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Preliminary Report and Conservation Status of the Río Mayo Titi Monkey, *Callicebus oenanthe* Thomas, 1924, in the Alto Mayo Valley, Northeastern Peru

Anneke M. DeLuycker

Department of Anthropology, Washington University, St. Louis, Missouri, USA

Abstract: From October 2004 to September 2005, I conducted a study on the behavioral ecology of the rare and endangered Río Mayo titi monkey (*Callicebus oenanthe*) in a fragmented premontane tropical forest of the Alto Mayo, near the town of Moyobamba, in northern Peru. This is the first such field study on this species. The study group consisted of an adult male, an adult female, and two offspring (a male and a female). An infant was born in May 2005. No offspring dispersed during the study. Data were recorded using instantaneous focal animal sampling and it was possible to obtain detailed information on behavior because the individuals could be identified and the group was easily followed at close range. There are pelage differences among the age and sex categories. Pelage coloration differences in individuals of different groups may indicate color morphs or possible subspecies. The conservation status of *C. oenanthe* is described, with the conservative estimate that it persists in less than 1,800 km² of forest, much of it now fragmented. *Callicebus oenanthe* is extremely threatened by deforestation, a severely fragmented habitat, and the scarcity of large forest tracts to maintain viable populations. I recommend that it should be upgraded to the status of Endangered in the IUCN Red List.

Resumen: Desde octubre de 2004 hasta septiembre de 2005, yo realicé un estudio en la ecología y el comportamiento del mono tocón (*Callicebus oenanthe*), una especie raro y en peligro de extinción, en un bosque tropical premontana y fragmentado de Alto Mayo, cerca del pueblo de Moyobamba, en el nordeste de Perú. Este estudio documenta el primer tal estudio del campo en esta especie y presenta fotografías en vida silvestre de esta especie poco conocida. El grupo del estudio consistió por un macho adulto, una hembra adulta, un juvenil (macho), y una infante (hembra), y luego un infante recién nacido en mayo, 2005. Ninguna migración de descendencia fue observada durante el estudio. Los datos se han tomado usando el método "focal instantáneo". Este estudio permitió los datos detallados en el comportamiento, porque los individuos pudieran ser identificados y habían podido ser observado de cerca. Se observaron diferencias en la coloración entre las categorías de la edad y del sexo, y se los describen en detalle. Se han notado diferencias en coloración de los individuos puede indicar "color morphs" o posible un subespecie. El estado de conservación de esta especie se describe, con la estimación que esta especie persiste en menos de 1800 km² de bosque restante, mucho de esto fragmentado. *Callicebus oenanthe* esta sumamente amenazado por las tasas altas de deforestación, un hábitat severamente fragmentado, y escasez de bosque continuo para mantener las poblaciones viables, y yo recomiendo que *C. oenanthe* se deben actualizar al estado de En Peligro en las inscripciones de IUCN.

Key Words: New World, Pitheciidae, primate ecology, conservation, Andean premontane forest, forest fragmentation

Introduction

The first long-term study on the behavior and ecology of the endangered Río Mayo or Andean titi monkey, *Callicebus oenanthe*, was conducted on the western side of the upper Río Mayo (Alto Mayo), in northern Perú from October 2004 until September 2005. *Callicebus oenanthe* is found only in the Alto Mayo valley of northern Peru in the Department of San Martín (Hershkovitz 1990). *Callicebus oenanthe* was reviewed in the recent monograph on the taxonomic revision of the genus *Callicebus* by Van Roosmalen *et al*. (2002), but only a drawing was included. Rowe and Martinez (2003) carried out a four-day survey of *C. oenanthe*, but did not observe it in the wild. Rowe was able to photograph a captive family of *C. oenanthe* at a local market. Mark (2003) carried out a two-month survey of *C. oenanthe* in five sites of the upper Río Mayo valley and conducted interviews to obtain information on its presence or absence in native Aguaruna forests. The photographs presented here, taken by the author (Figs. 1–3), are the first to be published of *C. oenanthe* in its natural habitat.

Figure 1. The Río Mayo titi monkey, *Callicebus oenanthe*. Adult male and infant near Moyobamba (6°01′31.9″S, 76°59′33.7″W, elevation 891 m a.s.l.).

