An evaluation of thermal infrared cameras for surveying hedgehogs in parkland habitats

Clare Bowen[1], Nigel Reeve[2], Tess Pettinger[1] & John Gurnell[3]

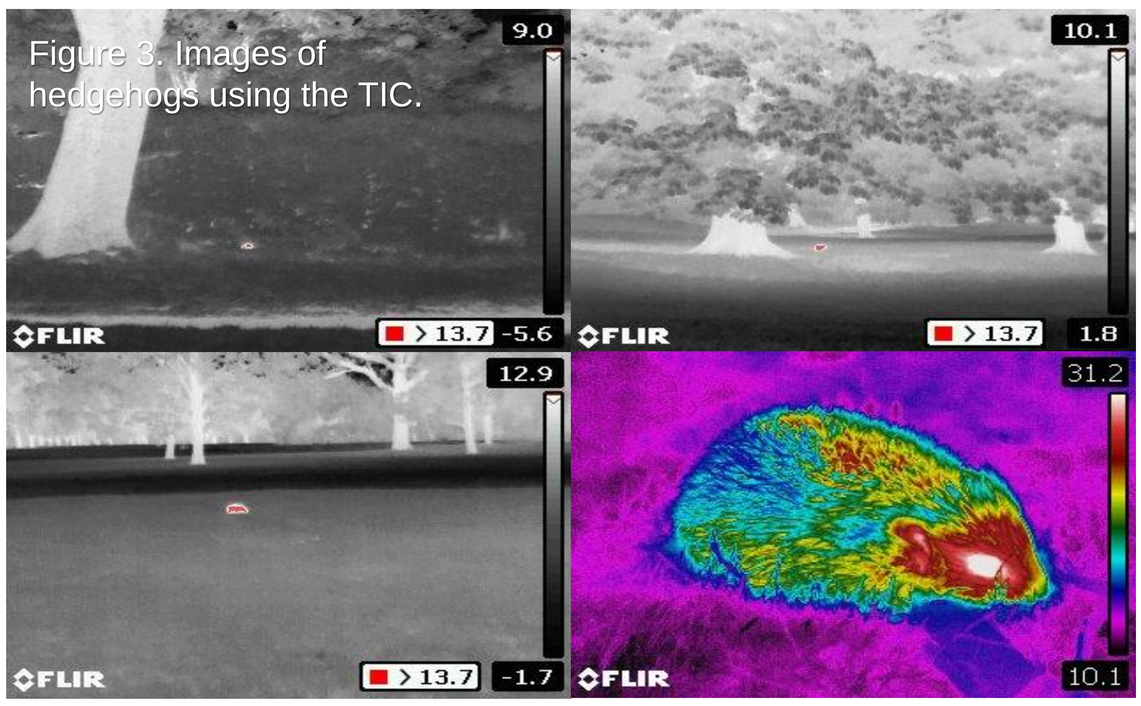
[1] The Royal Parks, The Old Police House, Hyde Park, London, W2 2UH UK, [2] 2 Paxton Gardens, Woking, Surrey GU21 5TR UK,
[3] School of Biological and Chemical Sciences, Queen Mary University of London, London E1 4NS UK

Background

Infrared or thermal imaging cameras (TIC) detect radiation at wavelengths of 9-14 µm in the electromagnetic spectrum, which is emitted by all objects and enables them to be seen without visible light. The amount of radiation varies with temperature and TICs display this information in the form of thermograms. Such cameras have many practical applications in the medical and natural sciences (see Cilulko at al. 2013, McCafferty et al. 2013), including the detection and identification of animals in the wild (Steen et al. 2012, Goodenough et al. 2018). In 2015, we tested the use of TICs in our spotlighting surveys of hedgehogs carried out by volunteers in The Regent's Park, London, and have used them in all surveys since then. Here we report on the usefulness of TICs for this type of work,

Using the camera

The FLIR E60 has a 4 hour battery life and we changed the battery with a fully charged spare to give us 8 hours of continuous use which was perfectly adequate for our surveys. At the start of each survey, we adjusted the 'Above Alarm' mode on the camera such that the temperature threshold above which an animal (or person) would be displayed showed red against a grey background. As the night cooled, further adjustments were made to compensate for changes in ambient temperature, thus ensuring good discrimination between a hedgehog and the background. Video (MPEG4) or still (JPEG) images were occasionally taken, but were not part of the survey protocol. We trialled the cameras in 2015 and found that hedgehogs could reliably be detected at distances up to 60 m in amenity grass (up to about 10 cm tall), further in very short grass or less far when the hedgehog was partially obscured by vegetation (Figures 2, 3). They were adopted for standard use in subsequent field surveys.



Spotlighting surveys

The park was divided into seven main survey zones including the Zoo, and groups of 4-6 volunteers would walk along designated routes in each zone during the night on two consecutive Fridays in May (spring) and September (autumn) in 2016-2018. Spotlighting by each group involved at least three members of each group searching for hedgehogs with the aid of bright torches (LEDLenser P7.2, brightness up to 450 lm; LEDLENSER, Sunninghill SL5 7BH), with one member using a TIC. The person with the TIC would stop every 20 m to 30 m and do a complete 360 degree scan of the Park. Searching also involved listening for the rustles in undergrowth, or the noises made during courtship or fighting.

