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Field Methods for Capturing and Marking Azarai Night Monkeys

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*Long-term behavioral studies require the permanent identification of individuals. The need for individual identification is even more crucial for sexually monomorphic species since not even the sexes can be differentiated by the field observer. Owl monkeys (*Aotus spp.*) are sexually monomorphic primates inhabiting the forests of Central and South America. We report here on the methods and drug dosages used to capture, mark, and identify individual owl monkeys (*Aotus azarai azarai*) in Eastern Formosa, Argentina. We successfully captured 70 owl monkeys using blowpipes or a CO_2 rifle, but attempts to capture them with baited traps proved unsuccessful. During the marking and collaring procedures, we gave individuals on average a total of 50 mg of ketamine hydrochloride, including the dose in the dart. To mark them, we freeze-branded portions of their tails and fitted them with radio or bead collars. There was no death or physical life-threatening injury while capturing or marking individuals. The procedures we describe should allow one to safely capture and to mark small arboreal primates when trapping is not possible.*

KEY WORDS: owl monkey; ketamine; marking; capturing; *Aotus*.

INTRODUCTION

Long-term behavioral studies require the permanent identification of individuals (Glander *et al.*, 1991) when it is not possible to distinguish

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individuals via natural marks. Although in many primate species individuals can be reliably distinguished via natural marks and scars, some species show no obvious differences among individuals. Sexually monomorphic species present the additional challenge because not even the sexes can be differentiated due to similar body size and appearance of the external genitalia. For example, the general appearance and size of the penis may not be readily differentiated from the clitoris.

Owl monkeys (*Aotus spp*.) are small (800 –1400 g, Smith and Jungers, 1997) arboreal, sexually monomorphic primates inhabiting the forests of Central and South America. They live in groups generally consisting of an adult heterosexual pair, one infant, and one or two juveniles or non-reproducing adults (Aquino and Encarnacion, 1994; Fernandez-Duque *et al.*, 2001; Fernandez-Duque and Huntington, 2002). Aquino and Encarnacion (1986) captured *Aotus nancymai* and *A. vociferans* while they slept inside tree holes in the forests of the Peruvian Amazon, but *A. nigriceps* could not be captured with baited traps in Manú National Park in Perú (Wright, 1985. p. 26).

When we began our project in 1997, we found very little published information on techniques for capturing small arboreal primates that could help us capture owl monkeys (Aquino and Encarnacion, 1986; Glander *et al.*, 1991; Müller and Schildger, 1994; Savage *et al.*, 1993; Terborgh and Goldizen, 1985; Wright, 1985, p. 26). We report here on the capturing methods, drug dosages, and marking techniques we used to identify individuals of *Aotus azarai azarai* in Eastern Formosa, Argentina (Fernandez-Duque *et al.*, 2001; Fernandez-Duque and Huntington, 2002). Because owl monkeys in the Chaco do not sleep inside holes (Wright, 1994), it was not possible to capture them there (Aquino and Encarnacion, 1994).

METHODS

Capture Equipment

Feeding Platforms and Baited Traps

We placed 10 wooden platforms at 3 m above the ground in 2 different owl monkey territories on 20 days between January and February 2000. We baited the platforms with grapes or peanut butter spread and monitored them regularly. We also offered bait at the tip of a pole aimed at approaching individuals in 4 different groups. Finally, we placed one trap baited with tangerines and a decoy owl monkey on 3 nights in 1997.

Blowpipe and Rifle

We used a 1-m blowpipe (Pneu-Dart, Inc. Williamsport, PA, USA) or a CO_2 powered rifle to dart the monkeys. We first tried the Pneu-Dart Model 176B, but did not offer a sufficiently precise means to controlling pressure. We are currently using a Dan-Inject CO_2 Injectionrifle model J.M. (Wildlife Pharmaceuticals, Inc. Fort Collins, Colorado, USA) with a mounted Bushnell scope.

We used reusable and disposable darts. We found the reusable 1.5 ml syringe darts with stabilizer (Wildlife Pharmaceuticals, Inc.) inconvenient (Jones and Bush, 1987) because they frequently ended up impaled on a high branch when we missed a shot. It was also cumbersome to reload and repressurize the darts in the forest. Instead, we preferred the disposable 0.5 or 1cc Type P darts with a 3/8" syringe (Pneu-Dart, Inc.) because they are easier to prepare and can be used with both the blowpipe and rifle. We loaded the darts with 0.5 ml of ketamine hydrochloride (50mg/ml, Vetanarcol, Konig, Argentina), which has been successfully used in *Aotus* spp. (Gozalo, 1985).