Figure 2. The Río Mayo titi monkey, *Callicebus oenanthe*. Adult female near Moyobamba (6°01′31.9″S, 76°59′33.7″W, elevation 891 m a.s.l.)

Figure 3. The Río Mayo titi monkey, *Callicebus oenanthe*. Juvenile near Moyobamba (6°01′31.9″S, 76°59′33.7″W, elevation 891 m a.s.l.).

I studied a group of five *C. oenanthe* in a privately-owned fragmented forest, near the town of Moyobamba (6°01′31.9″S, 76°59′33.7″W) at an elevation of 891 m a.s.l. The Alto Mayo valley is in the eastern foothills of the Andes, in the northeastern Department of San Martín, which comprises the provinces of Rioja and Moyobamba. The broad valley is flat to undulating, with low hills, high hills, and mountainous terrains. It is surrounded by the Cordillera Oriental to the southwest and the Cahuapanas to the northeast. The forest surrounding Moyobamba is Humid Premontane Tropical Forest, according to the Holdridge system of life zones (Holdridge 1967). The climate is tropical and humid, with the rainy season occurring from October to April, averaging 148 mm of rainfall per month. The dry season is from June to August, averaging 60 mm/month. The months of transition are May and September, during which average rainfall is 103 mm/month. Most variability in rainfall occurs from October through March (wet season). The average monthly temperature ranges from a minimum of 16°C to 21°C and a maximum of 26°C to 30°C, with an average annual temperature of 22°C (Peru, PEAM 2004).

There were a number of distinct vegetation formations in the forest fragment occupied by the titi monkey study group. They include *Cecropia*-dominated stands, bamboo stands, an area of low secondary forest, viney thickets, and fruit crops. The trees in a steep ravine in their range were especially tall and broad-trunked. The forest was surrounded by a rice field, cattle pasture, human settlements, and roads. It is largely isolated from other fragments, with only a few scattered trees in its vicinity, separated by 10 m or more, which could possibly be used by the monkeys. The area used by the titi monkeys during the study was approximately 2 ha. The group used the majority of this area early in the study, but abandoned the use of the ravine after the birth of the infant. A group of 10 saddleback tamarins (*Saguinus fuscicollis leucogenys*) also lived in the fragment, and I noted a number of instances of interactions between the two species.

From October 2004 to May 2005, the group consisted of an adult female, an adult male, a male juvenile (Juvenile I) and a female infant (Infant I) (an infant becomes a juvenile only when independently locomoting [*sensu* Kinzey 1981]). The adult female gave birth on 15 May 2005, and the infant's development was studied in detail (in addition to all other behavioral data) until September 2005. The group consisted thereafter of an adult female, adult male, Juvenile II (male), Juvenile I (female), and Infant II (male).

Pelage color of all individuals was light brown agouti, not dark brown agouti, and the ventral areas (chest, belly, inner limbs) were orange, not red-orange. This differs markedly with the darker coloration of the individuals photographed by Noel Rowe (2003). Mark (2003) reported pelage coloration differences between individuals seen close to the Río Mayo and those in areas to the northeast. This strongly suggests color morphs or possible subspeciation (see Fig. 4).

The pelage of the adults and the young differed in the degree of distinctiveness of the white frontal blaze and the strength of the orange coloration of the chest, belly, and inner

limbs. The adult male and female differed in pelage coloration as well (see below); this may, however, be individually based rather than an overall species characteristic. Further research is needed to confirm this.

Sex and Age Differentiation

Adult male

The adult male has a very distinct white frontal blaze, extending upward on the head forming a triangular buffy-colored extension or tuft of whitish hairs on the crown. Its beard is also buffy. The outer surfaces of the limbs, cheiridia, and tail are dominantly light agouti brown to buffy. Hair bases (closest to skin) are black. Super- and subciliary fringes (or patches) around the eyes are black, and the shading is circular around eyes. The inner surface of the limbs, chest, and belly are orange, but not as strongly colored as in the female. The adult male in the study group was much more buffy to pale blonde than the adult female.

Adult female

The face is strongly framed with a distinct white frontal blaze, which extends up onto the crown where it is distinct from the darker agouti hairs. The sideburns are white, and connect with the frontal blaze to frame the face. The white sideburns and frontal blaze contrast sharply with the surrounding beard, which is orange to agouti. The inner surfaces of the limbs, chest, and belly are orange. The outer surfaces of the limbs and tail are darker brown agouti than in the male. Black supra- and subciliary circular eye fringes are present. The adult female appears to be larger than the adult male. This was especially apparent when the female was lactating and the male was carrying the infant the majority of the time. No exact body weights could be obtained.

