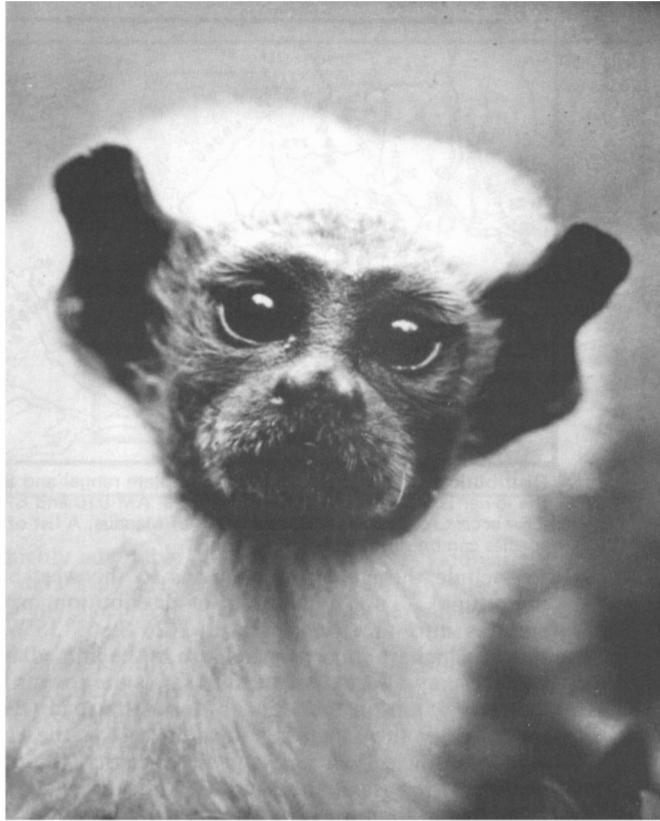


Brazilian Tamarins on the Way to Extinction?

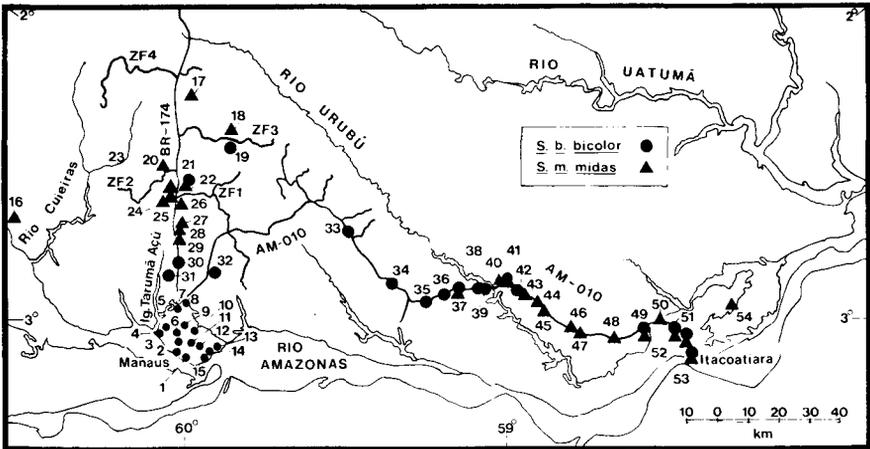
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The pied bare-face tamarin is found only in the vicinity of Manaus, the second largest city in Brazilian Amazonia, where rapid growth in recent years has resulted in much forest destruction. The authors' studies show that this tamarin is now endangered and they suggest an action plan to ensure its survival.

Some 37 species and subspecies of marmosets and tamarins, family Callitrichidae, occur in the Amazonian region of northern South America, according to the most recent systematic arrangement.¹ Many are wide-ranging and still among the most abundant of Neotropical monkeys, but several have very restricted ranges and may be in serious danger as a result of habitat destruction accompanying the large-scale Amazonian development programmes of the last ten years. Those of greatest concern are the three Brazilian bare-face tamarins *Saguinus bicolor* spp., *S. b. bicolor*, *S. b. ochraceus* and *S. b. martinsi*, especially the pied bare-face tamarin *S. b. bicolor*, which not only has one of the most restricted distributions of any Amazonian primate, but occurs mainly in the vicinity of rapidly growing Manaus, second largest city in Amazonia. Hershkovitz¹ gives the range of this group as, 'Amazonas, Brazil, north of the Rio Amazonas from the east bank of the lower Rio Negro east to the west bank of the Rio Erepecurú (= Cuminá = Paru de Oeste)'.

The range of the typical subspecies, the pied bare-face tamarin *S. b. bicolor*, is said to be the 'vicinity of Manaus, east bank of the Rio Negro near mouth Rio Amazonas ... probably confined to the angle between the east bank of the Rio Negro and the north bank of the Amazonas', expanded in an addendum



Distribution of *Saguinus b. bicolor* (complete range) and *S. m. midas* (part range) between the lower Rio Negro and the Rio Uatumã. AM-010 and BR-174 are two main roads; ZF = access roads for the Zona Franca of Manaus. A list of the numbered sites for the two species can be supplied by the authors.

