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Short Note

New distribution limits of *Bassaricyon alleni* Thomas 1880 and insights on an overlooked species in the Western Brazilian Amazon

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There is still much disparity in basic information about global biodiversity (Whittaker et al. 2005), especially in the Amazon, where many taxa are known from only a few specimens or localities (Nelson et al. 1990, Kress et al. 1998). Even for the better-studied vertebrate taxa such as mammals (Gaston and May 1992), lack of natural history data for some Amazonian species is common and problematic (see IUCN Red List at www.iucnredlist.org). Field studies routinely contribute startling discoveries, as evidenced by recent descriptions of large mammals, including several new primate taxa (van Roosmalen et al. 2002, Wallace et al. 2006, Boubli et al. 2008, Röhe et al. 2009), a possible new peccary species (van Roosmalen et al. 2007, Gongora 2008) and two new porcupines (Voss and da Silva 2001). In addition to the notorious logistical problems and lack of funding (Balmford and

Whitten 2003), detection and identification difficulties have contributed to the mystery surrounding certain mammalian groups.

Here, we present new field records from the Brazilian Amazon of Allen's Olingo (*Bassaricyon alleni*; Carnivora: Procyonidae), including the first Brazilian specimens. There is only one prior record of this species in Brazil (Calouro 1999; Table 1) and virtually no available information about its biology from anywhere in its known range (Reid and Helgen 2008a). Our records represent a range extension of more than 1000 km and offer insights on field identification, taxonomy, natural history, and conservation threats.

The olingos (*Bassaricyon* spp.) are a little-known group of small Neotropical carnivores (Glatston 1994, Kays 2000, Reid and Helgen 2008a,b), whose distributional limits and species-level identification are particularly problematic in Brazil (Oliveira 2009). They are described as solitary, arboreal and nocturnal, occurring patchily in multistrata neotropical evergreen forests (Glatston 1994), and are thought to feed primarily on fruits and nectar (Kays 2000). They can be overlooked easily or mistaken for the similar kinkajou (*Potos flavus* Schreber 1774) or even for night-monkeys (*Aotus* spp.) (Emmons 1984, Prange and Prange 2009). The distribution of olingos in South America is treated as sharply disjunct, with vast areas separating known occurrences (IUCN 2009, Prange and Prange 2009). It has been suggested that this irregular distribution is the result of possible competition with the larger, more widespread kinkajou, limiting the olingo to the areas of highest productivity, where the two species could occur together (Glatston 1994). However, as our results suggest, it is also possible that olingos occur more frequently than previously recognized, but tend to be overlooked owing to difficulties with detection and identification.

Olingo taxonomy is problematic and in need of revision (Reid and Helgen 2008a,b). Emmons and Feer (1999) treat all forms as pertaining to a single species, *Bassaricyon gabbii* (Allen 1876). Eisenberg and Redford (1999) recognize two species, distinguishing western Amazonian *B. alleni* from the rest. Most recently, Wozencraft (2005) recognized five cryptic species of olingos: *B. lasius* (Harris 1932; Costa Rica), *B. pauli* (Enders 1936; Panama), *B. gabbii* (central and northern south America), *B. beddardi* (Pocock 1921; northern Amazonia) – all previously treated within *B. gabbii* – as well as *B. alleni* (western Amazonia).

We registered olingos in the field in nine localities in southwestern Amazonian Brazil (Table 1), extending the

Table 1 New records of *Bassaricyon alleni* in the Brazilian Amazon.

Locality #/(year)	Site/(state)	Lat/Long	Sightings	Forest type	Museum specimen	Museum catalog #/ (field number #)	Collector or observer
1 (1992)	Igarapé Porangaba, right bank of the Juruá River (Amazonas)	72°24' W 8°25' S	0	<i>Terra firme</i>	One skull	INPA 2860/ (MNFS 1119)	M.N.F. da Silva
2 (1999)	Serra do Divisor N.P., western Acre state (Acre)	73°40' W 7°20' S	Not indicated	<i>Terra firme</i>	–	–	A.M. Calouro ^a
3 (2005)	Cujubim S.D.R., Curuena River, left bank of the Jutai River (Amazonas)	69°19' W 5°12' S	1	<i>Várzea</i>	Skull (adult female)	INPA 5911/ (RDSC 26)	A.L. Ravetta
4 (2007)	Uacari S.D.R., both banks of the Juruá River (Amazonas)	67°16' W 5°27' S	7	<i>Terra firme</i>	–	–	D.P. Munari
5 (2007)	Campina do Tupana, 110 km south of Manaus (Amazonas)	60°07' W 4°09' S	3	<i>Terra firme</i>	–	–	F. Röhe
6 (2007)	Campina do Igapó Açu, 256 km south of Manaus (Amazonas)	61°28' W 5°05' S	5	<i>Terra firme</i>	Skin and skull (adult male)	INPA 5910/ (RS 06)	F. Röhe, R. Sampaio and P. Rubim
7 (2008)	Piagaçu-Purus S.D.R., left bank of the Purus River (Amazonas)	62°28' W 4°18' S	1	<i>Terra firme</i>	–	–	D. Teles ^b
8 (2009)	Gregório River E.R., right bank of the Juruá River (Amazonas)	71°06' W 7°28' S	7	<i>Várzea, terra Firme</i>	Skins and skulls (two females)	INPA 5912 and 5913/(RS 20, RS 23)	R. Sampaio
9 (2009)	Módulo PPBio Manaquiri, 65 km south of Manaus (Amazonas)	60°37' W 3°53' S	2	<i>Terra firme</i>	–	–	R. Sampaio

Locality numbers are the same as in Figure 1.

