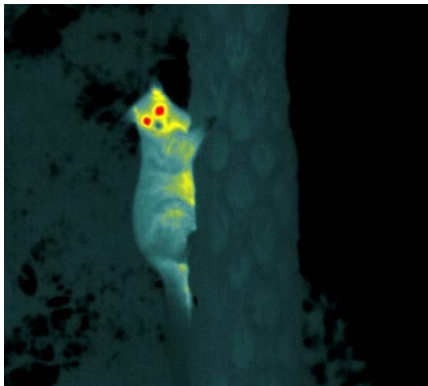




Landcare Research
Manaaki Whenua

Thermal Imaging and UAVs

Bruce Warburton, Ivor Yockney,
Stephen McNeil, Grant Halverson

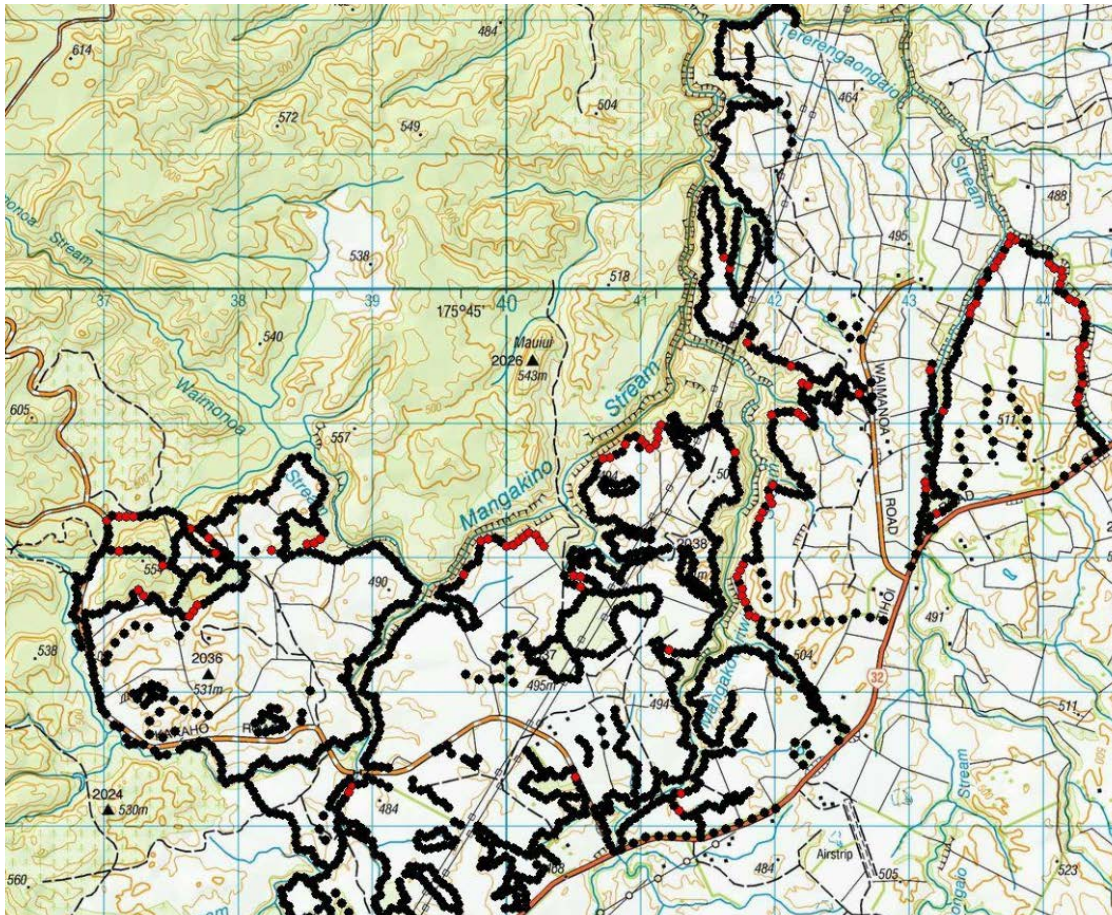


Contracted by
TBFree New Zealand



Background...1

TBfree New Zealand: Detecting residual possums in low density populations



Is there a lower-cost alternative?

Background...2

- AHB funded trials in 1999 to assess potential of using Thermal Imaging (TI) for possum detection (Trotter 1999).
- 1990 technology:
 - 320 x 320 pixels
 - Slow frame rate (20Hz)
 - Limited thermal sensitivity (100 mK)
 - Analogue video tape data capture
- Detected possums, but challenges with image processing

Current TI technology

- HD: 1024 x 1024 pixels
- Fast frame rate (from 20Hz to 100Hz)
- Good thermal sensitivity (100 mK to <30mK)
- Digital data capture
- Miniaturisation (<500g)
- Effective uncooled sensor arrays
- 24-mm lens at 150 m with a 1024 x 768 resolution will provide 15 pixels over a possum with a 70-m swath width.