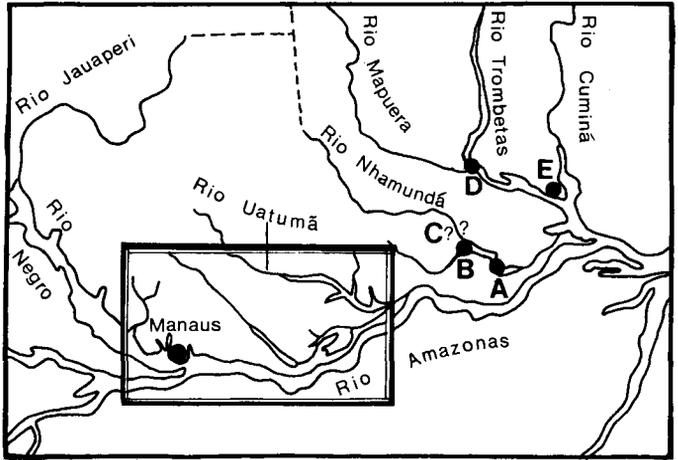
to include the area from 'Manaus to the west bank of the Rio Natuma (*sic*; = Uatumã) ... northern limits of distribution may be the Rio Jauaperi, which empties into the Rio Negro at 1°26'S, 61°35'W. Our initial surveys indicate that the highest concentrations are in the immediate vicinity of Manaus, but that this monkey also extends east as far as the town of Itacoatiara and north at least as far as 45km on the Manaus-Boa Vista road (BR-174). It may well extend as far north as the Jauaperi and as far east as the Uatumã, for there are no intervening ecological barriers, and the fact that the other two *S. bicolor* subspecies occur to the east of the Uatumã, indicates that the range of the Brazilian bare-faced tamarins must once have been continuous. The fact that it has not been recorded is probably because there has been little or no collecting or field work in these areas.

The pied bare-face tamarin is the only callitrichid in the greater Manaus area, but it overlaps with the golden-handed tamarin *S. midas midas* approximately 175km to the east of Manaus and about 25km to the north. A wide-ranging, highly adaptable species, the golden-handed tamarin occurs in almost the entire region east of the Rio Negro and north of the Rio Amazonas, and extends into the Guianas, where it is one of the most abundant monkeys.^{1,5} Its range also overlaps that of the eastern *S. bicolor* subspecies and it appears to be sympatric with *S. b. bicolor* at a number of sites between Km 175 and Itacoatiara on the Manaus-Itacoatiara road (AM-010) and in some areas north of Manaus.

The relationship between these two species is still unclear, but there are several possibilities. The widespread golden-handed tamarin may be invading the other's range. Hershkovitz¹ believes that the pied bare-face tamarin is the older species and arrived first in the Manaus area, and that the appearance of the more generalized golden-handed tamarin may have contained the spread of the more restricted species. The invading species may, in fact, still be spreading, and the habitat alteration along new roads like AM-101 and BR-174 may be providing even more openings for it.

The second possibility is that the two monkeys occupy somewhat different but geographically adjacent ecological niches, and that the occasional overlap now apparent along the new roads is a situation of long standing. This would mean that the greater Manaus area has certain forest types not utilized by *S. m. midas*, but for which *S. b. bicolor* has developed a special adaptation. This is

Distribution map for *Saguinus bicolor martinsi* and *S. bicolor ochraceus* in the area between the Rio Uatumã and the Rio Cuminá. The area within the rectangle is shown in detail on p. 330. The question marks indicate the uncertain position of locality C. Details of the sites are available from the authors.



unlikely since the former is highly adaptable and able to live in a wide variety of habitats,^{2,5} while the few data available on habitat utilization by the latter indicate that it is not exceptionally specialized and also occupies several different forest types.

The third possibility is the reverse of the first, i.e. that *S. b. bicolor* may be the species benefiting from habitat alteration along the new roads and is entering the range of *S. m. midas*. However, this also is unlikely since in most (but not all) the areas in which the two species are known to occur, the latter is more abundant.

Status

In earlier papers^{3,4} *S. b. bicolor* was not listed as an endangered species for lack of information, but our recent more detailed analysis of the situation leads us to believe that it should be. With its range centred on what is probably the most rapidly-growing large city in Amazonia, habitat destruction has become a serious threat. The population of Manaus increased from approximately 254,000 in 1967, when a duty-free zone was established, to 388,000 in 1978 and may now be as high as 700,000. Much of the forest surrounding Manaus has recently been divided into tens of thousands of small housing lots, which will be cut over the next five years. On top of this, a major industrial district now being planned on the city outskirts will cause still greater forest destruction.

