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Research Note

A permanent security post for camera trapping

Paul D. Meek[A,B,C,E], *Guy-Anthony Ballard*[D] *and Peter J. S. Fleming*[C]

[A]Invasive Animals Cooperative Research Centre, PO Box 4019, Coffs Harbour Jetty, NSW 2450, Australia.
[B]Ecosystem Management, University of New England, Armidale, NSW 2351, Australia.
[C]Vertebrate Pest Research Unit, NSW Department of Primary Industries, Orange Agricultural Institute, Locked Bag 6001, Orange, NSW 2800, Australia.
[D]Vertebrate Pest Research Unit, NSW Department of Primary Industries, PO Box U86, University of New England, Armidale, NSW 2351, Australia.
[E]Corresponding author. Email: paul.meek@invasiveanimals.com

Abstract. As the use of camera traps in wildlife management in Australia rapidly increases, government agencies, private enterprises, universities and individuals are investing considerable amounts of money in camera trap technology for research, monitoring and recreation. Often camera traps need to be placed along vehicle tracks or in obvious locations to detect animal activity. Consequently, units are frequently highly visible and therefore easily located by would-be thieves. We describe a field-tested security post design that increases security for both camera traps and data, whilst also offering a means of standardising placement.

Additional keywords: carnivores, tracks.

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Introduction

Internationally, camera trapping has grown in popularity as a wildlife survey tool because it is non-invasive (Kays and Slauson 2008; O'Connell *et al*. 2011), provides new insights into animal behaviour and ecology (Claridge *et al*. 2004; Bridges and Noss 2011; Meek *et al*. 2012), can be less resource hungry (Claridge *et al*. 2004; De Bondi *et al*. 2010; Meek 2010), allows surveys to be carried out for long periods in remote areas and in all weather, and is well suited to studying elusive and cryptic species (Cutler and Swann 1999; Tobler *et al*. 2008; Claridge *et al*. 2010; Swan *et al.* 2011). Camera trapping is of particular interest in Australia where the use of sand padding methods (Allen *et al*. 1996; Catling and Burt 1997) has been widely recommended for indexing wild carnivore (*Canis lupus dingo*, *Vulpes vulpes* and *Felis catus*) activity, particularly in broad-scale canid control, e.g. NSW Fox Threat Abatement Plan (NSWNPWS 2001) and wild dog control programs (Allen *et al*. 1996; Fleming *et al*. 1996). Sand padding has inherent biases (Engeman 2005) and can be expensive to undertake in large-scale programs owing to the human labour and machinery (truck and 4WD vehicle) costs of setting up sand pads and checking them over 3–4 nights.

Deployment of camera traps, particularly along roads (thereby mimicking sand padding techniques) creates a high risk of theft of cameras and data, a problem experienced worldwide (Bancroft 2010).

Simple security measures include camouflaging cameras by attaching bark and leaves to camera housings, hiding units behind structures or installing GPS tracking units inside the camera trap housing (Bancroft 2010). Several camera trap manufacturers or retailers produce steel security boxes for camera traps (e.g. CAMlock™) as stand-alone units that can be fastened to trees or posts. Other types can be bolted to concrete walls (Fiehler *et al*. 2007). It is this latter category of protection that offers the level of security that is the most promising. The aim of this trial was to test a security post design for camera trap surveys based on a modified commercial security box to deter thefts in highly visible sites whilst simultaneously providing a means of standardising camera trap deployment in fauna surveys.

Methods

Study site

All field trials on the security post were carried out in 2011 at the Bellinger Head State Park (BHSP) (30.5011°S, 153.0290°E), south of Coffs Harbour, located 530 km north of Sydney at the mouth of the Bellinger and Kalang Rivers. The reserve is predominantly beach and coastal scrub dune ecosystem with wetland habitat west of the dunes. The beach, dunes, fire trails and informal access tracks are frequented by members of the public. This ensured that both animal and human visitation to the site was high and offered a relatively high risk of theft or vandalism.

