

roduction or population reinforcement, with a fairly good probability of success. The positive results of the translocation, the large amount of original data, and the interest of the international scientific community for our samples, confirm our initial conviction that this operation was worthwhile once the political decision of building the dam had been taken.

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AN EASTERN EXTENSION OF THE GEOGRAPHICAL RANGE OF THE PYGMY MARMOSET, *CEBUELLA PYGMAEA*

Cebuella was proposed by Gray (1866) as a subgenus of *Hapale* (later *Callithrix*), and soon after as a distinct genus (Gray, 1870). Generic recognition was reinforced by Cabrera (1917) on account of dental characteristics, and by Thomas (1922) on certain cranial characters. The type specimen of *Cebuella pygmaea* was collected near Tabatinga, on the north bank of the Rio Solimões by Spix and Martius and described in 1823 (Spix, 1823). The ventral surface of the type specimen is ochraceous. In 1940,

Lönnberg described a second subspecies, *Cebuella pygmaea niveiventris* from Lago Ipixuna, south bank of the Rio Solimões, based on its sharply contrasting whitish chest, belly, and inner surface of arms and legs. Cruz Lima (1945) and Napier (1976) also recognized and described the two subspecies. With this taxonomic arrangement, *Cebuella pygmaea pygmaea* Spix, 1823 occurs in the state of Amazonas, Brazil, north of the Rio Solimões and south of the Rio Japurá, southern Colombia north of the Ríos Marañón and Putumayo and south of the Río Caquetá (Japurá), eastern Ecuador, and eastern Peru south of Río Putumayo, north of the Río Marañón and east of the Río Pastaza. *Cebuella pygmaea niveiventris* Lönnberg, 1940 occurs in eastern Peru south of the Río Marañón and east of the Río Huallaga, and in the state of Amazonas, Brazil, south of the Rio Solimões and west of the Rio Purus. Heltne *et al.* (1976) reported its presence in the Pando region of Bolivia, and Izawa (1979) and Izawa and Bejarano (1981) indicated that it may occur as far south as the Ríos Orthon and Manuripi, northern tributaries of the Río Madre de Dios. Brown and Rumiz (1986), however, confined it to the north of the Río Tahuamanu (see also Cameron *et al.* 1989). As argued by Rylands *et al.* (1993), its presence in northern Bolivia indicates that it should occur in the eastern part of the Brazilian state of Acre, including the upper reaches of the Rio Abunã, a tributary of the Rio Madeira. According to Hershkovitz (1977), the color of the underparts is individually and locally variable and does not justify the subspecific status of *niveiventris*.

In July and August, Van 1996, while searching for a new species of marmoset (Roosmalen *et al.*, in prep.), we sur-

veyed both sides of the lower Rio Madeira, from its mouth with the Rio Amazonas, upriver to beyond the mouth of the Rio Manicoré. Local residents were interviewed and shown photographs of the monkeys to be expected in the region. *Cebuella pygmaea* was said to be common, but ranging only in *terra firme* forest, and as such sharply contrasting with *Cebuella pygmaea pygmaea*, which, at least in the upper Amazon, is found mainly in white-water seasonally inundated (*várzea*) forest (Soini, 1982, 1988) and in very low densities in black-water (*igapó*) creek forest and secondary growth near permanent forest streams (Fess, 1975; Freese, 1975; Hernández-Camacho and Cooper, 1976; Peres, 1991). Most of the east bank of the Rio Madeira is fringed with *várzea* forest and lakes, but in some places *terra firme* forest extends right up to the riverbank. We confirmed the presence of pygmy marmosets, observing them gouging exudate-source trees, in the following places: Democracia, west bank of the Rio Madeira, 15 km south of the town of Manicoré (5°48'S, 61°26'W), Lago Matupiri (Santa Maria, 5°33'15"S, 61°15'47"W), Lago Matupirizinho (Novo Jerusalem, 5°33'28"S, 61°07'20"W), Vencedor (5°20'S, 60°45'W) and Bonfim (opposite the town of Borba) (4°20'S, 59°40'W). All animals observed in the wild, as well as one live specimen obtained in the community of Democracia, showed the typical characters of the *niveiventris* subspecies. We, therefore, follow the Lönnberg, Cruz Lima, Napier arrangement, and, for the subspecies *Cebuella pygmaea niveiventris*, confirm the extension of its range to the interfluvium of the Rios Purus and Madeira.