Thermal Images...1



Thermal Images...2

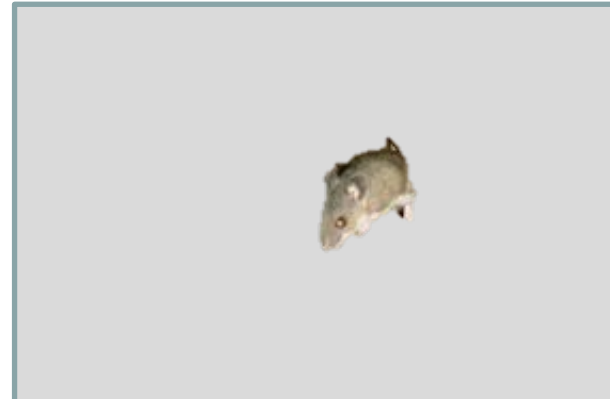


Thermal Images...3



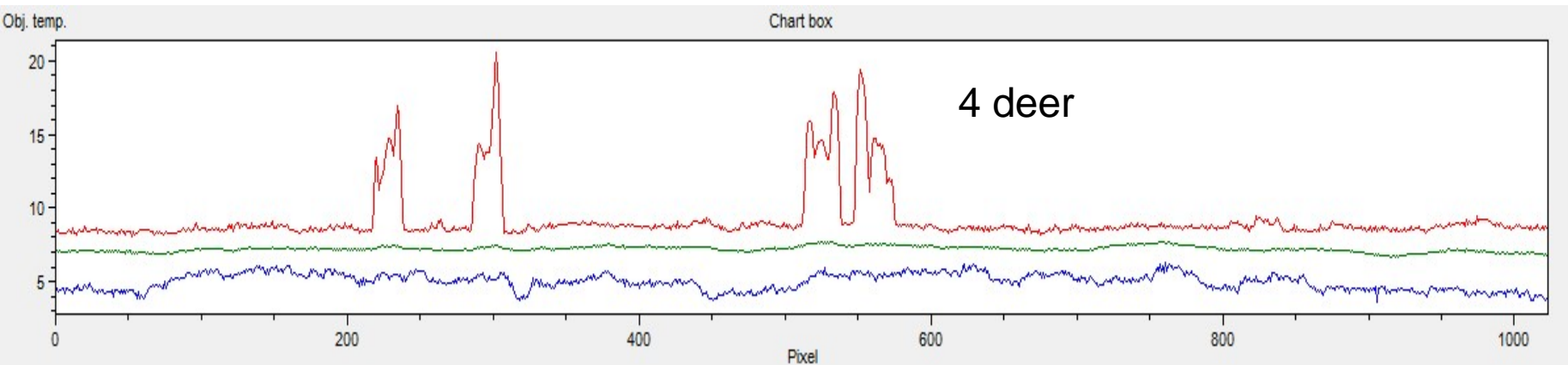
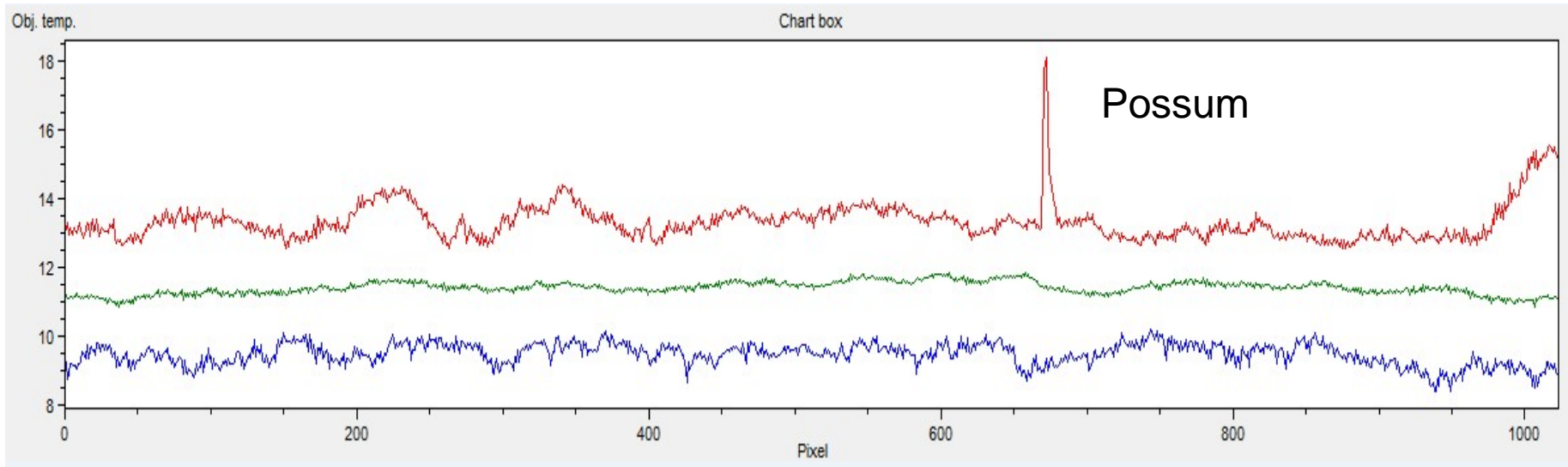
Image recognition

- Several international groups working on image recognition (security, military, Facebook).
- Australian Invasive Animal CRC developing software for analysing trail camera images.
- Landcare Research remote-sensing staff starting to develop thermal image recognition algorithms.



