heat imagery camera and high definition camera parallel on deck (cat kennel) facing transact. Aim and adjust.
3. Place bait/corruption (grains and fruit) along 25m transact interval points, throughout different stages of experiment.
4. Alternatively for variable of canopy cover inference run lateral trances from 25m intervals into foliage and place bait.

Method: (monitor)

Monitor over duration of 8 days, times 10AM to 11AM mornings and 3PM to 5PM in evenings (dusk).

Observe and record at each 25m interval: (25m, 50m and 75m)

- Subject Identifiable
- Size of species
- Polarity
- Weather conditions (clear sky, overcast, snow cover percentage)

Observations and Conclusions

In conclusion, the subject species (Turkey) was identifiable at the fenceline (10m) and at 25m (Transect 1 and 2) most easily distinguishable with black hot polarity with a 2x zoom. At 50m (Transect 2 and diminishing for Transect 1) it was possible to distinguish it was a bird through the videos at 2x and 4x zoom again, best with black hot polarity. Additionally images captured of the Turkeys roosting in the trees at 50m, only the heads were clearly visible. At the 75m on Transect 2 it was only possible to identify warm bodies (specifically their heads with the absence of feathers as a variable projecting higher isotherms). The dense vegetative cover (70%) at the 75m point on Transect 1 proved quite difficult to identify the animals.

Video provided a clearer indication of species through movement, to identify species at larger distances (50m and 75m). With a video recording it was possible to identify squirrels moving across the transect at 25m.

Black hot was the best polarity for distinguishing subjects. White hot was also suitable however fusion was difficult to distinguish warm bodies at further distances however at 10m fusion allows a for clear image with heat detail easily distinguishing the bird.

There was little improvement by altering the isotherms from original setting of 100, 95, 92, 90 to 100, 95, 90, 85. More research could be employed to further understand the benefits of this.

I propose that mammals at greater distances could be more easily identified than birds as evident with the thermal video of footage of a squirrel giving of heat readings for the entirety of its body making it distinguishable as a small mammal however a turkey at the same distance 25 to 30m is less distinguishable with the body mass not giving a clear heat reading except for the head. Therefore feathers act as an effective heat retaining insulation.

References

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