Juvenile II (approx. 18 months)

The juvenile at this age has light brown agouti-colored pelage on the outer surfaces of the limbs, cheiridia, and tail. The frontal blaze and sideburns are whitish, distinctly framing an orange-agouti beard and crown. Supra- and subciliary fringes are blackish, with the subciliary coloration extending down in a teardrop shape, surrounding the eyes. The pelage is not as long and shaggy as seen in the adults.

Juvenile I (approx. 9 months)

The juvenile at this age is similar in pelage to the older juvenile, but the frontal blaze is not as strongly white and has buffy-colored agouti hairs interspersed. Also, the contrast between orange undersides and light brown agouti outer surface is not as distinct.

Infant II (born 15 May 2005)

The pelage of the infant at birth is uniform in color, with its entire body covered with short, dark agouti-orange hairs. Its pelage contrasts with the adult male's buffy-agouti colored pelage. The frontal blaze around the face, including the malar sideburns, does not become apparent until the infant reaches five weeks of age (whitish hairs become apparent in the eyebrow region as soon as two weeks after birth).

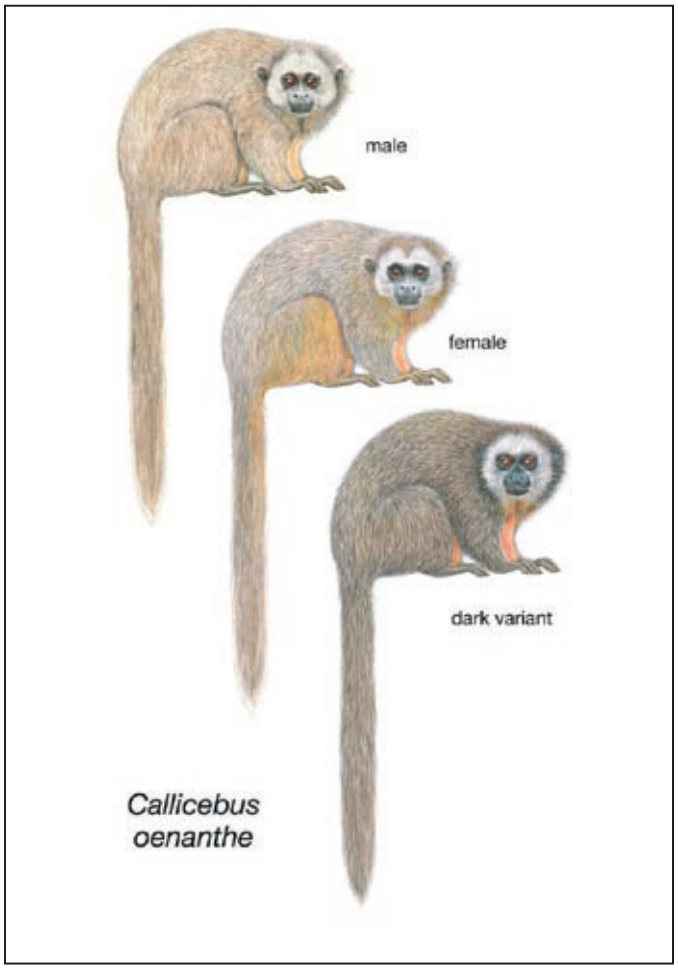

Figure 4. The Río Mayo titi monkey, *Callicebus oenanthe*. Illustrations by Stephen D. Nash.

Methods

The group was habituated for two months before systematic data could be taken consistently and reliably. Data were recorded using an instantaneous focal animal sampling method (Altmann 1974), which could be used reliably because all individuals could be identified and I was able to observe detailed behavior at close range (at an average distance of 5–6 m). This is in contrast to previous studies of *Callicebus*, in which most or all individuals (especially offspring) could not be individually identified. The forest at this site was mostly secondary, and included many vine species. As has been found in other studies of titi monkeys, *C. oenanthe* tended to hide in thick vine clumps in tree crowns. It was much easier to follow individuals because group members were very rarely in full view simultaneously. They tended to forage at some distance from each other.

