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NEW LOCALITY RECORDS AND THE FIRST PHOTOGRAPHS OF LIVING *ECHIMYS SATURNUS* (DARK TREE RAT, ECHIMYIDAE) FROM EASTERN ECUADOR

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INTRODUCTION

Echimys saturnus (Thomas, 1928), the dark tree rat, is a poorly-known member of the Echimyidae (spiny rats, tree rats). A recent revision included two species in the genus (Emmons 2005), with a third species subsequently described from Brazil (Iack-Ximenes *et al*. 2005). It is reported to be arboreal, as is true for other members of the genus, and to nest in hollow trees with one or two young once or twice per year (Emmons & Feer 1997, Eisenberg & Redford 1999). The species is distinctive, being the only large, blackish rat in its range with a fully-furred tail, the distal portion of which is white (Emmons & Feer 1997).

E. saturnus is known from a few scattered localities in eastern Ecuador and central Peru, on the upper Marañon River (Iack-Ximenes *et al*. 2005), to at least 1000 m a.s.l. in lowland and premontane rainforest (Emmons & Feer 1997, Woods & Kilpatrick 2005). According to Emmons & Feer (1997: 236), the species is "known from fewer than 10 individuals, from a small geographic range", which information is repeated by most web sources. According to IUCN Redlist, the species status is "Data Deficient", meaning that too little information is available on its distribution and life history characteristics to assess its status with respect to threats or conservation (Tirira & Solari 2008). To add to the sparse knowledge of this species, we report the first photographic records of *E. saturnus*, from lowland forest in eastern Ecuador.

STUDY AREA AND METHODS

We conducted our research at Tiputini Biodiversity Station (TBS), Orellana Province, Ecuador (c. 0°37'S, 76°10'W, 190-270 m elevation). TBS was founded in 1994 by the Universidad San Francisco de Quito (USFQ) in a tract of undisturbed lowland rainforest within the *c*. 1.7 million-ha Yasuní Biosphere Reserve, one of the most biologically diverse regions on earth (Bass *et al*. 2010). The station and nearby areas contain a variety of habitats, including *terra firme* and *várzea* forest, palm swamps and other wetlands, as well as areas of natural succession that follow tree-falls and wind-throws. The mean annual precipitation is about 2800 mm. There is a rainy season from April to early August when more than 65% of the annual rainfall occurs (monthly average *c*. 385 mm); 15% occurs from November to February (monthly average *c*. 140 mm) (based on data from 1998 to 2002; http://www.usfq.edu.ec/1TIPUTINI/research.html). January is often particularly dry (pers. obs., 2001-2010).

We used both digital (Snapshot Sniper, LLC) and film-based (Highlander Photoscout™, PTC Technologies) camera traps triggered by an infrared motion

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FIG. 1. Three *Echimys saturnus*, photographed at Tiputini Biodiversity Station, Ecuador, 6 November 2005 at 20:12 h.

and heat detector to document the occurrence of large terrestrial mammals and birds. Cameras were placed in *terra firme* forest along trails (14 sites, two cameras per site) and at four mineral licks (see Blake *et al*. 2010 for further description). Cameras remained continuously activated through July 2008 (except when batteries failed or other malfunctions occurred); date and time were automatically stamped on each photograph. We set cameras with a minimum time between photographs of 5 min. We checked cameras at regular intervals to replace film, batteries, memory sticks, and desiccant.

One of the mineral licks (0°37'36"S, 76°08'16.6"W) was located along an intermittent stream, in a drainage area approximately 10-12 m across; running water was typically present except during very dry periods. We installed two cameras (one with film, one digital) in January 2005, one on each side of the drainage. The film-based camera was removed after several months; the digital camera remained in operation through July 2008. Frequent visitors to the site included deer (*Mazama americana*), peccaries (*Tayassu tajacu*, *T. pecari*), tapir (*Tapirus terrestris*), and guans (*Pipile pipile*).

RESULTS AND DISCUSSION

We acquired 9 photographs of *Echimys saturnus*, during 297 trap-days (one trap-day indicates a camera trap operational for a 24-hour period) in 2005; the first photograph was taken on 30 January and the last on 6 November. One photograph includes three individuals close together at the edge of the stream, partially in the water (Fig. 1), whereas all other photographs show one individual, either moving towards the water or away from it, on mudflat areas that border the stream channel. Although the amount of white in the tail varied between the three individuals (Fig. 1), there was insufficient variation between

all photographs to determine if more than three individuals in total were involved. The earliest photograph was taken at about 20:00 h and the latest at 03:00, matching the reported nocturnal pattern for the species (Emmons & Feer 1997). Given that pairs are reported to produce one or two young per litter, the three individuals possibly represent a family group. Although the camera remained in place during 2006 - July 2008 (a total of *c*. 520 additional trap-days), no additional photographs of *Echimys saturnus* were obtained, suggesting that the individuals had either moved out of the area or changed their behavior pattern. No photographs of the species were obtained at any of the other three mineral licks (*c*. 4000 trap-days) and none were obtained along trails (> 8000 trap-days) suggesting a rather localized distribution of the species at the study site.

All accounts of *Echimys saturnus* that we have located report that the species is known from 10 or fewer specimens from a small area of Ecuador and Peru, information originally provided by Emmons & Feer (1997). A search of the Global Biodiversity Information Facility (accessed through www.gbif.net, 14 February 2010) produced records of 10 specimens, eight from Ecuador and two from Peru. All specimens with a date noted were from 1934 or 1937, suggesting that the species is rarely encountered. Five of the specimens listed good coordinates (i.e., that corresponded to the country of collection), all from Ecuador. Of those five, four were collected at one location (Rio Jatunyacu, 1°04'58"S, 77°56'60"W, c. 562 m a.s.l.; Yale University Peabody Museum) approximately 208 km west-southwest of the current site, and one at a different site (Rio Cotapino, 0°42'36"S, 77°22'48"W, c. 385 m; University of Kansas Biodiversity Research Center) approximately 138 km west of the current site. No data were provided on the specific habitats in which the specimens were obtained. Thus the current records are the farthest east (0°37'36"S, 76°08'16.6"W) and from the lowest elevation (*c*. 230 m).

Camera traps are an important tool for documenting the occurrence and distribution of rare or otherwise difficult to observe species (Rovero *et al*. 2005, Meijaard *et al*. 2006). Camera traps have also been used to estimate densities of large cats (tigers *Panthera tigris*, Karanth *et al*. 2006; jaguars *Panthera onca*, Soisalo & Cavalcanti 2006), to model habitat use by antelope (Bowkett *et al*. 2008), to document use of specific habitats, such as mineral licks (Tobler *et al*. 2009, Blake *et al*. 2010), and to determine temporal (i.e., diurnal, seasonal) patterns of activity (tapir *Tapirus pinchaque*, Lizcano & Cavelier 2000; primates *Ateles belzebuth*, *Alouatta seniculus*, Blake *et al*. 2010). Given the difficulties of observing nocturnal, rare, or otherwise hard to observe mammals, such as *Echimys saturnus*, the use of camera traps to provide additional data on distribution and habitat use will be useful under some circumstances.

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