SHORT COMMUNICATION

Observations on the mating behavior of the eastern lowland olingo *Bassaricyon alleni* (Carnivora: Procyonidae) in the Peruvian Amazon

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ABSTRACT. The behavior of wild olingos is poorly known. From May-Jul 2015, I surveyed nocturnal mammals in southeast Peru and recorded the behavior of olingos. Multiple olingos were observed in close proximity on four occasions: two occasions in which multiple olingos were feeding on the inflorescences of a Parkia pendula tree; an adult and immature olingo traveling together; and a pair of olingos copulating. The copulation lasted at least 142 minutes, and was characterized by the male biting the hind neck and back of the female, constant female vocalizations, and rapid head turning by the female toward the male. Olingos and kinkajous were similarly abundant. These observations offer insight into the behavior of the wild olingo.

KEY WORDS. Natural history, Procyonidae, reproduction, sexual behavior.
encountered approximately once per 30 km of walking trails, whereas kinkajous were found about six times per 30 km (Emmons 1984, Janson & Emmons 1990). Other estimates of olingo and kinkajou densities from other regions suggest that they occur at similar densities, which is mirrored by my results (Emmons 1984, 1997, Kays 2000).

Twice a pair of olingos, and twice solitary olingos were observed feeding on the inflorescences *P. pendula*, totaling four occasions in which olingos were seen feeding. These observations occurred in three different trees and were the only occasions I observed olingos feeding, which suggests that *P. pendula* is an important food resource for olingos, as it is for primates (Peres 2000).

On 18 June 2015, at 05:15, I encountered two olingos in the same tree, no more than a meter apart from each other. One olingo was at most 2/3 the size of the other, and the smaller olingo had a disproportionately shorter tail. Both olingos appeared to be females, bearing no scrotal sacs. When I approached the smaller olingo for photographs, the larger olingo began vocalizing, and continued to vocalize for at least ten minutes. The vocalization was the “wer-toll” vocalization described above. The olingos remained 1-10 m from each other for the next 30 minutes, moving through trees for at least 30 m, at which point I departed. The olingos frequently sniffed the bark of large branches, and occasionally stopped and looked around. No direct interactions between the individuals were observed. Given that this adult female and smaller olingo were traveling together, they may compose a mother and offspring pair.

On 21 June 2015, at 03:45, I encountered a pair of olingos on a horizontal vine about 10 cm in diameter. One olingo was on top of the other, with the belly of the top olingo lying directing on the back of the bottom olingo (Fig. 1). The olingos were copulating, i.e. the olingo on top was thrusting the pelvis into the posterior end of the olingo below. The male olingo frequently bit the hind neck and back of the female, and the female often immediately threw her head back toward the male with her mouth open, still vocalizing. The female gave 1-3 calls per second, which sounded like an incessant, high-pitched grunt – “Yik! Yik! Yik!...” – that varied slightly in pitch and amplitude. The male never vocalized, although he frequently bit the female on the back and neck. Over the course of the two hours, they moved from the horizontal vine to a large tree branch 50 cm in diameter, and at one point they were suspended amongst a tangle of diagonal vines, each about 1 cm in diameter (Supplementary Material S1, Appendix 1).

There were five occasions in which the male dismounted, likely in response to a particularly strong head turn and snap of the mouth from the female. The female ran from the male between 1 to 5 m, and when she was separated from the male, she vocalized far less frequently, i.e. once every 1-3 seconds. These five intermissions lasted a few seconds to five minutes. During each intermission, the female did not move as the male approached, but remained motionless and increased her vocalization rate as the male remounted. The onset of one of the intermissions was caused by a pair of black-headed owl monkeys *Aotus nigripes* (Dollman, 1909, Aotidae). The pair of owl monkeys was moving through the canopy and passed within 5 m of the olingos. When the monkeys were closest, the male olingo ceased his pelvic thrusts, the female ceased vocalizing, and both olingos looked toward the monkeys. The female shortly thereafter ran up the branch 2 m away, and the male approached the female and remounted after three minutes.

Between 04:45 and 05:35, another olingo could be heard nearby, approximately 20 m away. This third olingo was giving the typical “wer-toll!” At 06:08, the olingos separated for a last time and the female slowly departed from the male. One minute after departure, the female excreted approximately 100-200 mL of liquid. The female continued moving through the trees for at least five minutes until out of sight, and the male remained on an exposed branch for at least half an hour until 06:45, at which point I left.

Table 1. Olingos were almost always observed solitarily, although olingos were observed in pairs on four occasions, for which I have added details on their behavior.