Cebuella has not been previously reported from the upper

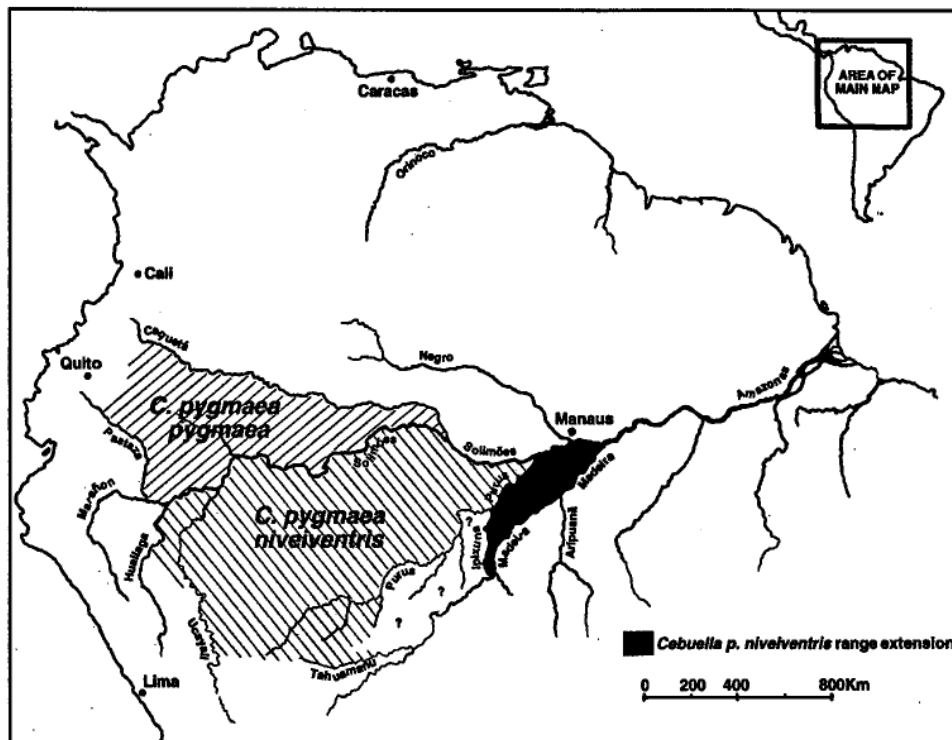


Figure 1. The distributions of the two subspecies of *Cebuella pygmaea*: *C. pygmaea pygmaea* and *C. pygmaea niveiventris*.

Rio Madeira, although Ferrari (1993) argued that it was likely to occur there. Ferrari *et al.* (1996) mentioned that local residents at the Serra dos Três Irmãos Ecological Station, northwestern Rondônia, reported the presence of *Cebuella* on the west bank of the Rio Madeira nearby. Its occurrence between the Río Tahuamanu and Río Acre in Bolivia indicates that it would also occur in the basin of the Rio Abunã, a western tributary of the Rio Madeira. However, until further fieldwork in the region reveals the presence of *Cebuella pygmaea* further south, we assume that, in Brazil, the Rio Ipixuna (or Rio Paranapixuna) forms the southern limit of the monkey between the Rios Purus and Madeira. The northern limit in this basin is formed by the extensive *várzeas* along the Rio Amazonas-Solimões (Fig. 1).

The exudate source trees that were seen to be used by the pygmy marmosets (the trunk being covered with gouge holes from the base to the lowest boughs and branches) were identified as *Enterolobium schomburgkii* (Mimosaceae), *Inga edulis* (Mimosaceae), *Inga ingoides* (Mimosaceae), and *Ficus guianensis* (Moraceae). Of these, the "orelha de macaco" (*Enterolobium schomburgkii*) seemed to be the principal source, being visited on a daily basis.

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HYBRIDIZATION IN FREE-RANGING *CALLITHRIX FLAVICEPS* AND THE TAXONOMY OF THE ATLANTIC FOREST MARMOSETS

Marmosets of the genus *Callithrix* are usually placed in two species groups on the basis of their morphology and distribution: The *Callithrix argentata* and the *Callithrix jacchus* groups. The tufted-ear marmosets, *Callithrix jacchus* group, are found in central and eastern Brazil, represented by the following distinct parapatric forms: *C. jacchus*, *C. aurita*, *C. flaviceps*, *C. geoffroyi*, *C. penicillata* and *C. kuhli*: the taxonomy of which has been the subject of some discussion (Hershkovitz, 1977; Mittermeier and Coimbra-Filho, 1981; Vivo, 1988; Rylands *et al.*, 1993).

