

PRIMATE CONSERVATION

The Newsletter and Journal of the IUCN / SSC Primate Specialist Group

NUMBER 5

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Front Cover: Verreaux's sifaka (*Propithecus v. verreauxi*) from southern Madagascar in a Didiereaceae tree. This individual was photographed in the Beza-Mahafaly Reserve, which is described in greater detail in the article section of this issue (Photo by R. A. Mittermeier)

A Word from the Editors

As indicated in the last newsletter, as of this issue we are changing our title to *Primate Conservation - the Newsletter and Journal of the IUCN/SSC Primate Specialist Group*. We believe that the new title will broaden the appeal of our publication, and that the expanded format will provide an outlet for more material of importance to primate conservation.

Rather than bringing out this new version of our newsletter/journal in October as originally scheduled, we decided to hold it until January, 1985, so that it could begin with the New Year. In the future, we hope to follow the January-July publication schedule, so please send any announcements, news items or articles that you would like to have included at least one or two months before these dates. In place of the second 1984 issue, we have produced a publication entitled *Species Conservation Priorities in the Tropical Forests of Southeast Asia*. This booklet is based on a symposium held at the 58th Meeting of the Species Survival Commission in Kuala Lumpur, Malaysia and we are sending complementary copies to all PSG members and subscribers together with this issue of *Primate Conservation*.

The PSG continues to grow as well. During the past year, we have added 32 new members whose names and addresses are given in the Appendix, together with address changes for current members. In the next newsletter/journal, we hope to publish a complete list of PSG members once again, as we haven't done this since our August 1982 issue.

As an added service to our members, we are including a new Field Positions Available item at the end of the Announcements section and immediately after Volunteer Field Assistants. This will make it possible for you to request specific help for field

projects that you are conducting. The volunteer list has already proved useful to some of you, and we hope that the field position announcement will help even more.

We are pleased with the response to the newsletter to date, and hope that you will continue to send us your contributions. As mentioned in the last issue, articles for the journal section should be in the 3-20 double-spaced typed page range, while announcements from the field/captivity items should be in the 1-3 page range. Please try to illustrate your contributions with photographs and maps, since these add a great deal to the publication as a whole. Also, we would like very much to obtain high quality photographs for our front and back covers, especially of little-known primate species, so please send whatever you might have available.

Finally, please let us know if there is anything else that you think should be included in *Primate Conservation* to increase its value to the international primate conservation community.

We look forward to hearing from you and to receiving your contributions.

Russell A. Mittermeier
Editor, *Primate Conservation*

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Assistant Editor

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Editorial Assistant

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Layout/Design

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ANNOUNCEMENTS

Jane Goodall Wins the Getty Prize

We are pleased to open this issue of *Primate Conservation* with the announcement that PSG member, Jane Goodall, has been awarded the \$50,000 J. Paul Getty Wildlife Conservation Prize. This prize has been called the "Nobel Prize of International Conservation" and is the largest single award in the world given specifically for outstanding achievement or service in the conservation of wildlife. The award ceremony was held on September 17, 1984, at the National Press Club in Washington, D.C. (Fig. 1).

Jane Goodall is one of the great pioneers of primatology, and certainly needs no introduction here. However, the editors would like to take this opportunity, on behalf of the entire PSG, to extend our congratulations to Jane and to thank her for the tremendous stimulation her 25 years of work with chimpanzees has given to primate conservation and the science of primatology as a whole.

Primate Conference To Be Held In San Diego

The San Diego Zoological Society and the Morris Animal Foundation are sponsoring a conference on "Primates - The Road to Self-sustaining Populations" to be held in San Diego, California from June 24-28, 1985. The purpose of the conference is to seek better ways to conserve vanishing primates than have been possible in the past and to provide direction for future management. The conference is being organized by Dr. Kurt Benirschke of the Research Dept. at San Diego and will feature presentations on primate conservation in the wild, captive breeding, primate trade, the role of genetics in taxonomy and breeding, reintroduction, pathology, virology, veterinary medicine, reproductive physiology and behavior. The proceedings of the conference will be published.