Radio-metric cameras

Temperature is recorded for each pixel



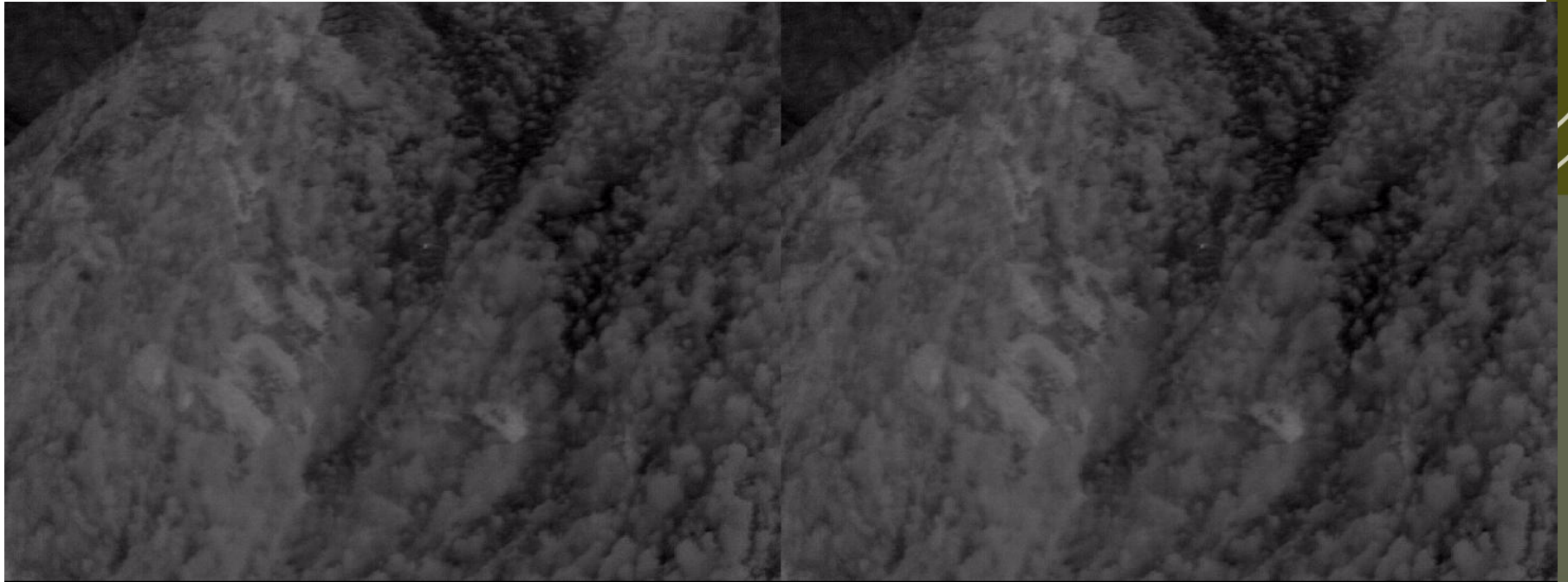
Thermal Image Recognition

- Animals detected by looking for “hot” outliers compared with the rest of the image.
- Current solution in Matlab processes images at about 10% of real-time video rate.
- Enables frames with hot-spots to be examined rather than the full video footage.
- Currently detects hot spots but does not identify species.
- Work in progress

Video processing example – Chamois

Original video

Processed video with chamois
detected



The Future????

- Aerial monitoring of tahr and chamois
- Rabbit monitoring (permanent transects)
- Bennetts wallaby (recent spread south of the Waitaki river)
- For large areas of Marlborough and Otago (low stature vegetation) multi-species monitoring (goats, pigs, possums, rabbits)
- Commercial deer recovery

Unmanned Aerial Vehicles

RPAS: Remote Piloted Aerial Systems



Martin Jet-Pack
Payload of 120kg

Unmanned Aerial Vehicles

Fixed-wing options:

- 2.5m wing-span payload of about 1 kg
- Cruise speed of 60km/hr
- 60-90 min duration
- Quiet electric motor
- Independent GPS guided flight system and autopilot platforms
- Hand launch/parachute recovery

- Miniaturised HD TI cameras available, but data capture system not currently miniaturised

Future Research

Determine the sensitivity and specificity of a TI detection system:

- False negatives (i.e. proportion of animals not detected)
- False positives (i.e. cats, rocks, etc., incorrectly identified as possums)
- Using possums and feral cats in cages at known locations to test above factors
- Further develop thermal image recognition software for operational use
- Comparing costs of using TI with chewcard detection