I collected behavioral data every two minutes, at which time I recorded the individual, the time, activity, activity type,

food types and sources, height in vegetation, vegetation type, posture or locomotion type, branch angle and branch size, nearest neighbor, and distance to nearest neighbor. I recorded phenological data using a transect line survey and an index score (0 to 4) on new leaf, fruit, and flower availability. I took measurements (Diameter at Breast Height [DBH], height, and crown diameter) on a sample of trees in the habitat (using line transects) and on all of the trees they fed in.

Data are currently being analyzed, but preliminary observations suggest that the titi monkeys included a large number of liana species in their diet, eating the leaves, tendrils, young pith, young seeds, and fruits. They were also observed eating large quantities of fruits from aerial stem-parasitic plants of the families Viscaceae and Loranthaceae (mistletoes). A lot of their time was spent foraging for insects, which formed a considerable portion of their diet. The group used only three sleeping sites consistently during the entire study, which contrasts with other studies in which *Callicebus* would change their sleeping sites frequently (Kinzey 1977; Easley 1982; Wright 1985).

Survey of the Native Community

I conducted a brief survey of the native Aguaruna community of Yarau (Fig. 5), which occupies 13,840 ha of primary forest. I showed drawings and photographs of various primates to community members, asking them to inform or otherwise detail the presence of *C. oenanthe*, known as "sugkamat" in the Aguaruna language. People mentioned that they are present in Yarao, and also are known to occur in other native communities to the north (Morroyacu and Nuevo Jerusalen), confirming their suspected range besides the areas surveyed by Rowe and Martinez (2003) and Mark (2003). Two other Peruvian endemic primates occur in the Alto Mayo region: the yellow–tailed woolly monkey, *Oreonax flavicauda*, and the Andean night monkey, *Aotus miconax*, both of them highly endangered. The presence of *O. flavicauda* in the higher altitude forests of Yarau (7–8 hours hiking distance) was also mentioned by the Aguarunas. Although I never saw them, I heard the hoot-calling of night monkeys on various occasions and their presence was also confirmed by the community