The presence or absence of natural hybrids has been a moot point for the discussion of the taxonomy of the *Callithrix jacchus* group (Coimbra-Filho and Mittermeier, 1973; Hershkovitz, 1977; Coimbra-Filho *et al.*, 1993; Marroig, 1995). Unfortunately, much of the debate has been based on museum specimens or captive animals which, in the majority of cases, are not representative of contact zone populations.

In an interesting article discussing the controversy about whether the Atlantic forest and central Brazilian marmosets are species or subspecies, Marroig (1995) proposed that the debate be postponed until new data on hybrid zones arise. He stated that there are few localities where hybrids exist between the species of eastern Brazil, and that records of hybrid zones are absent, beyond that of *C. jacchus* and *C. penicillata* reported by Alonso *et al.* (1987).

Contrary to Marroig's assertions, my field data have indicated that there has always been hybridization in contact zones between species of the *Callithrix jacchus* group (see also Coimbra-Filho *et al.*, 1993). In fact, the only contact zone where I failed to find evidence of natural hybridization was between *C. aurita* and *C. penicillata* in the state of São Paulo. I believe, however, that further fieldwork will probably uncover a hybrid zone there as well.

The buffy-headed marmoset, *C. flaviceps*, inhabits the highlands of the Atlantic Forest of Espírito Santo and eastern Minas Gerais, south of the Rio Doce, and has the smallest geographical range among the forms of *C. jacchus* group (Hershkovitz, 1977; Coimbra-Filho *et al.*, 1981; Ferrari and Mendes, 1991; Mendes, 1993). It is listed as endangered by the World Conservation Union (IUCN) and as threatened in the Brazilian national list (see Bernardes *et al.*, 1990). As in other marmosets, habitat destruction is the major threat, although recent studies have shown that these monkeys are relatively tolerant of habitat disturbance and fragmentation (Ferrari and Mendes, 1991; Diego *et al.*, 1993).

As was pointed out by Rylands *et al.* (1993), the occurrence of typical *C. flaviceps* in the north of the state of Rio de Janeiro is unlikely. I found *C. aurita* as far north as Natividade, and in the extreme north of this state there is probably a hybrid zone between *C. aurita* and *C. flaviceps* (Mendes, 1993). Recent attempts to obtain new information on the geographic distribution of these marmosets have revealed contact zones of *C. flaviceps* with *C. geoffroyi* in the state of Espírito Santo, and with *C. aurita* in the state of Minas Gerais. Hybrids were found in three sites in Espírito Santo in the contact zone between *C. flaviceps* and *C. geoffroyi*, in the municipalities of Santa Teresa and Santa Leopoldina, and in three sites in Minas Gerais, in the contact zone between *C. flaviceps* and *C. aurita*, in the municipality of Carangola and Ipanema (Mendes, 1993).

In the two sites in Santa Teresa, there were mixed groups containing hybrids as well as apparently typical *C. flaviceps* and *C. geoffroyi*. At one of these sites, the Santa Lúcia Biological Station, I saw a group composed only of *C. geoffroyi* about 500 m from the mixed groups. Groups consisting only of hybrids were not observed. In Santa Leopoldina, groups of *C. flaviceps* were found at altitudes between 500 and 650 m asl, while a group of hybrids was seen at 500 m asl. It was not possible, however, to determine whether the latter contained animals other than hybrids. A group consisting only of *C. geoffroyi* was observed at a site approximately 1 km to the southeast of this area.

In many ways, the coloration of the head and ear tufts of the *C. flaviceps* x *C. geoffroyi* hybrids is similar to that of hybrids of *C. flaviceps* x *C. jacchus* and *C. aurita* x *C. kuhli* described by Coimbra-Filho *et al.* (1993). The similarity of these hybrids with *C. penicillata* would account for Ávila-Pires' (1969) identification of a specimen from Santa Teresa as *C. penicillata*, which Hershkovitz (1977) considered to be a *C. flaviceps* x *C. geoffroyi* hybrid. Groups composed of individuals appearing to be *C. flaviceps* x *C. aurita* hybrids were observed at two localities in forest fragments near Carangola. Some of the individuals were similar in coloration to either *C. flaviceps* or *C. aurita*, while the majority exhibited intermediate patterns. A group with similar intermediate color patterns