Two New Specimens for the Bolivian Endemic Titi Monkeys, Callicebus olallae and Callicebus modestus

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Source: Neotropical Primates, 20(1) : 39-44

Published By: Conservation International

URL: https://doi.org/10.1896/044.020.0106
Introduction

The genus *Callicebus* is one of the most diverse for Neotropical primates (Van Roosmalen et al., 2002; Wallace et al., 2006; Defler et al., 2010). Six species of titi monkeys are now considered present in Bolivia including two endemics, *Callicebus olallae* and *Callicebus modestus* (Anderson, 1997; Wallace & Mercado, 2007; Martínez & Wallace, 2010). Lönnberg (1939) described these two endemic primate species based on only three specimens: one for *C. olallae* and two for *C. modestus*, collected by the Ollalla brothers in a 1937-1938 fieldtrip. Despite the low number of specimens and the proximity of the original collection sites (Patterson, 1992; Anderson, 1997), Lönnberg found sufficient evidence to consider them as separate species, and this position has been upheld in more recent taxonomic revisions of the genus (Hershkovitz, 1990; Kobayashi, 1995). No further information was available on these species until 2002 when researchers of the Wildlife Conservation Society (WCS) began field studies on the distribution, abundance and genetics of both endemic primates (Felton et al., 2006; Barreta, 2007; Martínez & Wallace, 2007; Lopez-Strauss, 2008). These studies noted several differences in pelage color between the two species. However, in the field this represents a great challenge because of the need to observe hair coloration patterns with observations at great distances and under difficult light conditions. The scientific collection of further specimens of these species for a complete taxonomic revision has not been considered due to their endemic status and probable low population sizes (Martínez & Wallace, 2007; Lopez-Strauss, 2008). Instead, emphasis has been placed on collecting fresh scats in order to facilitate genetic analyses of taxonomic status (Wallace et al., 2013; Barreta et al., unpublished data).

The area where these primates occur also includes other species of scientific and conservation interest, for example, the wattled curassow, *Crax globulosa*, which was rediscovered in 2001 (Hennessy, 2003). During a 2005 field trip along the Negro River, near the Beni River (Fig. 1) to document the biology of this regionally threatened cracid, HA was able to photograph a juvenile or subadult captive *C. modestus* individual in the Monte Rey community (13.284611 S; 67.259861 W). On a return visit in June 2005 HA was able to collect the recently deceased monkey that had been decomposing for almost a week and preserved it in alcohol. This specimen was frozen in the laboratory of the Institute of Molecular Biology and Biotechnology from the Universidad Mayor de San Andrés in La Paz. In May 2009, the *C. modestus* specimen was prepared, and subsequently deposited in the Mammalogy Department of the Colección Boliviana de Fauna in La Paz (Specimen Number: CBF 8381). In June 2007, JM began a behavioral ecology study on *C. olallae* at La Asunta (14.236483 S; 66.982533 W), a private cattle ranch adjacent to the Yacuma River (Figure 1). On 15th June 2007, he rescued a *C. olallae* skin from ranch workers that had been hunted opportunistically for fishing bait. This adult male skin had already been cleaned, stretched and dried in sunlight, and is incomplete because the head, feet and hands were removed and not preserved. This skin was also deposited in the Colección Boliviana de Fauna in La Paz (Specimen Number: CBF 8380). Here we describe these new specimens and compare pelage color and characteristics with previous descriptions (Lönnberg, 1939; Hershkovitz, 1990; Felton et al., 2006; Martínez & Wallace, 2007).

Results

The new *C. modestus* skin is predominantly a non-uniform brown color with orange tones (Fig. 2a). This color is somewhat darker dorsally becoming paler on the ventral portions of the specimen. The pelage, particularly dorsally, shows a conspicuous agouti pattern with light and dark bands alternating along each hair, resulting in the non-uniform brown appearance (Fig. 2b). The tail is conspicuously dark gray and contrasts clearly with body color (Fig. 2c). Fore and hindquarters are also non-uniform brown although somewhat lighter than body, and hand and feet pelage include black and gray hairs (Fig. 2d and 2e). A noticeable feature, despite the partial deterioration of the *C. modestus* specimen, is that in general the pelage of appears to be short and somewhat disheveled. The previous description is consistent with previous holotype skin and field observation descriptions which have mentioned the agouti pattern of body pelage, overall pelage coloration and the different color of tail as defining characteristics (Lönnberg, 1939; Hershkovitz, 1990; Felton et al., 2006; Martínez & Wallace, 2007). The original descriptions by Lönnberg (1939) indicated a general gray tone in all the pelage and field observations of Felton et al (2006) and Martínez & Wallace (2007) reported a pale zone at the ventral base of tail. Neither of these characteristics was observed in this new juvenile specimen.

