

WALK THROUGH TO A NEW ERA ELECTRONIC WALK-THROUGH CAGE FOR MOUNTAIN LIONS

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Introduction

The Audubon Canyon Ranch (ACR) Mountain Lion Project, based in Sonoma County in Northern California, has developed a new, high-tech trapping method for mountain lion capture. The concept grew out of Dr. Quinton Martins' experiences with the Cape Leopard Trust researching leopards in South Africa.

Leopards were trapped and radio-collared in South Africa between 2005 and 2014 using double-door walk-through box traps, placed on paths where leopards were expected to walk or had previously been recorded during camera trap surveys (Fig.1) (Martins, 2010). The traps were camouflaged with vegetation and vegetation was used to guide the animal into the trap. A fragrance such as a perfume or leopard scat was used on the centrally located tread-plate in conjunction with diagonally placed stepping-sticks in front of either side of the treadle-plate (Fig. 1). These measures were designed to break the momentum of the leopard and enhance the chance that it would place its foot on the treadle-plate, thereby triggering the trap.



Figure 1. Mountain lion cage trap set on a path (left) with detailed setting using stepping sticks with no treadle-plate (right).

Considering leopards and cheetah have been captured using this method, Martins believed mountain lions could be too. If so, it was considered a useful additional tool for biologists to use when other trapping methods were considered less suitable.

Going High-Tech

The disadvantage of the manual treadle was having the trap triggered by non-target species such as baboons, small ungulates and other mammals despite weighting the treadle for leopards. Consequently, to avoid non-target capture for our project in the USA, a “high-tech” electronically operated cage was developed to improve efficacy while simultaneously minimizing trap management. For easier transporting, the cage was made in two parts for easier handling, then connected in the field. The preferred dimensions for California mountain lions after multiple tests were: 275cm (l) x 81cm (h) x 61 (w). This allows for 2 x 137cm trap halves to comfortably fit in the bed of a pick-up truck. A horizontal guide for a middle door insert acts as type of “crush-cage”, forcing the cat into a smaller space for easier immobilization. Preferred wire mesh is 2.5 x 2.5cm or 2.5 x 5cm 12 gauge wire. Lighter wire and quick response time reduces chances of injuries to captured animals.



Figure 2: Actuator Mechanism

Advantages of Electronic Walk-Through Trap

- Use as a blind-set; choice of no bait or bait; or used as conventional single-door trap;
- Trap all-year round; no seasonal limitations due to bait degradation;
- Improve trapping success where lions do not return to cubby-sets or are trap shy;
- Set trap timer to have cage active only when capture teams are on standby;
- Set electronic sensors to target size-specific animals;
- Trigger instantaneously;
- All traps are fitted with Vectronic Aerospace Satellite Trap Transmitters and monitored using GSM trail cameras.

Details of how the trap mechanism works

The cage doors are held vertically in “U” channel guides that drop instantaneously when the actuator rods are pulled. A high-powered 12V “pop-door” solenoid with a strong pulling force is needed to pull the actuator rod ends. To simplify the design, a single solenoid was used to pull a ‘wheel’ which was connected to both actuator rods. By connecting the solenoid actuator to a pivot point closer to the center of the wheel, the rod pulling distance could be increased allowing the rods to clear the doors to reliably drop, and rebound after a timed delay of ~2 seconds becoming the door-lock mechanism.

For the electronic actuator, we evaluated several options including horizontal light beam sensors. For mountain lions, we instead used ultrasonic range sensors installed at the top of the cage pointing downwards. By measuring the distance from the top of the cage to the animal, we could set it to trigger for mountain-lion sized animals only. If the cage is 81cm high, we set the trigger

to 30cm. We used two range sensors spaced 35cm apart whereby it only triggered when it sensed an object 51cm or higher on both sensors. This minimizes the chance of triggering on a smaller animal such as a fox that might sniff the top of the cage with its nose triggering one of the sensors, but not both. For mountain lions, the doors were modified to have a soft “buffer” zone included in the event a young cub is following the mother into the cage and the door falls on it. Traps are monitored using satellite trap transmitters and GSM trail cameras. We added a 12-volt timer to ensure we only power the trap during times when the capture team are on call. All components are housed in a single weather-proof case. The sensors point down through holes drilled in the bottom of the box, and the actuator rods protrude through holes in the side of the box. Field set up is extremely easy and involves setting the box on top of the cage in a center location and adjusting the actuator rods for the doors to rest on. We set the rods to just hold up the doors so that a 1.5cm pull ensure that they drop. It is important to ensure that there is nothing obstructing the ultrasonic range sensors. When the unit is on and sensing, total current draw is 133mA. We only power our traps at night and with our setup, a 12V, 12AH battery lasts about a week which is acceptable for us. The timer could be set to allow activation anytime.

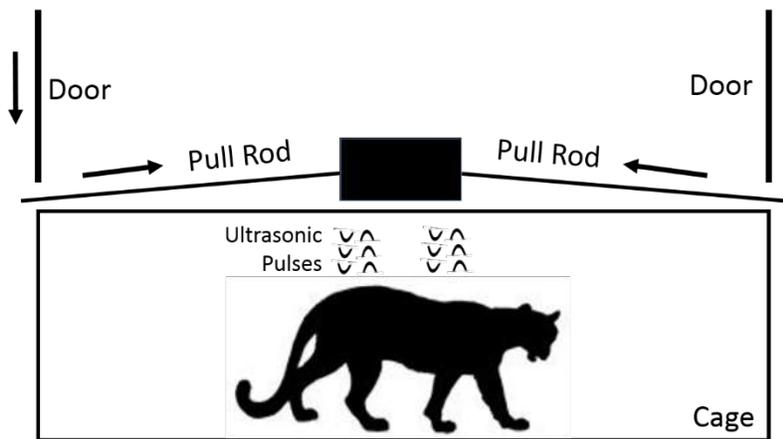


Figure 3: Mountain Lion Cage Operation



Figure 4: Quinton (in the cage!) and Neil setting up the trap in the field (Picture by Jim Codington)

Proof of Concept and Benefits

To prove the concept worked, we first had to demonstrate that mountain lions would walk through our cage (unset) and then, that this trap was safe to use. We placed a trap on a suitable path and had video evidence of mountain lions walking through. We then field-tested the trap demonstrating that the mechanism worked by capturing two adult mountain lions in one week.

This technology could be very useful in South African environments where walk-through cages have been used for some time. We also see this that with minor adjustments, this cage concept could be implemented for multiple species including caracal.

Future design improvements

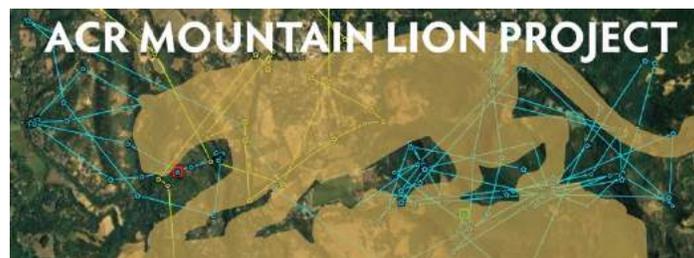
- GSM/remote cage control including amongst others: trap activation at will; remote release of non-target species using small motorized 12V winch
- Image recognition software for trap activation/trigger
- Reduce current draw for fewer battery changes



Figure 5: Female mountain lion captured in walk-through cage

Reference

Martins, Q. (2010). **The ecology of the leopard *Panthera pardus* in the Cederberg Mountains.** PhD Thesis, University of Bristol, UK.



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ACR protects our natural and human communities through land preservation, nature education, and conservation science.