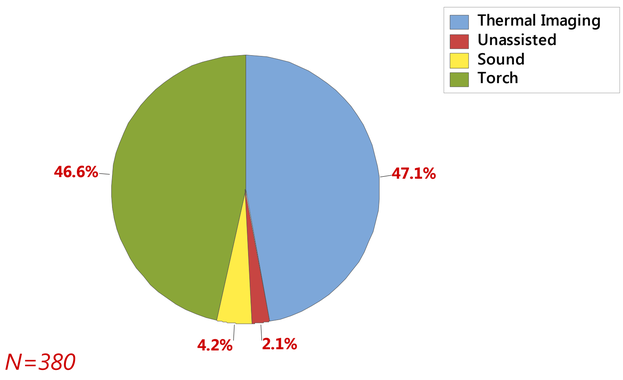
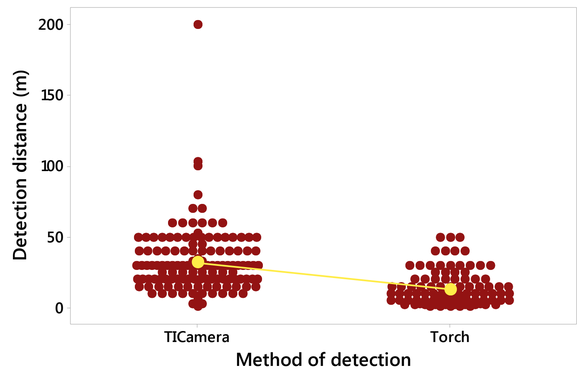


Figure 4. Pie chart of detections by method.

Figure 5. Dot plot of detection distances for TIC and Torch methods. Yellow dots are mean values.



Findings

Approximately equal numbers of hedgehogs were detected using TICs and torches over the three years of the study, together comprising almost 94% of all hedgehog detections (Figure 4). A small number were located by sound and a very small number unassisted. On average, hedgehogs were detected at greater distances using TICs than the other methods (Figure 4, Table 1). Comparing just TICs and torches, this difference was significant (t_{206} = 8.14, p<0.001). Most hedgehogs were detected in grassland habitats, with most in short grassland (Figure 6).

Table 1 Detection distances

	Detection distance					
Method	N	Mean	CV (%)	Median	IQR	Max
Thermal Imaging Camera	166	30	75	25	25	200
Torch	133	12	93	10	11	50
Sound	11	4	91	3	3	15
Unassisted	6	4	102	2	5.25	10

Discussion

TICs proved to be very useful for detecting hedgehogs during spotlighting surveys in our study, and TICs detected them at greater distances than other methods. It is also worth noting that three or more people searched with torches in each group to one person with a TIC, and so there are economies to be made using TICs. Of course, it is unknown how many detections with TICs would have been detected later with torches, and *vice versa*, but probably many of them would have been. Predictably, most detections were in grassland habitats without tall vegetation or other obstacles to obstruct vision, although TICs were also helpful to detect animals partly hidden amongst undergrowth. Although a clear line of site is needed for TICs (and torches) we found them very useful for covertly observing the behaviour of radiotracked animals without using torches and where their movement through undergrowth may only partly conceal them.

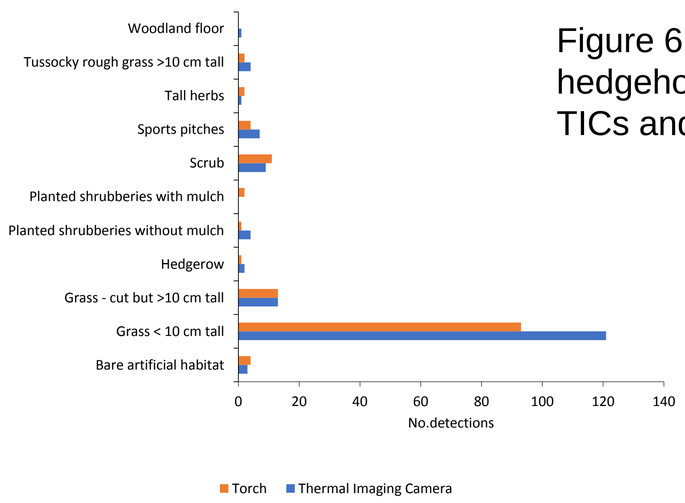


Figure 6 Habitats in which hedgehogs were detected by TICs and torches.

Conclusion

Although Haigh et al. (2012) in Ireland found that a TIC (a Testo 880) was of little use for detecting hedgehogs in gardens, pastures or arable land, we found the FLIR cameras with the Above Alarm feature to be particularly useful and a good experience for volunteers in our parkland habitat. We believe that using TICs to supplement torches in spotlighting surveys should be tested in other places, especially where there is a considerable amount of open habitat.

References

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Acknowledgements

We are grateful to the 'Hedgehog Hero' volunteers, the Meyer Family, the Zoological Society of London, Regent's University, The Open Air Theatre, the Garden Wildlife Health Project team, The Central Wildlife Group, Sue Kidger, Benugo, John Reynolds of FLIR Systems, Penny Dixie (photographer) and the staff of The Royal Parks.

The Royal Parks is a registered charity (No. 1172042)