ISSN 1027-2992

CAT news

N° 77 | Spring 2023

SPECIES SURVIVAL COMMISSION

CAT SPECIALIST GROUP

CATnews is the newsletter of the Cat Specialist Group, a component of the Species Survival Commission SSC of the International Union for Conservation of Nature (IUCN). It is published twice a year, and is available to members and the Friends of the Cat Group.

For joining the Friends of the Cat Group please contact Christine Breitenmoser at ch.breitenmoser@kora.ch

Original contributions and short notes about wild cats are welcome
Send contributions and observations to ch.breitenmoser@kora.ch.

Guidelines for authors are available at www.catsg.org/catnews

CATnews is produced with financial assistance from the Friends of the Cat Group.

Design: barbara surber, werk'sdesign gmbh
Layout: Eline Brouwer, Tabea Lanz and Christine Breitenmoser
Print: Stämpfli AG, Bern, Switzerland
ISSN 1027-2992 **©** IUCN/SSC Cat Specialist Group

Editors: Christine & Urs Breitenmoser
Co-chairs IUCN/SSC
Cat Specialist Group
c/o KORA, Villettengässli 3, 3074 Muri
Switzerland
Tel ++41(31) 951 90 20
Fax ++41(31) 951 90 40
<u.breitenmoser@kora.ch>
<ch.breitenmoser@kora.ch>

Associate Editors: Brian Bertram
Maximilian Allen
Juan Reppucci
Giridhar Malla
Sugoto Roy

Cover Photo: Jaguarundi
Photo: Juan Reppucci

IAN THOMSON[1], STEPHANNY ARROYO-ARCE[1], BEN LUKE[2] AND MAX KING[3]

Custom designed camera traps: lessons learned from a case study in Costa Rica

Despite gaining popularity worldwide for capturing high quality images of wildlife, the usage of custom designed camera traps has been poorly documented. Herein, we record video behavioural responses of wildlife to this equipment, and highlight the need to establish clear guidelines to minimise or prevent their potential negative impact on wildlife.

Fig. 1. Wildcat images taken with a custom designed camera trap in Costa Rica. Above: an adult female jaguar looking towards the white flashes while feeding from the carcass of a green sea turtle in Tortuguero National Park (Photo I. Thomson). Below: an adult male melanistic oncilla displaying a negative response to the activation of the white flashes in Cloudbridge Nature Reserve, Costa Rica (Photo B. Luke).

The use of camera trapping to study wildlife dates back to the late 1890s (Sanderson & Trolle 2005) and has since become a commonly used tool in wildlife monitoring. A key aspect of its popularity is the belief that camera traps do not cause disturbance to the target animal, and are therefore considered non-invasive (Henrich et al. 2020). However, studies regarding their impact are scarce (Wegge et al. 2004, Rovero et al. 2010, Huang et al. 2011, Meek et al. 2014, 2015, 2016; Henrich et al. 2020). Here we provide insight concerning the use of custom designed camera traps based on our research in Costa Rica.

Data collection took place in two protected areas, Tortuguero National Park (10°26'12.1'' N / 83°30'35.4'' W) and Cloudbrige Nature Reserve (9°28'18.7'' N / 83°34'38.1'' W). In both locations, custom designed camera traps were used opportunistically to obtain high quality photos of wildcats and their prey species for educational dissemination purposes between 2013 and 2022 (Table 1). A commercial camera trap was positioned to video the behavioural response of the species to the presence or triggering of each custom designed camera trap (Table 2). For the purposes of our study, a 'custom designed camera trap' was defined as a unit consisting of several independent pieces including a DSLR camera inside a housing, a passive infrared sensor, and slaved white light flashes. In turn, a 'commercial camera trap' is a single unit consisting of a camera, a passive infrared sensor, and infrared flashes that can be purchased from various manufacturers (e.g. Bushnell, Browning, Moultrie).

