REPTILES & AMPHIBIANS

Passive-activated Camera Trap Used to Detect a Medium-sized Reptile: A Case Study of the Jamaican Iguana, *Cyclura collei*

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Passive infrared (PIR) camera trap technology is commonly used in faunal studies for species inventories, relative densities, animal behavior, species richness, and diversity (e.g., Mugerwa et al. 2013; Hobbs and Brehme 2017). The technology is advantageous in detecting elusive and cryptic animals. It is more affordable than the traditional methods and is less time-consuming than conventional methods (direct and active searching) used in faunal surveys. Within the detection zone, PIR cameras are triggered by temperature differences between the ambient environment and the animal's body (Rovero et al. 2013; Apps and McNutt 2018; Urbanek et al. 2019). However, the reliability of the PIR cameras in detecting smaller vertebrates is uncertain (Ortmann and Johnson 2021; Sasse et al. 2023) as they produce less heat (Apps and McNutt 2018). Detecting reptiles is unreliable because IR sensors have difficulty detecting poikilothermic animals as a reptile's body temperature might differ little from background temperature and elude detection (Welbourne 2014).

The Jamaican Iguana (*Cyclura collei* Gray1845), listed as critically endangered on the IUCN Red List (Grant and Pasachnik 2021), is a medium-sized iguana, with males reaching total lengths of 120 cm and weights of 5.6 kg (Searcy et al. 2009). It is diurnal, cryptic, elusive, and rarely seen in its natural habitat, which consists of dry forest in the karst environment of the Hellshire Hills (Schwartz and Henderson 1991). The few camera trap studies of this iguana focused mainly on monitoring invasive alien species (Small Indian Mongoose, cats, and pigs) at iguana nesting sites (van Veen and Wilson 2017) and one study using both timelapse and IR triggers cameras to monitor presence in an area of high iguana activity (Goode et al. 2020).

Camera traps are one of the tools that will be used to establish if Jamaican Iguanas still exist on Great Goat Island, a proposed sanctuary. The island is karst, with many hiding places for iguanas, which are difficult to detect, especially during short visits. Hence, camera traps were proposed to search for Jamaican Iguanas. However, the efficacy of detecting iguanas with cameras must be established.

Methods

We conducted our camera-trap study at the Hope Zoo, St. Andrew Parish (18.025542, -76.745914), home of the Jamaican Iguana Headstart Program, in which iguanas are collected as hatchings in nature and kept for 4–6 years before they are released into suitable habitat.

We utilized Browning Strike Force HD Pro Trail® (Model BTC-5HDP®) cameras, which have a 0.3-second trigger speed, 55° field of view, and 22.4-m infrared detection zone, which has been shown to be effective in detecting small and medium-sized vertebrates (Fontúrbel et al. 2020; Sowa et al. 2023).

We deployed two cameras, designated Cam A and Cam B, in a subadult male iguana (SVL 32 cm) enclosure (Fig. 1). The enclosure measured 11.25 m^3 (1.8 x 2.5 x 2.5 m), and positioning cameras to cover the entire structure was impossible. The focus of the study was a platform in proximity to the iguana's retreat (a plastic pipe elevated slightly above the main platform), an area of relatively high activity. The platform (0.4 x 0.8 m, 1 m above the ground) provided a feeding station and a site where the iguana basked. This area was in the field of view of both cameras, which were placed 0.5 m above one end of the platform. We deployed both cameras at 1552 h on 19 January 2021, and they were active for 24 hours over five days; however, for data analysis, we used footage from only four days.

Cam A was programmed to take a picture tagged with the date and time when triggered by the detection of movement. Cam B was set to time-lapse mode (0600–2000 h), in which photos were taken at one-second intervals and provided a record of the field of view independent of detectability by movement. We viewed the pictures from both cameras using Buck Watch Timelapse Viewer Plus® software. We

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Figure 1. A subadult male Jamaican Iguana (*Cyclura collei*) on a feeding platform in an enclosure in the Hope Zoo, St. Andrew Parish, Jamaica. Note the elevated plastic pipe used as a retreat. Photograph by Damion Whyte.

coded the data in Excel (date, time, iguana presence, human presence, and iguana activity) and reported it in 30-minute intervals. We excluded pictures triggered by the zookeeper. Iguana activity was documented using both cameras from the time the iguana left its retreat in the morning until it returned in the evening. We were unable to measure the iguana's body temperature because the necessary equipment was not available; nor was a weather station present at the study site, hence we used hourly weather data from the Meteorological Service of Jamaica Climate Branch, Mona Automatic Weather Station (AWS), 2 km from the enclosure.

