SHORT COMMUNICATION

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LONG-DISTANCE MOVEMENT OF *ARTIBEUS LITURATUS* (CHIROPTERA: PHYLLOSTOMIDAE) IN THE STATE OF ESPÍRITO SANTO, BRAZIL

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INTRODUCTION

The ability of some animal species to cross deforested areas is directly related to their survival in fragmented landscapes (Davies *et al.* 2000, Pires *et al.* 2002, Viveiros de Castro & Fernandez 2004, Primack & Rodrigues 2005). In addition, the movement of individuals from one area to another promotes gene flow between different populations isolated in different fragments, thus minimizing the extinction risk of these populations (Jones *et al.* 2003), which is known as the "rescue effect" (Hanski & Gilpin 1991, González *et al.* 1998).

Bats may escape from adverse environmental conditions by moving over large distances into more favorable areas (Neuweiler 2000, Kunz & Fenton 2005). However, bat species differ in their capacities to cross open areas. Some species do not cross a non-forested matrix, and a recent study shows that roads present a barrier to *Myotis bechsteinii* movement (Kerth & Melber 2009). Water bodies (Meyer & Kalko 2008) and urban areas (Oprea *et al.* 2009) may also represent movement barriers to some bats.

On other hand, some Neotropical bat studies report the capacity of some bat species to cross different kinds of matrix between forest fragments, like pastures (Medina *et al.* 2007), agricultural areas (Bianconi *et al.* 2006), savanna areas (Bernard & Fenton 2003), and the sea (Menezes-Jr *et al.* 2008). However, for the majority of bat species more data are still needed to help us understand their dispersal capabilities in different matrix types.

Artibeus lituratus occurs from Mexico to northern Argentina, including in all Brazilian states (Peracchi *et al.* 2006, Gardner 2007, Zortéa 2007). Within the family Phyllostomidae, *A. lituratus* is known by its large size and wide distribution. In Brazil, this species is well known due to its great abundance and occurrence in several types of habitat (Zortéa 2007).

Here we communicate a dispersal event of an individual of *A. lituratus* between two distinct areas (a protected area with coastal *restinga* vegetation and pastureland) in the state of Espírito Santo, southeastern Brazil.

METHODS

Sampling sessions were conducted in two study areas in the state of Espírito Santo: (i) Paulo César Vinha State Park (PEPCV), a coastal *restinga* habitat, in the

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municipality of Guarapari (20°32'02"S, 40°25'59"W), from September 2006 to July 2007; and (ii) a rural landscape in the municipality of Alfredo Chaves (20°37'29"S, 40°41'00"W), from August 2007 to February 2008.

Originally, the state of Espírito Santo was almost completely covered by the Atlantic Forest. However only 7.25 % of the original forest cover still remains (IPEMA 2004). The landscape between both localities where this individual was captured is comprised of very small forest fragments embedded in a matrix composed of pastures and agriculture (mainly coffee), most of them isolated (IPEMA 2004).

In each sampling session, we used between eight to 10 mist-nets that were operated over six hours after sunset. Captured animals were identified, sexed, the reproductive condition was recorded, and forearm length and weight were determined. Individuals were marked with coded collars (Esbérard & Daemon 1999).

RESULTS

We marked 196 individuals of *A. lituratus* at PEPCV and 15 individuals in the municipality of Alfredo Chaves. On 18 January 2007, a male *A. lituratus* was captured in *restinga* vegetation near a lagoon at PEPCV (20°36'18"S, 40°25'18"W). The animal weighed 56 g and its forearm measured 68.9 mm. We marked it with a collar coded as 333.

Seven months later, on 17August 2007, two hours after sunset, the same individual was recaptured in the municipality of Alfredo Chaves near a fruiting fig tree (*Ficus* sp.) surrounded by pasture (20°39'26"S, 40°45'39"W). The weight of the animal at this time was 72g.

The linear distance between the two capture sites is approximately 35.9 km. There is no urban area between the original capture and the recapture site, and the landscape is a mosaic composed of rural areas (pastures, *Musa* sp. and *Cocos nucifera* plantations) and small Atlantic Forest fragments.

DISCUSSION

There are some estimates of distances moved by some Neotropical bats, and different bat species may have different movement capabilities. Fleming *et al.* (1972) registered at Finca La Pacifica in Costa Rica that *Artibeus jamaicensis, A. lituratus, Glossophaga soricina*, and *Phyllostomus discolor* used larger areas and tended to be nomadic in comparison with *Carollia perspicillata, Sturnira lilium, Artibeus phaeotis*, and *Desmodus rotundus*.

Additionally, different matrix types promote different degrees of barrier to different bat species. Meyer & Kalko (2008) showed that water bodies seem to be a movement barrier, and many bat species apparently do not regularly cross it. Oprea *et al.* (2009) showed that only one species out of ten (*A. lituratus*) was found in non-wooded streets in an urban landscape.

Bernard & Fenton (2003) showed that savanna areas surrounding forest fragments in the Amazon did not prevent the movement of several bat species. Medina *et al.* (2007) reported that bats were capable of crossing several types of matrix (e.g. pastures, live fences, forest fallows, riparian forests, and secondary forests), but most of these movements were observed through the riparian forests. In this study, a movement of 764 m was recorded for *A. lituratus*.

In southern Brazil, Bianconi *et al.* (2006) recorded a movement of 4.9 km for *A. lituratus*, between forests fragments embedded in an agriculture-pasture matrix. Menezes-Jr. *et al.* (2008) recorded a movement of 34.8 km for *A. lituratus*, between an island and the continent, with a distance of at least 500 m of sea between the capture sites. Of the recorded movement distances for the species, this last one is similar to our result (35.9 km).

The movement recorded for this individual could have been influenced by resource availability. Morrison (1978) reported a pattern change in the movement of *A. jamaicensis* in Panama, in accordance with the availability of mature fig fruits. Fleming (1988) observed a similar pattern for *Carollia perspicillata*. The fact that this individual crossed pasture and agricultural areas might support the suggestion that *A. lituratus* is a species that can cope rather well with habitat destruction and fragmentation (Galetti & Morellato 1994, Zortéa & Chiarello 1994, Wilson *et al.* 1996).

Frugivorous bats are of great ecological importance (Fleming 1988). They may promote seed dispersal between isolated fragments (helping to maintain gene flow among populations), they may rescue plant populations from demographic and genetic stochastic events, and help the regeneration of degraded areas. One example of this service provided by bats was demonstrated by Kelm *et al.* (2008), who reported that artificial roosts in deforested areas (like pastures) could increase the seed inputs from neighboring forest fragments. Large Phyllostomidae species (like *A. lituratus*) utilize re-

sources more patchy in space than small species, suggesting its potential as a long-distance seed disperser (Heithaus *et al.* 1975). Garcia *et al.* (2000) found seeds from 13 plant species in the faeces of *A. lituratus*, another evidence of its potential to disperse a great variety of plants. To our knowledge, there are no studies that measured the seed dispersal distance for this bat species.

Our study provides new data about the movement behavior of *A. lituratus,* indicating that an individual could move over large distances (35.9 km) in a mosaic landscape composed of different habitat types (e.g. *restinga* and pasture), and connect areas with different conservation status (protected and non-protected areas). Our results confirm previous results that *A. lituratus* potentially contributes to maintaining gene flow among plants between forest fragments, even when these are separated by more than 35 km and by non-forested areas.

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