The skin of the new *C. olallae* specimen is characterized by a uniform reddish brown pelage color (Fig. 3a). Individual hairs do not show agouti banding patterns. Instead hairs show a broad orange brownish band with dark brown hair tips (Fig. 3b). Body color is darker dorsally turning paler on the ventral side of the body, arms and legs (Fig. 3c). Fore and hindquarters are uniformly brown with noticeable black tips, while the ventral pelage is non-uniform brown (Fig. 3d). The skin of the juvenile appears to be shorter and somewhat disheveled (Fig. 3e).

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Tail color is darker than the body but does not contrast as markedly as in *C. modestus* (Fig. 2a, 2c and 3a). However, at the base of the tail there is a 6.7 cm long band that appears markedly paler (Fig. 3c). The long hairs of the body and tail give the pelage a very silky texture. This *C. olallae* specimen shows the characteristic features mentioned in previous descriptions (Lönnberg, 1939; Hershkovitz, 1990; Felton et al., 2006; Martinez & Wallace, 2007).

**Figure 1.** Original localities of the skins of *Callicebus modestus* and *Callicebus olallae*. 
Figure 2. *Callicebus modestus* skin (a), and details showing (b) agouti coloration pattern of hair, (c) coloration of body and tail pelage, (d) hairs on arm and hand and (e) leg and foot.
Figure 3. *Callicebus olallae* skin (a), and details showing (b) hair coloration pattern, (c) basal tail pelage, (d) hairs on arm and hand and (e) leg and foot.
However, Felton *et al.* (2006) reported disheveled pelage textures more similar to *C. modestus*, but this may have been due to recent rain and resulting wet fur in their field observations (A. Felton pers. comm. to Wallace, 2002). This change in appearance was also observed for *C. olallae* in a behavioral study (Martínez pers. obs., 2007).

We measured the skins and the hair (Table 1). Lönnberg (1939) reported average hair length for each species, however, there is no description of how he did this and so we measured back hair length from the central part of the back. Hair length is slightly longer in *C. olallae* than in *C. modestus*, an observation similar to previous examinations by Lönnberg (1939) and Hershkovitz (1990). Differences in the age of the specimens (*C. modestus* was a juvenile or sub-adult) as well as the incomplete nature of the *C. olallae* skin (lacking of head, hands and feet portions), makes body size measurement comparisons challenging. The condition of the *C. olallae* skin also precludes the possibility to compare facial and head hair color. It is also important to recognize that the new *C. modestus* specimen does not completely show the adult representative coloration patterns, although observed differences increase our knowledge about the development and morphology of this species. Nevertheless, all descriptions refer to the conspicuous banding present in *C. modestus* hairs as the most relevant diagnostic characteristic between the two species. *C. olallae* has longer and silky hair than *C. modestus*, and the tail coloration in *C. olallae* is more similar to the body hair color although the base of the tail is paler. Tail color in *C. modestus* is entirely dark grayish and clearly different from body color. These are useful diagnostic characteristic and confirm field observations (Martínez & Wallace, 2007). Although the preservation of these specimens by local people did not follow standard taxidermy standards, this study underlines the potential importance of local people for donating valuable scientific material that would otherwise be thrown out as garbage or consumed by domestic animals.

### Conclusions

These new *C. olallae* and *C. modestus* specimens represent a unique opportunity to compare previous taxonomy and to confirm field identifications, particularly if we consider that the original descriptions of both species were made over seventy years ago using only two individuals for *C. modestus* and one for *C. olallae*. Considering their similar appearance, close proximity, threatened status and the ongoing ecological studies that have been initiated on both Bolivian endemic monkeys, the confirmation of their identification using genetic material such as the opportunistically collected specimen reported herein and/or scat material (Barreta *et al.*, unpublished data) is of paramount importance.


### References