Procedures

We required a minimum of 2 people for all procedures. Our shots with the blowpipe are accurate up to a distance of 6–7 m, whereas we can reliably shoot as high as 15–20 m with the rifle. We always aimed at the hindquarters and tried to hit perpendicular to the surface of the individual. As soon as the monkey was hit, a net was prepared and held between 2 people below it.

To mark individuals, we shaved 1 or 2 rings of fur off their tails. For males we shaved 1- or 2 cm wide rings in the distal portion of the tail, whereas we shaved females' tails in the upper and middle portion. To make the mark permanent, we freeze-branded the shaved portions of the tails via the commercially available spray refrigerant Envi-ro-tech 1672 Freeze Spray (Tech Spray, L.P.; Amarillo, Texas USA) or a generic brand purchased locally in Argentina.

We fitted all individuals with a radio collar or with a bead collar depending on the age of the monkey and our interest in being able to locate it reliably. The radio collar consisted of a Mod-080 transmitter package mounted on a ball-chain collar with a 15-cm whip antenna (Telonics Inc, Mesa, AZ, USA). The total mass of the unit (50 g) was 3–5% three percent of the bodily mass of the collared individuals (mean body mass $\pm$ s.d: 1246 $\pm$ 145 gr, n = 45). The battery lifespan *cd.* 20 mo. To maximize battery life, the transmitters cycle through on and off cycles (5 h on, 6 off, 5 on, 8 off). The transmitters have a mortality sensor to locate the collar in case it falls off or the monkey

dies. The bead collars consisted of a stainless steel ballchain carrying between 3 and 7 plastic colored beads in a unique combination (Terborgh and Goldizen, 1985).

While the monkey was anesthesized, we weighed and measured it and evaluated its teeth, scent gland and testicular development (unpublished data). We also obtained the following samples: hair, ectoparasites, urine, feces, scent gland secretions, blood, ear punches and skin tissue. We kept the monkeys in an aluminum wire-mesh cage ($1 \times 1 \times 1$ m) until they were fully recovered. We covered the cage with a blanket to reduce visual stimulation during recovery. We report different sample sizes for some of the results because not all measurements were recorded for all individuals.

RESULTS

Baited Traps

Our limited efforts to capture owl monkeys via traps were unsuccessful (contra Terborgh and Goldizen, 1985). Four young animals in 3 groups approached, smelled, and tried the bait offered with a pole, but did not retry on following days. The traps baited with tangerines and the decoy owl monkey did not attract other monkeys. The advantages of training owl monkeys to enter traps would be numerous (Savage *et al.*, 1993). Still, the available evidence on trapping *Aotus* spp. (Wright, 1985) and *Callicebus spp*. (Müller and Schildger, 1994) suggest it will be a very time-consuming approach of uncertain outcome.

Blowpipe and Rifle

We darted 70 owl monkeys via the blowpipe ($n = 25$ monkeys) or the rifle ($n = 45$). We hit them at a median distance of 5 m with the blowpipe (range: 3–8, mean $\pm$ s.d, 5.0 ± 1.2, $n = 17$) and 10 m with the rifle (range: 6–19, mean $\pm$ s.d.: 10.8 ± 3.0, $n = 40$).

There was no death or significant physical injury while darting. We hit approximately half of the monkeys on a hindquarter ($n = 25$), and the other ones on the tail ($n = 5$), shoulder ($n = 1$), genital area ($n = 5$), forelimb ($n = 1$), hindlimb ($n = 11$), foot ($n = 8$), chest ($n = 2$), abdomen ($n = 4$). The monkeys bled very little and the bleeding usually stopped by the time we captured them. The only monkey that we darted with a reusable dart had the needle stuck inside a sole when captured. After that event, we stopped using the reusable darts. The median time to fall measured from the moment

they were hit was 5 min (mean ± s.d., 8.5 ± 8.5, n = 60), but at least a few individuals fell within a minute.