Moreover considerable habitat alteration and deforestation is taking place elsewhere in the range of these tamarins, especially along the new roads (e.g. AM-010, BR-174) out of Manaus, and the rate of deforestation in recent years has increased tremendously. An analysis of deforestation in the area between 54–66°W and 0–4°S (which includes the entire range of all three Brazilian bare-face tamarins) indicated that almost as much forest had been destroyed in the two years 1976–78 (146,550ha) as had disappeared in the entire period from colonization to 1975 (205,100ha).⁶ If this trend continues little will be left within a decade.

At present, *S. b. bicolor* occurs in only one protected area, the 10,000ha Reserve Ducke 25km north of Manaus and belonging to the National Amazonian Research Institute, where at least two groups of *S. b. bicolor* occur. The search continues. A single group also occurs on the Institute's main campus, on the Estrada do Aleixo in Manaus, and at least two other groups (ca. 12 indi-

viduals) are protected in a 20ha forest in the grounds of the Hotel Tropical 15km west of the centre of Manaus. More protection is obviously needed.

The situation of the pied bare-face tamarin is similar to that of another Brazilian callitrichid once found close to a large city. Twenty to 30 years ago, the golden lion tamarin *Leontopithecus rosalia* was found around Rio de Janeiro, but as the city grew, urban sprawl destroyed all of the animal's habitat and new roads opened more distant habitat to destruction. Now the golden lion tamarin is on the verge of extinction in the wild and is certainly one of the most endangered monkeys in the world. *S. b. bicolor* is clearly heading in the same direction and in the next 10–20 years may well be in an equally critical position.

The other two subspecies, *S. b. ochraceus* and *S. b. martinsi*, are very poorly known and apparently similarly restricted in range. However, they do not occur near major urban centres and are more secure, at least for the time being. The Red Data Book gives their status as indeterminate and they should remain in this category until there is more information.

Recommendations for an Action Plan

In order to ensure the survival of representative populations of *S. bicolor* in the wild, we propose the following measures:

1. Conduct a survey to determine the precise range of *S. b. bicolor*, locate the best possible area for a reserve of at least 10,000ha, and investigate the ecological relationships between this species and *S. m. midas*;
2. Conduct a survey of the ranges of *S. b. ochraceus* and *S. b. martinsi* to determine their status and possible threats to their survival;
3. Conduct a survey of the greater Manaus area to determine where *S. b. bicolor* still occurs within the city limits, with the aim of establishing a modest intra-city protected area. A suitable site might be in the vicinity of the Hotel Tropical, where at least one group of *S. b. bicolor* occurs in the grounds and the hotel management is interested in preserving a substantial tract of rain forest to add to the 'jungle adventure' atmosphere;
4. Start a conservation education programme in Manaus to demonstrate the importance of this unique species as a symbol of Manaus;
5. Conduct a long-term ecological study of two or three groups of *S. b. bicolor* to determine habitat and dietary requirements.

In addition, we would like to see a conservation-oriented captive breeding programme using individuals captured from forest tracts scheduled for destruction. At present, there are only five *S. b. bicolor* in captivity in the world – two at São Paulo Zoo, two at Manaus CIGS Zoo and one at the Rio de Janeiro Primate Center.

Postscript

Steps 1 to 4 have already been partially carried out by the senior author in conjunction with INPA and the WWF-US, Primate Program. The conservation education programme was carried out in November 1981 using posters provided by the Rare Animal Relief Effort (New York, USA) in conjunction with INPA and WWF. During the campaign we used local television and radio to advertise the threats to the species and gave a series of lectures on Amazonian endangered species in several high schools in the Manaus area, using *S. b. bicolor* as the symbol of the campaign. Step 5 is now being conducted by Silvia Egler of UNICAMP/INPA who has been participating in the programme since step 4.

Acknowledgments

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Causes of Hare Decline in Britain

Over the last 20 years hares have decreased considerably in Britain. The second report of the Hare Project, set up to identify the causes, points to two aspects of modern farming that have contributed to this: the absence of cover and the lack of forage. Hares use woods, hedges and shelterbelts, especially after harvest and autumn cultivation, and they feed on both grass and weeds in arable crops. But the acreage of grass leys has dropped by half in the last 20 years in eastern England, and the widespread use of herbicides has resulted in weed-free crops. The Project is now investigating the effects of predation by foxes and the direct and indirect effects of agricultural sprays.

Egypt Carries on in Sinai

'The Israeli Nature Reserve Authority has been employing and training Bedouins as nature reserve wardens in Sinai for nearly a decade', writes Bill Clark, following the story in *Oryx*, October 1981, pages 114-15. He adds, 'When the land is transferred to Egypt, with it will go a completely functioning nature reserve system with well-trained wardens, full facilities and results of scientific studies of the fauna and flora.'