^aData from Calouro (1999); ^bdata from Santos (2009).

One photograph of the skin of specimen (INPA 5911/RDSC 26) was first presented as *B. gabbii* in Cheida et al. (2006). N.P., National Park; S.D.R., Sustainable Development Reserve; E.R., Extractive Reserve.

known geographic distribution by 1200 km eastward to the Madeira River (Figure 1). All five specimens collected (from sites 1, 3, 6, 9) show the diagnostic characters of *Bassaricyon alleni*: frontal region of the skull flattened from the crown to the nasals, bullae less inflated anteriorly, and lowest points of the bullae below the mastoid when viewed in profile (Thomas 1880, Prange and Prange 2009). Also, our sequences of the mitochondrial gene NDH5 (unpublished data) of four specimens (sites 3, 6, 9) differed from one another and from a single Peruvian sample of *B. alleni* (GenBank DQ660230; Koepfli et al. 2007) by 0.4–1.8%. The only other existing sequence of this gene in an olingo *B. gabbii* from Panama (GenBank DQ660300; Koepfli et al. 2007) differed from all of these by approximately 5%. This is consistent with the view that *B. alleni* and *B. gabbii* are distinct species, but does not eliminate the possibility of significant genetic population structure within *B. alleni*.

Based on the identification of our specimens, which span the entire geographic range of our records, we assume the

other sight records (which were recognized in the field as a *Bassaricyon* sp. based on vocalizations, see below) also refer to *B. alleni*. We cannot rule out the possibility that some or all of the sight records refer either to *B. gabbii* or to *B. beddardi*, the two other species known to occur nearest to our records. The former species presumably has a highly disjunct distribution in partial overlap with *B. alleni* (Prange and Prange 2009), with which it apparently co-occurs in at least one locality in Ecuador (Helgen and Wilson 2006). Nevertheless, we have no reason to suspect the presence of more than one species of olingo in our area, and consequently the conservative approach is to treat all records as referring to the same species. We believe *B. beddardi* to be even less likely, because its known range is limited to extreme northern Amazonia (Reid and Helgen 2008b), much farther than the closest records of *B. gabbii*, and its presence in Brazil (Mendes Pontes and Chivers 2002, Mendes Pontes et al. 2002, Mendes Pontes 2004) is still unproven (R. Sampaio, unpublished data).

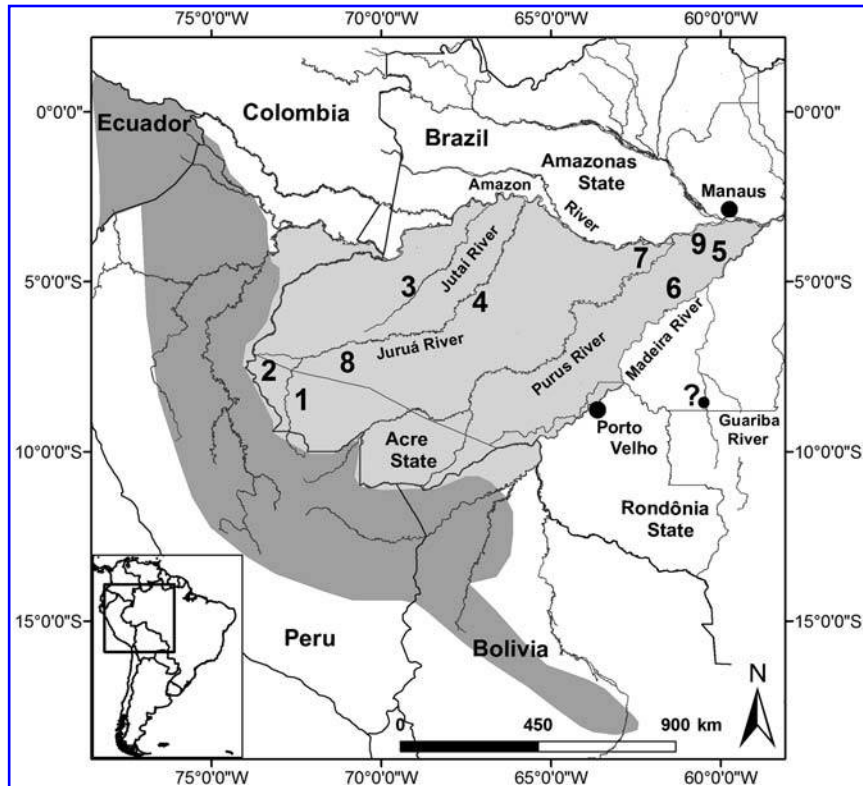


Figure 1 Geographic distribution of *Bassaricyon alleni*.