Further information on the conference can be obtained by writing Dr. Kurt Benirschke, and reservations for attending the seminar can be made with the Morris Animal Foundation.

Dr. Kurt Benirschke
San Diego Zoo
P.O. Box 551
San Diego, Calif. 92112-0551
UNITED STATES

Morris Animal Foundation
45 Inverness Drive East
Englewood, Colorado 80112
UNITED STATES

Seventh Annual Meeting Of The American Society Of Primatologists To Be Held In Niagara Falls, New York

The Seventh Annual Meeting of the American Society of Primatologists (ASP) will be held June 1-4, 1985 in Niagara Falls, New York, and will include a meeting of the ASP Conservation Committee, which is now chaired by PSG member Charles Snowdon. For further information on the meeting, write to the Chair of the Local Arrangements Committee:

Dr. Chris R. Duggleby
American Society of Primatologists
Dept. of Anthropology
State University of New York at Buffalo
Buffalo, New York 14261
UNITED STATES

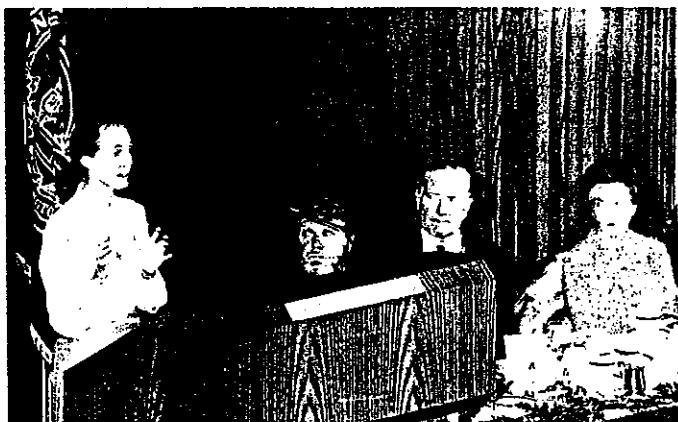


Figure 1: (Top) Russell E. Train, President of WWF-U.S., presenting the Getty Prize to Jane Goodall. (Bottom) Jane Goodall delivering the keynote address at the National Press Club, as John Fogerty of the National Press Club, Russell Train and Jane's mother, Vanne Goodall, look on (photos by Richard Greenhouse).

CITES Meeting To Be Held In Buenos Aires, Argentina

The 5th Meeting of the Conference of the Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) will be held in Buenos Aires, Argentina from April 22 to May 3, 1985. Several primate proposals will be considered, and are listed here:

- Proposal from the People's Republic of China to transfer *Rhinopithecus* species (the snub-nosed monkeys) from Appendix II to Appendix I.
- Proposal from the Republic of India to transfer *Loris tardigradus* from Appendix II to Appendix I.
- Proposal from the Republic of India to transfer *Presbytis phayrei* from Appendix II to Appendix I.
- Proposals from the Republic of India and the Kingdom of Nepal to transfer *Presbytis entellus* from Appendix I to Appendix II.
- Proposal from the Republica de Costa Rica to transfer *Alouatta palliata* from Appendix I to Appendix II.

Of much greater concern than any specific proposals is a draft resolution relating to the "Berne criteria". These are the criteria for adding species to the appendices and they were adopted at the CITES meeting held in Berne in November, 1976. Many species (about 80%) were placed on the CITES appendices before adoption of these criteria, most of them being listed because they were in the *Red Data Book*, because national governments requested it, etc. Now there is a move underway to make the Berne criteria inapplicable to proposals to downgrade species from Appendix I to Appendix II where the species was listed prior to 1976. The criteria would also not have to be applied when it is virtually impossible to supply the data required by the Berne criteria within reasonable time or with reasonable effort, but where one can take for granted that the populations of the species can withstand "reasonable" commercial traffic. Downgrading could also occur when habitat countries adopt a "quota system" approved by the Conference of the Parties.