After 152 photographic events, 23 species were identified (1 reptile, 3 birds, 19 mammals; Fig. 1). A photographic event was defined as a sequence of photos that ends when the animal is no longer detected by the custom designed camera trap. The species recorded varied in size (6 small: ≤1 kg, 13 medium: 1–15 kg, 4 large: ≥15 kg, Azevedo 2008) and activity pattern (26% diurnal, 26% crepuscular, 48% nocturnal; Maffei et al. 2005). Based on the behavioural response, 36% of the photographic events were classified as no response, 18% as minor response, 14% as major response and 32% as unclassified (Table 3). There was no discernible correlation between negative response (minor and major)

and the body size or activity pattern of the species recorded (Fig. 2).

One of the most significant negative behavioural reactions recorded was that of a female jaguar *Panthera onca*. On 3 December 2013, both a custom designed and commercial camera traps were installed near a fresh carcass (< 24 h) of a green sea turtle *Chelonia mydas* predated by a jaguar in Tortuguero National Park. An adult female jaguar was recorded approaching the carcass on three different occasions (see video at https://www.youtube.com/watch?v=a26Tm8VhRIg). During the first event (3 December 2022 at 18:12 h) the individual is only present for less than 5 s as she immediately reacts to the activation of the camera trap by fleeing the site (hitting her snout with a branch while doing so). The jaguar then returned at 21:05 h, carefully approaching the carcass while looking directly at the housing. Although the custom designed camera trap did not activate, the jaguar leaves the area almost immediately with body language showing clear evidence of nervousness and skittish behaviour. The following day at 02:21 h, the female returned and approached the carcass while again looking directly at the housing. The jaguar tries to drag the carcass into the vegetation away from the camera housing and activation zone. The animal then leaves the site quickly without trying to feed from the carcass. It is important to highlight that in Tortuguero National Park commercial camera traps have been used since 2010 to record jaguar predation on sea turtles (Guilder et al. 2015), and this constitutes the first time a negative reaction was recorded, coinciding with the first time a custom designed camera trap was used in our research. Following this event, our team began to test various measures to reduce their negative impact on wildlife (Arroyo-Arce & Thomson 2014).

As other authors have suggested (Wegge et al. 2004, Huang et al. 2011, Meek et al. 2014, 2015), the different components of the custom designed camera trap can trigger negative behavioural reactions. In our study areas, the main factors could be the mere presence of the equipment (e.g. unfamiliar shape), the sound of the equipment while triggering, and the type of flash used (e.g. white flash). Additionally, the characteristics of the location also play an important role in our study sites. For

Table 1. Specifications of the custom designed camera traps set up in the study areas: Tortuguero National Park and Cloudbrige Nature Reserve, Costa Rica.

Set up specifications	Tortuguero National Park	CNR
Equipment placement in the field	At human-made trails, at carcasses of green sea turtles *Chelonia mydas* and leatherbacks *Dermochelys coriacea* predated by jaguars	At human-made trails
Equipment site locations	22	14
Study year	2013, 2015, 2016, 2017, 2018, 2019, 2021	2022
Length of deployment	1–12 camera trap nights	7–30 camera trap nights
DSLR cam. make and model	Nikon 610 Canon EOS 30D	Canon 1DX, Canon 1200D, Canon 7D mkii
Housing	Pelican case (customised)	Camtraption, Pelican case (customised)
DSLR cam. installation height	0.2–2 m	0.2–2 m
Flashes installation height	0.2–2 m	1–2 m
Passive infrared sensor	Yes	Yes
Shutter speed	30, 60, 160, 200, 250, 320	250
Photos per second	1	1, 4, 14
Photos per activation	3	3, 4, 14
Delay between activations	0	0
ISO	100, 400, 800, 1000	100, 200, 250, 400, 500, 1000, 1250
Aperture	3.5, 4, 4.5, 5.6, 6.3, 8, 9, 10, 11	6.3, 7.1
Quiet Continuous Shutter Release	Yes	Yes
Flash model	Nikon Speedlight SB-5000, Nikon Speedlight SB-900, Nikon Speedlight SB-700	Nikon SB-28
Power of flashes	0.5, 1, ½, ¼, ⅛, TTL	0.25, 0.5, 0.6
Nº flashes used	2	2
Nº flash fires per activation	2, 4, 3, strobe	1, strobe
Flashes activation system	Wireless system (Camtraption wireless trigger) Cable connection	Wireless system (Camtraption wireless trigger) Cable connection
Distance between DSLR cam. and the predicated point of activation	1–4 m	1–4 m
Distance between flashes and the predicated point of activation	1–2 m	1–2 m
Placement of commercial cam. trap relative to the custom designed cam. trap	1–4 m from predicated location of an animal before, during, and after activation	1–4 m from predicated location of an animal before, during, and after activation
Infrared DSLR	Only used for one year	No
Commercial cam. trap model	Bushnell	Ceyomour