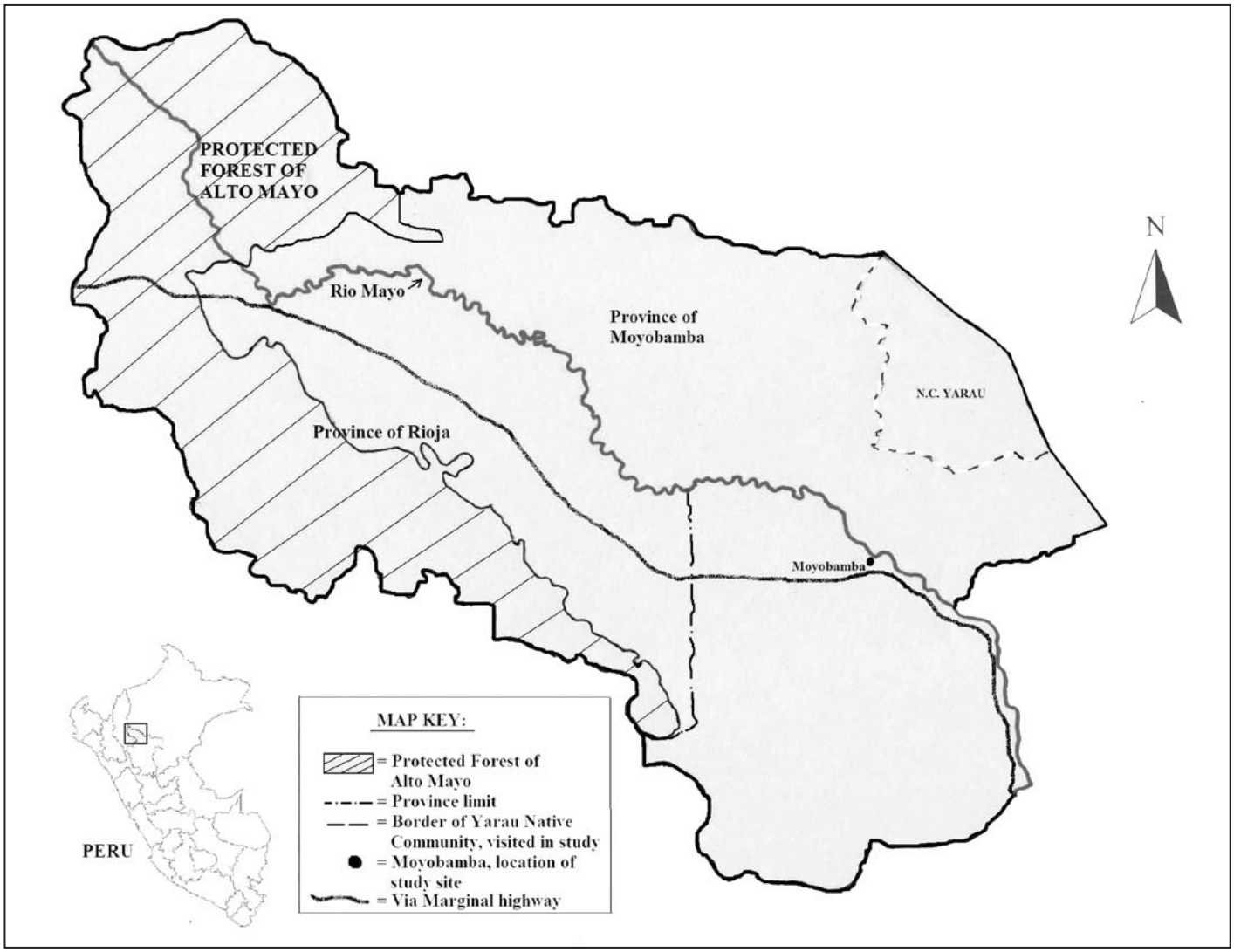

Figure 5. Location of study site within the Alto Mayo Basin (upper Rio Mayo valley), which consists of the provinces of Moyobamba and Rioja, in the north of the Department of San Martín, Peru.

members. Until recently the larger monkeys such as *O. flavicauda* and spider monkeys (*Ateles belzebuth*) were abundant in the lower parts of the forests, but have now been extirpated there due to hunting and deforestation, or have moved into the higher elevation forests.

With the help of community-assisting organizations such as the GTZ (German Technical Cooperation) and PEAM (*El Proyecto Especial Alto Mayo*), the Aguaruna have attempted to integrate domestication of animals such as *majas* (*Agouti* and *Dasyprocta*) and *sajino* (*Tayassu tajacu*) into their subsistence. Just a few families were raising agouti when I visited the community. Some game, such as agouti and peccary, is taken to markets and sold. Large game is scarce and even small birds are hunted. I did not witness the Aguarunas hunting any monkeys during my stay there, although the smaller species are game whenever the opportunity arises. The larger primates have long disappeared from the more easily accessed parts of the forests. *C. oenanthe* is hunted by locals outside the Aguaruna native community lands, and one I saw had been killed by a landowner to provide food for his dogs. Titis are also captured for the local pet trade and are sold in markets. New land invasions and occupation by *mestizo* peoples and the annexation of land (splitting into new territories) by indigenous community members are common, resulting in increasing conflict. There are a total of 14 indigenous Aguaruna communities located throughout the Alto Mayo region, occupying a considerable portion of forested area. These areas, due to their large expanses of forest, are key to conservation initiatives in the region. Indigenous community members in Yarau use the land to plant mostly yucca, corn, and coffee, a growing practice in the area.

Conservation Implications

The entire geographic range of *C. oenanthe* is restricted to the upper Río Mayo valley (Alto Mayo), which covers an area of approximately 630,700 ha. I made a number of trips into the higher altitude cloud forests of the Bosque de Protección (Fig. 5), which extends north along the border between the departments of San Martín and Amazonas. I did not encounter *C. oenanthe* there and their altitudinal range, it would seem, is restricted to below 1,000 m. The Instituto de Investigaciones de la Amazonia Peruana (IIAP), Iquitos, estimated that 268,487 ha of the Alto Mayo region had been deforested by 2004, thus leaving an estimated 362,213 ha of forest as potential habitat for *C. oenanthe* (Peru, IIAP 2004). Subtracting the area of the high-altitude forest of the Bosque de Protección (182,000 ha), this leaves an estimated potential distribution (area of occurrence) of *C. oenanthe* of a mere 180,213 ha (1,802 km²). This forest is disappearing at an alarming rate, and during my stay many patches were burned or cut down. Estimated rates of deforestation in the region of San Martín vary from 50,000 to 100,000 ha per year (Brack 2004; López Cardeñas 1994, respectively). The forest is also becoming much more fragmented, so titi monkey groups are increasingly isolated, surrounded by cattle pasture and rice fields. This fragmentation precludes the titi monkey's ability to migrate into new areas to reproduce and establish new territories. Titi monkeys were absent from a number of fragments I visited, and the locals informed me they had not been heard or seen in them for some four years or more.