This resolution could affect a number of primate species that were listed on Appendix I prior to 1976, including *Daubentonia madagascariensis*, *Avahi laniger*, *Indri indri*, *Propithecus* spp., *Lemur* spp., *Leontopithecus* spp., *Callimico goeldii*, *Saimiri oerstedii*, *Cacajao* spp., *Alouatta palliata*, *Brachyteles arachnoides*, *Nasalis larvatus*, *Simias concolor*, *Pygathrix nemaeus*, *Presbytis geei*, *Presbytis pileatus*, *Presbytis entellus*, *Colobus badius kirkii*, *Colobus badius rufomiratus*, *Cercocebus galeritus galeritus*, *Macaca silenus*, *Hylobates* spp., *Gorilla gorilla*, *Pan* spp., and *Pongo pygmaeus*.

This resolution is being viewed with alarm by conservationists, and members present at the meeting in Buenos Aires should pay special attention to it. Any members wishing to comment on the above proposals or other CITES matters should write to the following address:

Mr. Jacques Berney
CITES
6, rue du Maupas
Case postale 78
CH-1000 Lausanne 9
SWITZERLAND

Xth International Primatological Society Congress Held In Nairobi, Kenya

The Xth International Primatological Society Congress was held in Nairobi, Kenya from July 22-27, 1984. It was organized by James G. Else, Director of Kenya's Institute of Primate Research and a PSG member, and was hosted by the National Museums of Kenya and its Director, Richard E. Leakey. The Congress theme, "Primates at their Source: Past, Present and Future", was especially appropriate given Kenya's pivotal role in unravelling our primate ancestry.

Several conservation sessions were held as part of the Congress, including one entitled "Population Trends and Conservation" (chaired by R. S. Harding and S. K. Seth), another on "Primate Conservation in the Broader Realm" (chaired by David Western) and a third called "Conservation - an Overview" (chaired by PSG Chairman Russ Mittermeier and IPS Vice-President for Conservation J. S. Gartlan). A lengthy discussion followed the last of these sessions, and the topic receiving the most attention was the problem of the seven Cameroun gorillas. The sale of these animals to three U.S. zoos had been blocked by the U.S. conservation community, but the animals were subsequently obtained by the Burgers' Zoo in Arnhem, The Netherlands, using the name of the IUCN Netherlands Committee and without appropriate consultation with the PSG. This issue was a source of considerable controversy, and a number of PSG members protested the action. More detail on this case can be found in Vol. 11 (Nos. 1-3) of the *International Primate Protection League Newsletter*, since this organization spearheaded efforts to prevent the importation of these animals into the U.S.

The IPS also elected a new slate of officers, including John Hearn as the Society's new president and Kenneth M. Green as the new Vice-President for Conservation (replacing J. S. Gartlan, whose term had expired).

It is evident that the PSG will be well-represented in the IPS over the next few years, and we extend our congratulations to the new officers. Congratulations also to Jim Else for the outstanding job he did in organizing this interesting and productive meeting.

Symposium On Captive Propagation Of Endangered Primates Held At Bielefeld, West Germany

A symposium on captive propagation and conservation of primates was held on October 29 and 30, 1984, in Bielefeld, West Germany. It was organized by PSG member Juergen Wolters and by the head of the Department of Ethology of the University of Bielefeld, Klaus Immelmann, and was sponsored by the Center for Interdisciplinary Research of the university.

The symposium tried to bring together people from two different "disciplines" within primatology in its widest sense: those who do basic empirical and theoretical research at universities and other research institutions and those who are involved in problems of applied science in zoological gardens or departments of wildlife protection.

The overall aim of the conference was to increase mutual understanding between basic research and applied aspects and thus to help solve problems regarding the protection and captive pro-

pagation of endangered primate species. This task required an interdisciplinary approach. Therefore, primate ethologists, physiologists, population geneticists, veterinarians and experts in the practical management of captive primate populations were invited to participate in the Bielefeld Symposium. Nearly 50 participants from the United States, Brazil and several European countries took part in the meeting, including several PSG members. Twenty papers were presented at the meeting, covering such topics as the development of captive breeding programs, ethological problems of demographic management strategies, enrichment of the captive environment, environmental psychology, and the problems of rehabilitation and reintroduction of primates.