Table 2. Classification of the behavioural response to the custom designed camera trap recorded in the study areas: Tortuguero National Park and Cloudbrige Nature Reserve, Costa Rica.

Classification	Definition
No response	The individual has no visible response to the equipment's presence/ triggering.
Minor response	The individual seems to be aware (i.e. looking at the equipment) of the equipment but displays no negative response (e.g. flee response) to the equipment's presence/triggering.
Major response	The individual displays an evident negative response (i.e. flee response) to the equipment's presence/triggering.
Unclassified	Unable to determine if the reaction of the individual was a response to the equipment's presence/triggering; and instances when the commercial camera trap failed to record a video.

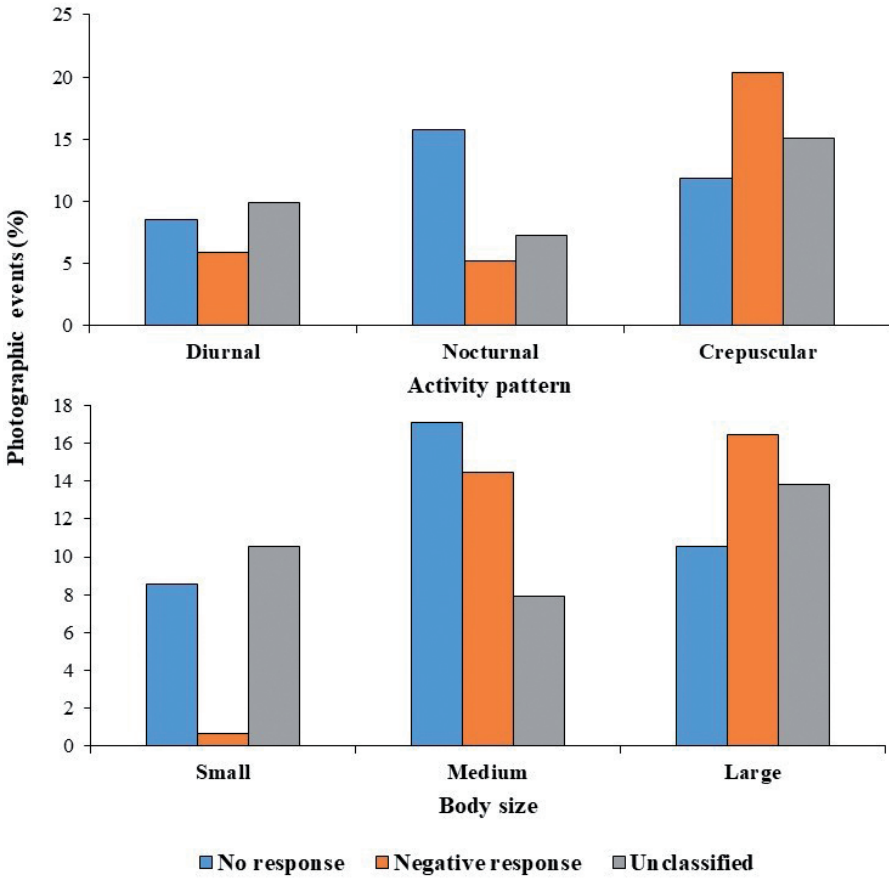

Fig. 2. Comparison between the activity pattern and body size of the species with their behavioural response to the custom designed camera trap recorded in the study areas: Tortuguero National Park and Cloudbrige Nature Reserve, Costa Rica.