Another severe problem in this region is the unregulated influx of migrants from the sierras, which has increased considerably over recent years. The conclusion in 2003 of a two-lane asphalt highway running alongside the Río Mayo has also contributed to this increase in immigrants, and a change from traditional subsistence and small-scale farming. The Alto Mayo was a focus of a major agrarian program (the second largest in the entire country) attracting large numbers of immigrants to San Martín during the latter part of the 1980s, and deforestation increased considerably accordingly (Rengifo Ruiz 1994). The most important crops being promoted were rice and corn. This influx did not just cause an increase in population density, it changed its spatial distribution. Before the construction of the highway, settlements had been established mainly along rivers and creeks, but now they accompany the highway, extending far into the valley and high forests (Maskey *et al*. 1991). This intense colonization, combined with a lack of state regulation of land use and territory occupation, places protected areas and the remaining forests at high risk.

An agriculturalist from the area of Moyobamba can earn between 10 to 15 soles per day ($3–4). One of the major crops grown in the valley is rice, which sells for 75–80 cents per kilogram (other crops include coffee, corn, plantain, yucca, and cotton). Such a low price demands fields larger than 20 ha for the crop to be profitable. Rice, however, is still unprofitable for the region because it is also imported from a number of countries, and due to the poor soils it is necessary to apply large quantities of costly fertilizer. Intense application of fertilizer results in severe water and soil contamination throughout the valley's watersheds. Coffee is grown even in the lower altitude regions on the steep slopes, and can bring a better price than rice, although it is subject to a fluctuating market. The coffee is mostly not shade-grown and the plantations result in total deforestation. Forests are cleared using slash-and-burn techniques and crops grown in this manner give rise to non-sustainable markets. Custom and lower cost mean that cooking is mostly with firewood even when propane is available. The remaining fragments where *C. oenanthe* live are prime forests that are rapidly cut and used for fuel and to build houses and fences.

Other areas where *C. oenanthe* were heard calling during my surveys and reported to exist by local people were in *renacales* (*Ficus*-dominated forests) and *aguajales* (*Mauritia flexuosa* palm-dominated forests), both of which are semi-inundated forests found near rivers. The *aguaje* palm fruit is an important agroforestry food product, and *aguajales* are crucial ecosystems, maintaining rare species of animals and plants that rely on the palm trees and the swampy grasslands. These palms are a crucial component for titi monkeys (they eat the fruit of these and several other palm species), and their sustainable use and exploitation by humans provides an

important conservation opportunity for *C. oenanthe* and the remaining forests of the region.

The provision of forest corridors is urgent throughout the highly fragmented range of *C. oenanthe*, being as they are the only means to ensure that remaining groups and individuals can disperse and colonize isolated forest patches. Local government should support landowners to do this and reward those still keeping forests intact, even through financial aid based on acreage of intact forest. It is important to control and implement regulations over new farming settlements in the region, as well as those existing.

A local association, Sacha Llaqta (meaning "Forest Land"), was recently formed by the author and Rosse Mary Vásquez Ríos of Moyobamba in the hopes of creating a foundation for the preservation of the forests in the area and for restoration efforts to reconnect forest fragments. The association is seeking participation with national and international organizations, with these goals in mind. Strong interest in a multitude of conservation initiatives needed for the region exists; I was approached by the municipal leaders of two towns in the area interested in the sustainable use and preservation of their large expanses of *aguajales* and cloud forests.

Further surveys of *C. oenanthe* are still urgently needed to obtain population estimates and densities, in order to assist in the management and protection of its remaining habitat. We have no information on their numbers and ranges in larger (continuous) forest tracts. Its minute geographical range and narrow altitudinal range (750–950 m a.s.l) indicates that a large proportion of the population is now restricted to isolated forest fragments. *Callicebus oenanthe* is currently listed as Vulnerable on the *IUCN Red List of Threatened Species* (IUCN 2004), but due to the extremely high rate of deforestation in the Alto Mayo area, the increasing fragmentation of the forest, and the scarcity of potential forest habitat (<1,800 km²), I recommend that its status be upgraded to Endangered. Additional surveys and studies will confirm the urgency of protection and conservation measures needed in this region.