When the monkeys were immobilized, we captured them in a net (n = 27) or brought them down after climbing the tree (n = 26). We also caught 3 individuals in our arms upon realizing they would miss the net. Thirteen animals fell to the ground after slowing down on branches. The reaction from other group members varied. Sometimes the group moved to a tree nearby and remained there watching us. Other times, they approached the observer or the shooter while vocalizing and displaying. This provided additional opportunities to shoot subjects at close range. Once a second individual was captured after it approached the shooter. On 10 occasions we could not reach an immobilized individual that remained high in the canopy. Eventually they recovered and left. We have also experienced some failures due to problems with darts that did not explode or exploded but the animal was not immobilized.

Marking

It took us, on average, 2 hours and 20 min from the moment the first dart hit the subject to the time we finished the examination and marking procedures. We used an average of 46 mg of ketamine, including the dose in the dart (s.d. 17, range: 25–85, n = 70). No monkey experienced convulsions or any side-effect that we could attribute to ketamine.

We freeze-branded the first 32 individuals via Envi-ro-tech 1672 Freeze Spray and a second set of 15 individuals using a generic freeze spray purchased locally in the field (Wilson *et al.*, 1996). Most monkeys marked during the first year did not grow white hair in the freeze-branded area. In the few individuals in which freeze branding worked, it turned out to be a very reliable means of identification since the tail is the most conspicuous body part. Nine percent (3/32) of the individuals freeze branded with the Envi-ro-tech Spray lost the section of their tail below the most distally shaved band, whereas 33% (5/15) of those that received generic spray lost a portion of their tails.

There has only been one death that can be undoubtedly related to our procedures (1.4 % of all captured individuals). We found one 3-year-old female hanging from the collar 11 mo after she had been fitted with it. Additional evidence for evaluating the potential negative effects of the collars comes from the examination of 6 individuals that were recaptured, and the recovery of 6 recently dead bodies. None of them had visible injuries on the neck that could be attributed to the collar. We were able to recover 15 collars on the ground thanks to the mortality signal. Two were open suggesting that

we may not have tightened the collar adequately, whereas a third one was closed indicating that the monkey may have pulled it off.

After marking and collaring an individual, we kept it inside the recovery cage during ≥2 h before release. On 4 occasions when we captured monkeys at dusk on a relatively cold night, we kept them in camp until the following morning. We released all subjects at the location where we had captured them.

DISCUSSION

We successfully darted, captured, and marked 70 owl monkeys. Although we never had any problem with either the blowpipe or rifle, we never used the rifle with infants or small juveniles. The blowpipe is a very interesting inexpensive option, but the opportunities will be limited to a maximum height of 6–7 m. Conversely, although the rifle can be used at any height, it could result in subjects remaining immobilized high in the canopy, which is the most frequent problem when trying to capture arboreal primates (Glander *et al.*, 1991; Jones and Bush, 1987).

We fitted radio and bead collars without problems. We collared young individuals (800–900 gr), as well as adults (1300–1500 gr), and detected no change in behavior that we could attribute to a collar. Some individuals tried to remove the collar during the first couple of days, but there seemed to be no immediate or short-term, i.e. several mo, negative effect. Even if transmitters of different weights were placed on different animals (Gursky, 1998), the relatively small samples sizes may not allow us to detect a potential long-term effect.

There have been other attempts to capture and collar monomorphic taxa in South America. Bossuyt (2002) darted several titi monkeys (*Callicebus moloch*) with a blowpipe in Manú National Park in Perú. Müller and Schildger darted 5 *Callicebus personatus* via a CO_2 gun and fitted 2 of them with collars on the neck or hip, but they later found infections through wounds caused by the tight radio collar in 2 recaptured animals (1994). The transmitters they used were fitted on a stiff collar, whereas ours are supported by a ball-chain collar. We chose to use the ball-chain collars which have been used on golden-lion tamarins (*Leontopithecus rosalia*, Dietz, pers. com.), and after our own evaluation of the stiff collar on pet monkeys. We did not know how much to tighten the collars initially, and we probably placed them too loosely since some individuals removed them.

We must continue to improve the methods for permanently marking tails via freeze-branding. Researchers have successfully freeze-branded red-tailed monkeys (*Cercopithecus ascanius*) (Jones and Bush, 1987), but we had very modest success with the technique. Only a few subjects grew white hair

as expected, whereas most did not show any permanent mark. Even worse, several monkeys lost the distal end of the tail. Our careful recording of the distance and duration of spraying will hopefully provide us with the data needed to refine the technique.

In conclusion, the techniques described here have allowed us to reliably locate individuals in 15 different social groups. We are now able to describe dispersal patterns, male-female relationships and paternal care in identified owl monkeys more detailed than ever.

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