Results

We found that the PIR Browning Strike Force HD PRO PIR camera detected Jamaican Iguanas (Cam A results are recorded in Table 1). The time was divided into 30-minute blocks from 0800–1700 h, during which the iguana was continuously recorded by the timelapse photos of Cam B. If the iguana was active at any time during the 30 minutes, that time block was coded as Active. Except in a single case, Table 1 shows that the iguana was detected by Cam A once activity commenced. In this case, although no locomotory activity occurred, small movements, such as head-bobbing and slight body shifts, took place. Detection captured all instances in which locomotion occurred.

The iguana slept in its retreat and moved onto the platform in the morning (Cam B). At this time, Cam A did not detect the iguana. The iguana generally remained almost motionless, basking for varying periods. Eventually, the iguana became active and was detected by Cam A. When the camera was triggered, neither the sound nor detection of the IR startled the iguana. Ambient temperatures at which the iguana exited the retreat varied (22.8–23.4 °C), and when it became active, the camera was triggered (24.9–28.1 °C).

Of note is that adult Stripe-footed Anoles, *Anolis lineatopus* Gray 1840 (males with SVLs ≥8 cm), foraging on the food plate did not trigger the camera.

Discussion

In the early morning, the iguana was not detectable, presumably because the temperature of the iguana's body would have fallen close to ambient temperature during the night. After exiting the retreat, the iguana remained on the platform, basking as reptiles do in the early morning (Brattstrom 1965; Carrière et al. 2008). When the body's temperature rose sufficiently, the iguana became active and was detectable by the camera.

Our results indicate that the Browning Strike Force HD Pro Trail (Model BTC-5HDP®) camera can detect a Jamaican Iguana and, by extension, other medium-sized

Table 1. Detection of a subadult male Jamaican Iguana (*Cyclura collei*) in an enclosure in the Hope Zoo, St. Andrew Parish, Jamaica, by a Browning Strike Force HD Pro Trail camera. Periods when the iguana was active, are shaded in grey. RT = retreat (see text).

Time (h)	Day 1	Day 2	Day 3	Day 4
0800–0830	Leave RT	In RT	In RT	Leave RT
0830–0900	Not detected	Leave RT	In RT	Not detected
0900–9300	Not detected	Not detected	In RT	Not detected
0930–0100	Not detected	Detected	Leave RT	Not detected
1000–1030	Detected	Detected	Not detected	Detected
1030–1100	Detected	Detected	Not detected	Detected
1100–1130	**Not detected**	Detected	Detected	Detected
1130–1200	In RT	Detected	Not detected	Detected
1200–1230	In RT	Not detected	Detected	In RT
1230–1300	Detected	Detected	Detected	In RT
1300–1330	Not detected	Detected, in RT	Detected	In RT
1330–1400	Detected	In RT	Detected	Detected
1400–1430	Not detected	In RT	Not detected	Detected, in RT
1430–1500	Detected, in RT	In RT	Detected	In RT
1500–1530	In RT	In RT	Not detected	In RT
1530–1600	In RT	In RT	Not detected	In RT
1600–1630	In RT	In RT	Not detected	In RT
1630–1700	In RT	In RT	Not detected, in RT	In RT

reptiles. However, small movements such as body-shifts and head-bobbing did not trigger the camera, whereas locomotion did. Urbanek et al. (2019) noted that behavioral patterns and rates of movement might affect detectability. This indicates that the camera is suitable for studies such as presence/absence, where cameras are deployed for extended periods at various temperatures.

Several factors might affect detectability, and these include cases when a hot background reduces the temperature difference between the background and the target species (Apps and McNutt 2018). To counter this, Apps and McNutt (2018) recommended the use of areas that are shaded rather than exposed. More extensive studies are needed to document the full detectability capabilities of this camera and mechanisms that could enhance its use.

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Literature Cited

Apps, P.J. and J.W McNutt. 2018. How camera traps work and how to work them. *African Journal of Ecology* 56: 702–709. https://doi.org/10.1111/aje.12563.