Security post design

We used a commercially available security box (designed to hold Reconyx camera traps, see examples at http://www.reconyx.com/accessories.php, http://www.scoutguard.com.au/scoutguard-accessories.htm, http://www.moultriefeeders.com/productdetail.aspx?id=mfh-csb, http://www.bushnellaustralia.com.au/product pages/trailcameras/accessories.html). To increase the versatility of these security boxes, we welded them to a steel post with some modifications: the security box was faced downwards at the front (10°), the standard front lock was removed and a modified flat steel key was manufactured to go through to the rear of the box. A shield for the lock was also constructed at the rear to limit access using bolt-cutters to the locking mechanism (Fig. 1). The modified security box was welded to a 1.5-m-long rectangular hollow section (RHS) steel post (75 mm × 75 mm). At the end of the post a cross-section of 42 mm RHS was welded to the post so that cross struts could be inserted diagonally (Fig. 1). These struts create a further barrier to removal when concreted into place. The length of the RHS post can be adjusted to suit the preferred height of the camera trap. For the purposes of these trials we set camera traps at heights of 90–100 cm above the ground, targeting wild dogs, foxes and feral cats. The height of the camera can be varied by digging a deeper hole or having the manufacturer shorten the length of the post. We chose an angle of ~25° to the road to maximise detection at 5–6 m from the device. At the time of writing the cost of manufacturing the post was AU$210 per post, comprising AU$130 for the steel and construction, and AU$80–90 for each security box plus a padlock to suit.

To install in the field, each post was turned upside down and the RHS filled with concrete slurry, a >50-cm horizontal steel strut was then placed through the bottom of the post and concreted into a hole ~1–1.25 m deep. The height of the camera can be varied by changing the length of the post or depth of the hole to accommodate different height protocols of camera trap surveys. In situations where roadside slashing occurs, a ground-level plate design can be used so that the post can be temporarily removed. The base plate is concreted into the ground as described, and a flat plate construction allows the top and bottom sections to be bolted together using tamper-proof bolts (Fig. 1).

In the first of our trials, the security post was installed along a high-use service track in the BHSP near the town of Mylestrom (30.4650°S, 153.0439°E) (Site 1). The security box housing was fitted with smoke-coloured Perspex to disguise the empty contents of the box (dummy camera trap). Two unprotected camera traps (Reconyx Hyperfire HC600) were set adjacent to the empty security post for 13 nights in February 2011 to monitor animal behaviour and then the post was left for a further month without camera traps. These camera traps were placed in trees using python locks above eye level in camouflage to reduce the likelihood of being noticed. The camera traps were set on rapid-fire settings, high sensitivity and programmed to take three photographs per trigger event without a delay.

The second trial was conducted near the mouth of the Kalang–Bellinger River (30.4985°S, 153.0301°E) and North Beach at Mylestrom (Site 2) on the high tide line. One Reconyx HC600 was placed inside the security housing (Fig. 2) and another camera trap was installed high in a tree adjacent to the security post to record the behaviour of passing animals over 14 nights in August 2011. Both camera traps were set on rapid-fire, high sensitivity and programmed to take five photographs per trigger event with no delay.

A third and fourth trial were carried out along the Urunga Sand Mass track behind the village of Mylestrom in the BHSP (30.4650°S, 153.0439°E) at a known red fox (*Vulpes vulpes*)