example, camera traps at feeding sites or in dense vegetation were most likely to trigger a negative reaction since the animal may be more sensitive to external stimuli. In conclusion, since this type of equipment is becoming increasingly popular, it is essential to establish clear guidelines to mitigate or prevent their impact across all species, as well as address the regulation on their use by local authorities responsible for issuing permits. The authors of this paper also emphasise that it is responsibility of the people employing these devices (e.g. biologists, photographers) to monitor them using commercial camera traps set to record video. We believe that it is inaccurate to determine the behavioural reaction of the species by looking at pictures alone. Finally, when employing custom designed camera traps the primary concern of all those involved must be the welfare of the animals, and that the quality and number of images taken a very distant second.

Acknowledgements

Our research was conducted under the permits R-SINAC-GASP-PIN-015-2013, SINAC-ACTO-D-RES-033-2014, SINAC-ACTO-D-RES-003-2016, SINAC-ACTO-D-RES-012-2017, SINAC-ACTO-D-RES-009-2018, SINAC-ACTO-D-RES-001-2019, SINAC-ACTO-DIR-RES-013-2021, R-SINAC-PNI-ACLAP-047-2021. Thanks to the reviewers and Kat Cutler for their thoughtful comments that helped improve our manuscript.

References

Arroyo-Arce S. & Thomson I. 2014. Lecciones aprendidas sobre el empleo de cámaras trampa profesionales. Coastal Jaguar Conservation, Heredia, Costa Rica. 9 pp.

Azevedo F. C. C. 2008. Food habits and livestock depredation of sympatric jaguars and pumas in the Iguaçu National Park Area, South Brazil. Biotropica 40, 494–500.

Guilder J., Barca B., Arroyo-Arce S., Gramajo R. & Salom-Pérez R. 2015. Jaguars (*Panthera onca*) increase kill utilization rates and share prey in response to seasonal fluctuations in nesting green turtle (*Chelonia mydas mydas*) abundance in Tortuguero National Park, Costa Rica. Mammalian Biology 80, 65–72.

Henrich M., Niederlechner S., Kröschel M., Thoma S., Dormann C. F., Hartig F. & Heurich M. 2020. The influence of camera trap flash type on the behavioural reactions and trapping rates of red deer and roe deer. Remote Sensing in Ecology and Conservation 6, 399–410.

Huang B., Lubarsky K., Teng T. & Blumstein D. T. 2011. Take only pictures, leave only … fear? The effects of photography on the West Indian anole *Anolis cristatellus*. Current Zoology 57, 77–82.

Maffei L., Noss A. J., Cuéllar E. & Rumiz D. I. 2005. Ocelot (*Felis pardalis*) population densities, activity, and ranging behaviour in the dry forests of eastern Bolivia: Data from camera trapping. Journal of Tropical Ecology 21, 1–6.

Meek P. D., Ballard G. A. & Fleming P. J. S. 2015. The pitfalls of wildlife camera trapping as a survey tool in Australia. Australian Mammalogy 37, 13–22.

Meek P. D., Ballard G. A. & Fleming P. J. S. 2016. Are we getting the full picture? Animal responses to camera traps and implications for predator studies. 2016. Ecology and Evolution 6, 3216–3225.

Table 3. Species behavioural response (proportions of photographic events) to the custom designed camera trap recorded in the study areas: Tortuguero National Park and Cloudbrige Nature Reserve, Costa Rica.