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Literature Cited

Altmann, J. 1974. Observational study of behavior: sampling methods. *Behaviour* 49: 227–265.

Brack, A. 2004. Desarrollo sostenible en la San Martín, Febrero Boletín, San Martín, Perú.

Easley, S. P. 1982. Ecology and behavior of *Callicebus torquatus*, Cebidae, Primates. PhD thesis, Washington University, St. Louis, Missouri.

Hershkovitz, P. 1990. Titis, New World monkeys of the genus *Callicebus* (Cebidae, Platyrrhini): A preliminary taxonomic review. *Fieldiana Zool., New Series* 55: 1–109.

Holdridge, L. R. 1967. *Life Zone Ecology.* Tropical Science Center, San José, Costa Rica.

IUCN 2004. *2004 IUCN Red List of Threatened Species.* Website: www.iucnredlist.org. Accessed 26 March 2006.

Kinzey, W. G. 1977. Diet and feeding behavior of *Callicebus torquatus*. In: *Primate Ecology: Studies of Feeding and Ranging Behavior in Lemurs, Monkeys, and Apes*, T. H. Clutton-Brock (ed.), pp.127–151. Academic Press, London.

Kinzey, W. G. 1981. The titi monkeys, genus *Callicebus*. In: *Ecology and Behavior of Neotropical Primates*, Vol. 1, A. F. Coimbra-Filho and R. A. Mittermeier (eds.), pp.241–277. Academia Brasileira de Ciências, Rio de Janeiro.

Lopez Cardenas, W. 1994. Centros de Biodiversidad para la preservación de la flora y fauna en la Región San Martín-Perú. Proyecto Especial Huallaga Central y Bajo Mayo, Dirección de Manejo Ambiental. Tarapoto, San Martín, Perú.

Mark, M. M. 2003. Some observations on *Callicebus oenanthe* in the upper Río Mayo Valley, Peru. *Neotrop. Primates* 11(3): 183–187.

Maskey, A., J. Riojas and T. Pinedo (eds). 1991. *Raices y Bosques, San Martín, Modelo para Armar*. Tecnología Intermedia, Lima. 235pp.

Peru, IIAP. 2004. *Mapa Forestal de la Cuenca Alto Mayo: Mezozonificación de la Cuenca Alto Mayo*. Instituto de

Investigaciones de la Amazonía Peruana (IIAP), Iquitos, Departamento de Loreto, Perú.

Peru, PEAM. 2004. *Boletín Meteorológico e Hidrológico del Alto Mayo, 1996–2004*. El Proyecto Especial Alto Mayo (PEAM), Moyobamba, Departamento de San Martín, Perú.

Rengifo Ruiz, G. 1994. Bases para la gestión de los recursos naturales y elaboración de un plan de ordenamiento territorial del departamento de San Martín. Ministerio de Agricultura, Departamento de San Martín, Moyobamba, Perú.

Rowe, N. 2003. Primate Conservation, Inc. (PCI). Primate Gallery. The Andean titi monkey (*Callicebus oenanthe*) is found only in the Rio Mayo valley of Peru near the town of Moyobamba. Website: http://www.primate.org/gallery11.htm. Accessed 24 April 2006.

Rowe, N. and W. Martinez. 2003. *Callicebus* sightings in Bolivia, Peru and Ecuador. *Neotrop. Primates* 11(1): 32–35.

Van Roosmalen, M. G. M., T. van Roosmalen and R. A. Mittermeier. 2002. A taxonomic review of the titi monkeys, genus *Callicebus* Thomas, 1903, with the description of two new species, *Callicebus bernhardi* and *Callicebus stephennashi*, from Brazilian Amazonia. *Neotrop. Primates* 10(Suppl.): 1–52.

Wright, P. C. 1985. The costs and benefits of nocturnality for *Aotus trivirgatus* (the night monkey). PhD thesis, City University of New York, New York.

Author's address:
Anneke M. DeLuycker, Department of Anthropology, Washington University, St. Louis, MO 63130, USA. E-mail: <amdeluyc@artsci.wustl.edu>.

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