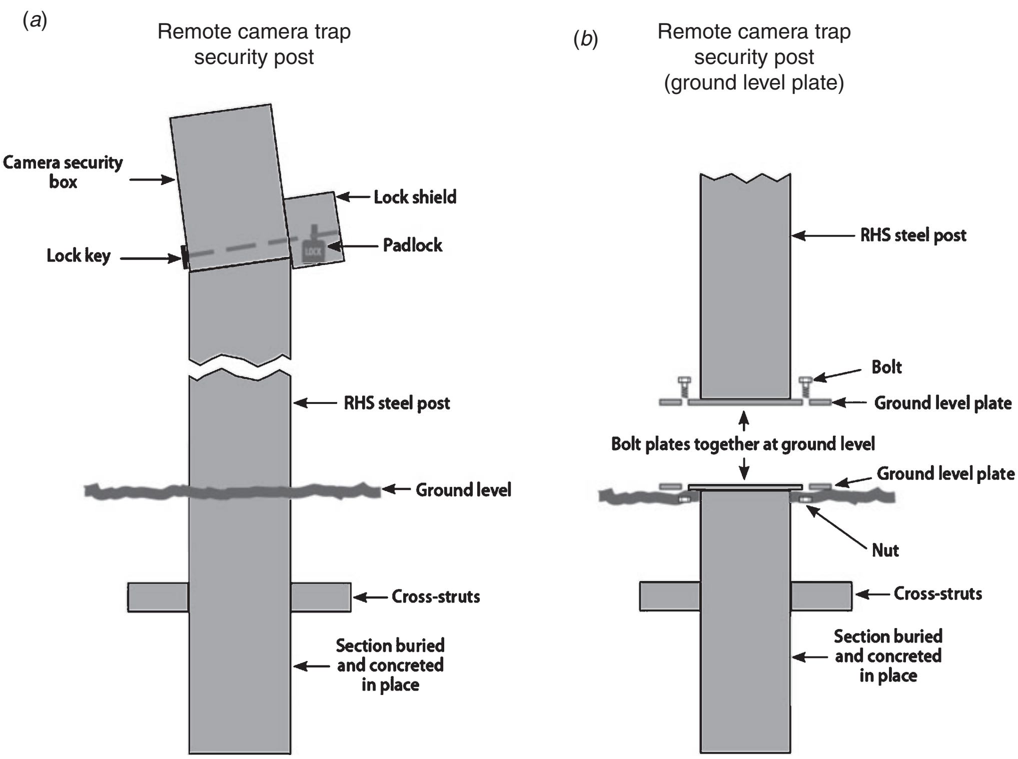

Fig. 1. Schematic diagram of the camera trap security post. (*a*) Permanent set up; (*b*) removable ground-level plate set-up.

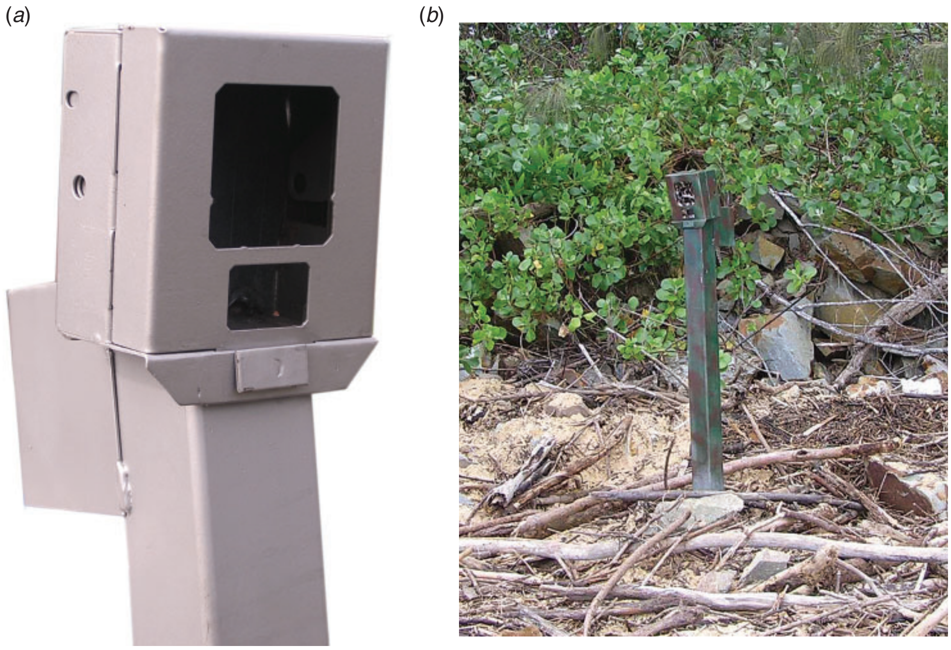

Fig. 2. (*a*) The security housing and lock shroud; (*b*) a Reconyx HC600 inside the security post housing at Mylsetrom spit (Site 2).

activity site over 13 nights in late August–September 2011. One Reconyx Hyperfire HC600 was placed inside the security post and the other adjacent high in a tree to monitor animal behaviour near the device. The cameras were programmed on rapid-fire, high sensitivity to record five photographs per trigger with no delay. Site 4 was established 50 m south of Site 3 in a shaded area over seven nights with the same camera trap settings.