Order	Family	Species	No response	Minor response	Major response	Unclassified
Galliformes	Odontophoridae	*Odontophorus guttatus**1	0.66	0.00	0.00	1.97
Cathartiformes	Cathartidae	*Coragyps atratus***1	0.66	0.00	0.00	0.00
Pelecaniformes	Ardeidae	*Nyctanassa violacea**2	0.00	0.00	0.00	0.66
Squamata	Iguanidae	*Iguana iguana***1	0.66	0.00	0.00	0.00
Cetartiodactyla	Cervidae	*Mazama americana***3	0.66	0.00	1.32	1.32
Cetartiodactyla	Tayassuidae	*Pecari tajacu****3	1.97	0.66	3.29	1.97
Carnivora	Felidae	*Panthera onca****3	7.89	9.87	1.32	9.87
Carnivora	Felidae	*Puma concolor****3	0.66	0.00	0.66	1.97
Carnivora	Felidae	*Leopardus pardalis***3	0.66	3.29	0.00	0.00
Carnivora	Felidae	*Leopardus tigrinus***2	0.00	0.66	0.66	0.00
Carnivora	Mephitidae	*Conepatus semistriatus***2	0.00	0.00	0.66	0.00
Carnivora	Procyonidae	*Nasua narica***1	3.95	1.32	3.95	0.00
Carnivora	Procyonidae	*Potos flavus***2	0.66	0.00	0.00	0.00
Carnivora	Procyonidae	*Procyon lotor***2	0.00	0.00	0.00	0.66
Didelphimorphia	Didelphidae	*Philander opossum**2	0.66	0.00	0.00	0.00
Didelphimorphia	Didelphidae	*Didelphis marsupialis***2	6.58	0.00	0.66	1.97
Lagomorpha	Leporidae	*Sylvilagus brasiliensis**2	5.26	0.00	0.00	0.66
Perissodactyla	Tapiridae	*Tapirus bairdii****3	0.00	0.00	0.66	0.00
Rodentia	Sciuridae	*Sciurus granatensis**1	1.32	0.00	0.66	7.24
Rodentia	Geomyidae	*Orthogeomys cavator**2	0.66	0.00	0.00	0.00
Rodentia	Cuniculidae	*Cuniculus paca***2	1.97	1.32	0.66	3.29
Rodentia	Dasyproctidae	*Dasyprocta punctata***1	1.32	0.00	0.00	0.66
Rodentia	Erethizontidae	*Coendou mexicanus***2	0.00	0.00	0.66	0.00

No response: the individual has no visible response to the equipment's presence/triggering.
Minor response: the individual seems to be aware (i.e. looking at the equipment) of the equipment but displays no negative response (e.g. flee response) to the equipment's presence/triggering.
Major response: the individual displays an evident negative response (i.e. flee response) to the equipment's presence/triggering.
Unclassified: unable to determine if the reaction of the individual was a response to the equipment's presence/triggering; and instances when the commercial camera trap failed to record a video.
Species size: *small, **medium, ***large
Activity pattern: [1]diurnal, [2]nocturnal, [3]crepuscular

Meek P. D., Ballard G. A., Fleming P. J. S., Schaefer M., Williams W. & Falzon G. 2014. Camera traps can be heard and seen by animals. PLoS ONE 9 (10): e110832.

Rovero F., Tobler M. & Sanderson J. 2010. Camera trapping for inventorying terrestrial vertebrates. *In* Manual on field recording techniques and protocols for all taxa biodiversity inventories and monitoring. Eymann J., Degreef J., Häuser C., Monje J. C., Samyn Y. & VandenSpiegel D. (Eds). Belgian Development Cooperation, Belgian, pp. 100–128.

Sanderson J. G. & Trolle M. 2005. Monitoring elusive mammals. American Scientist 93, 148–156.

Wegge P., Pokheral C. P. & Jnawali S. R. 2004. Effects of trapping effort and trap shyness on estimates of tiger abundance from camera trap studies. Animal Conservation 7, 251–256.

[1] Coastal Jaguar Conservation, 48 Milton Road, Kirkaldy, Fife, Scotland
*<sturnina@gmail.com>
[2] Tavistock, Devon, PL19 0AZ, United Kingdom
[3] Cloudbridge Nature Reserve, San Gerardo de Rivas, Pérez Zeledón, San Jose, Costa Rica