<table>
<thead>
<tr>
<th>Number of olingos</th>
<th>Sample size</th>
<th>Behavior</th>
<th></th>
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<tbody>
<tr>
<td>1</td>
<td>25</td>
<td></td>
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<tr>
<td>2</td>
<td>1</td>
<td>Adult and immature females traveling together</td>
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</tr>
<tr>
<td>2</td>
<td>1</td>
<td>Male and female copulating</td>
<td></td>
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<tr>
<td>2</td>
<td>2</td>
<td>Feeding on Parkia pendula inflorescences</td>
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Figure 1. The first observation of mating wild olingos. The female is positioned on the right with her mouth open and all four feet contacting the branch, and the male is on the left grasping the female with his two front feet.
This is apparently the first recorded observation of an olingo copulation in situ. I observed the pair of wild olingos engaged in mating behavior for a total of 143 minutes, which is longer than the longest duration of mating behavior (68 minutes) of olingos in captivity (PoGlayen-neuwall 1976). The length of this copulation suggests that olingos are induced ovulators, as are other procyonids and carnivores (Llewellyn & Enders 1954, Milligan 1982, Hass & Roback 2000, Boons et al. 2004). The wild female olingo in this study vocalized incessantly, and a captive eastern lowland olingo female vocalized “always during copulation, and sometimes following it” (PoGlayen-neuwall 1966). The calls of the female olingo appear to be part of the mating ritual, although their exact function remains unclear. The female olingo sharply turned her head toward the male while still underneath him, seemingly as a direct aggressive response to the male biting her hind neck and back. Given her position, it was difficult for her to reach the male for physical contact with her mouth.

The behavior observed in this study is similar to behavior observed in other procyonids. A copulation of kinkajous lasted 150 minutes (Kays & Gittleman 2001). In a fashion similar to the female olingo in this study, female kinkajous aggressively threaten the male, and the male advances and mates with her regardless (Kays & Gittleman 2001). The mating behavior of olingos is most similar to the mating behavior of northern raccoons (Procyon lotor). A female and male northern raccoon exhibited mating behavior for at least 56 minutes, which was characterized by the female vocalizing frequently during copulation, turning her head upward toward the male, attempting to bite the male, and the male and female ceasing and resuming copulation multiple times over the course of the 56 minutes (Stains 1956). White-nosed coatis, however, differ from olingo in that copulation lasts only 5-6 s but occurs many times over multiple hours, the female does not display aggression or vocalize, and the male vocalizes and does not bite the female (Hass & Roback 2000).

Only until recently were olingos recognized as several distinct species that diverged approximately 3.5 mya (Helgen et al. 2013). Although these observations pertain to only the eastern lowland olingo, the behavior of other olingo species likely is similar due to the relatively recent divergence.

In sum, these behavioral details offer important insight into the natural history of olingos. Further observations of any behavior on any species of olingo will serve as important contributions to our knowledge about these cryptic, nocturnal carnivores.

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LITERATURE CITED


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Appendix 1. About the Supplementary Material S1 (available with the HTML version of the article at http://www.scielo.br/zool).

The video demonstrates the olingos mating, the male biting the female on the back, leg, and neck, and the female snapping her mouth toward the male and incessantly vocalizing. The video is composed of six segments. For each segment, I give the segment duration, the time of day the segment starts, and I describe noteworthy events. Segment 1 (0:00-1:41, 04:46am): At 0:22, the female snaps her mouth particularly strongly toward the male, and at 0:51-1:09 the male bites the neck of the female. Segment 2 (1:41-4:05, 4:52am): At 1:43 and 1:56, the male bites the female, and the female responds by vigorously snapping her mouth toward the male. Segment 3 (4:06-4:47, 5:01am): At 4:14-4:28, the male olingo bites the neck of the female. At 4:29, the female olingo displaces herself from the male, and at 4:34, the male olingo again bites the neck of the female. Segment 4 (4:47-5:11, 5:04am) The male olingo bites the back of the female many times throughout the segment, to which the female responds by snapping her head toward the male, and even once biting the leg of the male at 4:55. Segment 5 (5:12-5:54, 5:48am) The male olingo again bites the neck of the female at 5:15, and he bites the leg of the female three times at 5:29-5:34. Segment 6 (5:55-6:28, 05:52am) At 6:02, the male sniffs the posterior end of the female. At 6:20, the male olingo dismounts from the female for a final time, but the two olingos remain adjacent to each other for approximately 20 minutes after the end of the video.