Results and discussion

In analysing the image data, an 'event' was a series of photographs taken by the camera traps in response to a heat and movement signature detection of an object (human, dog, car, bike), where the object was observed on the series of images to leave the detection zone for more than 5 min. Table 1 summarises the data recorded at each site. At Site 1 there were 550 events of people walking, riding and running past the security post and of cars and motor bikes driving past. Passing dogs (and their owners) showed little interest in the security post, and the presence of the security post did not seem to affect dog behaviour. Despite 17 occasions when people stopped to inspect the security post, we recorded no attempts to remove or damage it. On one night a car stopped and three men emerged to inspect the post but did not attempt to pull it out. At some point after the cameras were removed by the authors, an attempt was made to smash the Perspex using a sharp device although the post remained in place. Every dog ($n = 68$) that encountered the security post ignored the structure and none scent marked or sniffed the post.

At Site 2 there were two events of dogs and two events of people walking past the security post. Three people showed interest in the security post (Fig. 3) and walked up to and around the post but none attempted to open or damage the camera.

At Site 3 people walked past the security post twice and a dog and crow triggered the camera trap. A walker stopped at the camera and inspected it closely. We suspect that the descriptive

Table 1. Visitation, photographs and events recorded at the four study sites

Site	No. of images	No. of events	No. of images showing interest by dogs	No. of images showing interest by humans
1	4000	550	0	17
2	69	5	0	3
3	48	5	0	1
4	413	6	0	2

Fig. 3. Two passing local residents inspect the camera trap post at Mylestrom spit, New South Wales.

note we attached to the post satisfied his interest. There was evidence that a fox walked close to the device but it turned off down an animal pad before entering the camera's detection zone. At Site 4 an eastern grey kangaroo (*Macropus giganteus*) was recorded over five events grazing beside and hopping along the track. Two people were recorded walking past the cameras and both stopped to inspect the camera but did not interfere with the device.

Across all deployments, there were 4530 photographs of 566 events, 66 containing people, 55 containing dogs ($n = 70$), 355 containing cars and seven containing other animals. No dogs, foxes or other animals scent marked or investigated the post. There were 14 events (21%) involving people investigating the device, although no cameras were stolen one camera housing box was damaged after the camera had been removed.

On the basis of this trial it was evident that most passers-by were not interested in the security post but, more importantly, domestic and wild dogs did not appear to modify their behaviour at any time when they walked past the posts, completely ignoring the devices. A few individual people did stop at each of the sites and inspect the novel post, but at only one site with very high traffic did any damage occur. The risk of camera trap damage remains a possibility. At Mylestrom, the 'dummy' camera trap was struck once with an object and this will always be a risk no matter how secure the camera traps are. Risks may be further reduced by placing more protection near the front of the camera trap.

Camera trap theft is a global problem (Bancroft 2010). The security post described here provides a solution to the problem of using camera traps along roadsides by reducing the likelihood of theft of the camera trap and/or valuable data.

While the security post is not theft proof, having the security box welded to the steel post and filling it with concrete reduces the ability of thieves to cut the post with a metal grinding disc. Moreover, installing the cross strut and using concrete fill makes the post very heavy and difficult to remove. It is possible to modify the base of the security post design so that a base can be concreted into the ground as described, and a flat plate construction can be added and fixed with tamper-proof bolts (Fig. 1) so that the upright post can be removed if needed. This may be necessary in locations where roadside slashing is necessary. Moreover, the length of the steel post and the angle of the security box can be modified according to the survey design. The closer the camera trap is to the ground, the less the angle of the security box needs to be; where camera traps are 30–50 cm from the ground there will be less need to angle the security box.

We recommend that these posts be installed for a few weeks before deploying camera traps so that they become less noticeable to road users, a practice known as 'obsolescence conditioning'. This occurs when a feature is regularly seen and becomes a part of the landscape and is ignored despite being obvious. It is also advisable to attach a weather-proof notice to the lock shield, explaining the program and providing a contact number for further information.

The security post provides a second advantage when set in the field by establishing a standardised placement, thus reducing set-up time by removing the need for fine-scale adjustment of every camera trap to focus the passive infrared sensor on the area of most likely detection. Once the camera post is concreted into the right position initially, all that is needed for each survey is to open the security box, place and turn the camera trap on and move to the next site.

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