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## On the phylogenetic position of *Carollia manu* Pacheco *et al.*, 2004 (Chiroptera: Phyllostomidae: Carollinae)

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### Abstract

The Neotropical bat genus *Carollia* (Phyllostomidae: Carollinae) currently includes eight species. *Carollia manu* was described in 2004 and is distributed in montane forests in southern Peru and Bolivia. The phylogenetic affinities of *C. manu* have never been assessed before. Phylogenetic analyses of cytochrome *b* sequences of seven of the eight known species of the genus place *C. manu* sister to *C. subrufa*. The analyses also suggest hidden diversity in the genus.

**Key words:** *Carollia*, Neotropics, Phyllostomidae, Phylogeny, Systematics

### Introduction

The Neotropical bat genus *Carollia* Gray, 1838 includes some of the most abundant species of mammals found in the Neotropics, where they play important roles in seed dispersal and forest regeneration (Fleming 1988; Lim & Engstrom 1998). This genus of small to medium-sized bats (forearm 33.7–44.6 mm, greatest length of skull 18.7–23.5 mm; Solari & Baker 2006; McLellan & Koopman 2008) is distributed from central Mexico to southern Brazil (Simmons 2005; McLellan & Koopman 2008). The genus *Carollia* currently includes eight species: *C. benkeithi* Solari and Baker, 2006; *C. brevicauda* (Schinz, 1821); *C. castanea* Allen, 1890; *C. manu* Pacheco *et al.*, 2004; *C. monohernandezii* Muñoz *et al.*, 2004; *C. perspicillata* (Linnaeus, 1758); *C. sowellii* Baker *et al.*, 2002; and *C. subrufa* (Hahn, 1905).

The most extensive revision of the genus was performed by Pine (1972). He recognized four species (*C. brevicauda*, *C. castanea*, *C. perspicillata*, and *C. subrufa*). Additionally Pine (1972) suggested that some specimens that he was unable to assign to the four aforementioned species could represent undescribed species (i.e., *Carollia* sp.? (1), *Carollia* sp.? (2), *Carollia* sp.? (3), and *Carollia* sp.). McLellan (1984) extended Pine's (1972) work by using morphometric techniques, including multivariate analyses, to examine geographic and nongeographic variation in cranial morphology. McLellan (1984) found that all the species included in her analyses (*C. brevicauda*, *C. castanea*, *C. perspicillata*, and *C. subrufa*) were easily separated by the multivariate analyses; additionally she found that sexual dimorphism was present in all species, where males were consistently larger than females.

During the past decade, the systematics of the genus has changed dramatically: *C. benkeithi* and an undescribed species were recognized from populations usually assigned to *C. castanea* (see Solari & Baker 2006); *C. colombiana* Cuartas *et al.* 2001 was described from specimens from northern Colombia, but later synonymized with *C. brevicauda* (see Zúrc & Velazco 2010); *C. manu* Pacheco *et al.* 2004, the *Carollia* sp.? (3) of Pine (1972), was described from montane forests in southern Peru and Bolivia (Fig. 1); *C. monohernandezii* Muñoz *et al.* 2004 was described from several localities in Colombia, but later restricted to the type locality—Colombia: Caquetá, Florencia, Villaraz (Zúrc & Velazco 2010); and *C. sowellii* Baker *et al.* 2002 was described to include Central American populations north of central Panama that had been previously assigned to *C. brevicauda*.

Several hypotheses of phylogenetic relationships of the species of *Carollia* have been published in different