Brattstrom, B.H. 1965. Body temperatures of reptiles. *American Midland Naturalist* 73: 376–422. https://doi.org/10.2307/2423461.

Carrière, M.-A., N. Rollinson, A.N. Suley, and R.J. Brooks. 2008. Thermoregulation when the growing season is short: sex-biased basking patterns in a northern population of painted turtles (*Chrysemys picta*). *Journal of Herpetology* 42: 206–209. https://doi.org/10.1670/07-070R1.1.

Fontúrbel, F.E., G.B. Rodríguez-Gómez, N. Fernández, B. García, J.I. Orellana, and G.J. Castaño-Villa. 2020. Sampling understory birds in different habitat types using point counts and camera traps. *Ecological Indicators* 119: 106863. https://doi.org/ 10.1016/j.ecolind.2020.106863.

Goode, A.B.C., S.A. Pasachnik, and T.L. Maple. 2020. Assessing the status of a threatened island endemic, *Ctenosaura oedirhina*, on Roatán, Honduras. *Wildlife Research* 47: 137–145. https://doi.org/10.1071/WR18195.

Grant, T.D. and S.A. Pasachnik. 2021. *Cyclura collei*. *The IUCN Red List of Threatened Species* 2021: e.T6027A206739532. https://dx.doi.org/10.2305/IUCN.UK.2021-3.RLTS.T6027A206739532.en.

Hobbs, M.T. and C.S. Brehme. 2017. An improved camera trap for amphibians, reptiles, small mammals, and large invertebrates. *PLoS One* 12: e0185026. https://doi.org/10.1371/journal.pone.0185026.

Mugerwa, B., D. Sheil, P. Ssekiranda, M. van Heist, and P. Ezuma. 2013. A camera trap assessment of terrestrial vertebrates in Bwindi Impenetrable National Park, Uganda. *African Journal of Ecology* 51: 21–31. https://doi.org/10.1111/aje.12004.

Ortmann, C.R. and S.D. Johnson. 2021. How reliable are motion-triggered camera traps for detecting small mammals and birds in ecological studies? *Journal of Zoology* 313: 202–207. https://doi.org/10.1111/jzo.12849.

Rovero, F., F. Zimmermann, D. Berzi, and P. Meek. 2013. 'Which camera trap type and how many do I need?' A review of camera features and study designs for a range of wildlife research applications. *Hystrix* 24: 148–156. https://doi.org/10.4404/hystrix-24.2-8789.

Sasse, D.B., J.S. Reifeiss, and R.W. Perry. 2023. Increasing detections of small to medium-sized mammals using multiple game cameras. *Southeastern Naturalist* 22: 36–42. https://doi.org/10.1656/058.022.0104.

Schwartz, A. and R.W. Henderson. 1991. *Amphibians and Reptiles of the West Indies: Descriptions, Distributions, and Natural History*. University of Florida

Press, Gainesville, Florida, USA.

Searcy, R.A., L.M. Villers, R.D. Reams, J.E. Wyatt III, and J. Pilarski. 2009. Captive reproduction of the Jamaican iguana (*Cyclura collei*). *Zoo Biology* 28: 343–349. https://doi.org/10.1002/zoo.20236.

Sowa, S.L., Y. Luong, G. Quezada, B.K. Scott, and J.A.C. Vardaro. 2023. First record of a Siberian RubyThroat (*Calliope calliope*) in the conterminous United States. *Western Birds* 54: 309–312.

Urbanek, R.E., H.J. Ferreira, C. Olfenbuttel, C.G. Dukes, and G. Albers. 2019. See what you've been missing: An assessment of Reconyx® PC900 Hyperfire cameras. *Wildlife Society Bulletin* 43: 630–638. https://doi.org/10.1002/wsb.1015.

van Veen, R. and B.S. Wilson. 2017. Predation of Jamaican rock iguana (*Cyclura collei*) nests by the invasive small Asian mongoose (*Herpestes auropunctatus*) and the conservation value of predator control. *Herpetological Journal* 27: 201–216.

Welbourne, D. 2014. Using camera traps to survey diurnal terrestrial reptiles: a proof of concept, pp. 225–232. In: P. Meek and P. Fleming (eds.), *Camera Trapping. Wildlife Management and Research*. CSIRO Publishing, Collingwood, Victoria, Australia.