Dark gray depicts the range according to Reid and Helgen (2008a). Light gray indicates the presumed additional range based on new records (sites numbered as in Table 1). The question mark refers to our unconfirmed sight record (see text).

It is possible that olingos also occur east of the Madeira River. In November 2008, one of us (D.P.M.) saw a small procyonid at night in a palm tree, 15 m up in the interior of low-canopy forest on the Guariba River, in the state of Amazonas (60°25' W, 8°44' S; Figure 1). This animal struck the observer as strongly resembling an olingo; however, the individual was not collected, nor did it vocalize, so we cannot rule out the possibility that it was a kinkajou.

Although Kays (2000) asserts that the larger size and prehensile tail are diagnostic of kinkajous, our experience is that these characteristics are very hard to observe high in the forest canopy, where the animals tend to be found. Without a voucher specimen, the most efficient way to distinguish these species is by their vocalizations. They vocalize often at night, exhibiting what we believe to be genus-specific sounds when illuminated by flashlight or when they detect a person's presence. Both emit a series of sharp, short, squealing notes, but the notes of *Bassaricyon* are considerably lower in frequency and delivered at a slower pace (Emmons et al. 1997). We have not been able to record any olingos ourselves and do not have sufficient experience to suggest whether there is geographic or species-level variation in their vocalizations.

The suggestion that olingos only occur in high-productivity forests (Glatston 1994) is not upheld by our data. The northeasternmost localities (5, 6, 9; Figure 1) are in a mosaic of nutrient poor terra-firme forests and extremely poor, oligotrophic campinaranas and white-sand campinas (Veloso et

al. 1991). Interestingly, on several occasions we noted two individuals together or within 100 m of one another, despite suggestions that they are normally solitary (Glatston 1994).

Some local people in our study areas are familiar with olingos. They use several different names for them: "gatiara" in the state of Acre and in Amazonas along the Juruá and Jutai rivers, "macaco-janauí/janauí/januí" on the Juruá and upper Amazon rivers, and "miru-miru" on the Purus River. The name "macaco-da-noite" (literally "night-monkey") is also used for a variety of nocturnal arboreal mammals, including the primate *Aotus*, as well as *Potos* and *Bassaricyon*. Likewise, "jupará", the common Brazilian name for the kinkajou, can also be used by local people, some of whom recognize the existence of more than one species, thus distinguishing kinkajous from olingos while using the same name for both. It is commonly believed by locals that both these procyonids are very aggressive and allegedly attack people and suck their blood; however, we never observed any indication of such aggressiveness.

In Brazil the major threat to this species, which appears not to tolerate forest fragmentation or other disturbances (Glatston 1994, Emmons and Feer 1999, Kays 2000, Reid and Helgen 2008a,b), is undoubtedly habitat loss. Although some indigenous groups are known to hunt and eat olingos (Bisbal 1993, Redford and Stearman 1993), hunting pressure does not appear to be significant in our area. No local people we interviewed claimed to hunt them. However, because

some locals believe in their evil nature, both kinkajous and olingos might be killed when encountered (Santos 2009).

The huge area in southwestern Amazonia between the upper Amazon and Madeira rivers, which we now believe to represent the distribution of *Bassaricyon alleni* in Brazil (Figure 1), includes some of the most remote and well-preserved parts of the Amazon (Barreto et al. 2006) and numerous parks, reserves, and indigenous lands (see ISA website: www.socioambiental.org). By contrast, some areas in the states of Acre and Rondônia are under intense and growing pressure from deforestation (Fearnside 2005). The entire area between the Madeira and Purus rivers is particularly threatened. Large development projects in this region, such as the repaving and reactivation of the BR-319 interstate highway, which cuts the entire interfluvium along the nearly 900-km from Manaus to Porto Velho, a proposed gas pipeline along a similar route, and the construction of two enormous hydroelectric dams on the Madeira River near Porto Velho, are now a priority of the Brazilian government (Fearnside and Graça 2006). These projects are predicted to cause massive deforestation in the region (Laurance et al. 2001, Soares-Filho et al. 2006), leading to endangerment or even extinction in a region where new (Voss and da Silva 2001, van Roosmalen et al. 2002, Röhe et al. 2009) and endemic (Vale et al. 2008) vertebrates continue to be discovered. Thus, the newly discovered Brazilian range of *B. alleni* could suffer considerable reduction in the near future.

This major range extension illustrates our overall lack of knowledge about biodiversity in the Amazon. More studies are urgently needed, particularly in light of ongoing and planned large-scale development in the region. Nocturnal mammals are especially poorly known, but active nocturnal census work, including audio-recording, can lead to startling discoveries (Melo et al. 2005). Specimen collection, including preserving vouchered tissue samples, is crucial to resolving taxonomic doubts and to recognizing and describing the true diversity of species, while there is still a chance to use these biodiversity data to inform public development and conservation strategies.

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