The proceedings of the Bielefeld Symposium are scheduled to be published in 1985 and will be announced in *Primate Conservation*.

Juergen Wolters
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Universität Bielefeld
Postfach 8640
4800 Bielefeld 1
WEST GERMANY

Primate Conservation At The 16th IUCN General Assembly In Madrid, Spain

The 16th IUCN General Assembly was held in Madrid from November 5-14, 1984, with IUCN Commission Meetings taking place on November 3 and 4. At the SSC meeting on November 3, there was a special mini-symposium entitled "Primate Rehabilitation and Reintroduction, with Special Reference to Apes", with invited papers by a number of specialists on this topic. The session was chaired by Russ Mittermeier, and included presentations by Arthur Mitchell on orang rehabilitation, Ardith Eudey on gibbon rehabilitation, Fred Prince and James Mahoney on veterinary aspects of rehabilitation, and general papers on the topic by John Mackinnon, David Chivers and Shirley McGreal. Panelists also participating in the session included John E. Fa, William McGrew and Admiral Ibsen de Gusmão Câmara. The final presentation by Simon and Peggy Templer focused on a uniquely Spanish primate conservation problem, the use of infant chimpanzees as photographer models on Spanish resort beaches. The Templers have been spearheading the effort to end this trade, which involves the import of dozens of infant chimps every year, and their presentation attracted much-needed attention to this serious problem.

At the end of the General Assembly, a special IUCN Recommendation entitled "Exploitation of Chimpanzees in Spain" was passed by the assembled delegates, and recommended that the Spanish government take action to end this trade. The recommendation was drafted by William McGrew, Shirley McGreal, Ardith Eudey and the Templers, and was jointly sponsored by the PSG (representing the entire SSC), the International Primate Protection League (IPPL), and ADENA (the Spanish appeal of WWF), together with several other WWF National Organizations. Since this document is of considerable interest to primate conservation, it is reproduced here in its entirety:

EXPLOITATION OF CHIMPANZEES IN SPAIN

RECOGNISING that both species of chimpanzees are rapidly declining in the wild, and are therefore listed in the IUCN Red Data Book and Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES);

GIVEN the continuing use in Spain of young chimpanzees by up to 200 itinerant photographers who charge tourists to have their photographs taken with a chimpanzee;

RECOGNISING that the usual method of capturing chimpanzees is to kill the mother and protective adults to obtain infants;

APPALLED at the high losses of adult and infant chimpanzees in the course of capture and of infants in subsequent holding and transport, and concerned at the resulting drain on wild populations of chimpanzees;

ALARMED by the deaths of the young chimpanzees who are often killed at the end of their short and stressful working lives;

AWARE that the situation is deteriorating because some confiscated chimpanzees have recently been returned to the photographers under existing laws;

The General Assembly of IUCN, at its 16th Session in Madrid, Spain, 5-14 November, 1984;

CALLS upon Spain to stop the importation of chimpanzees for commercial use;

RECOMMENDS strongly that Spain adopts legislation requiring the confiscation of all chimpanzees now being commercially exploited; and

RECOMMENDS Spain to ratify and implement CITES as soon as possible.

The PSG is firmly behind the Templers in their efforts to end the Spanish beach chimp trade, and we are sure that they would like to receive letters of support from PSG members. Assuming that the Spanish government takes action in this matter, a major problem will be what to do with the confiscated animals. Any suggestions from PSG members would certainly be welcome and should be sent to:

Simon and Peggy Templer
"Can Miloca"
Breda
Gerona
SPAIN

Bolivia And Malaysia Institute Primate Export Bans

Two of the world's more important primate exporting countries, Bolivia and Malaysia, instituted primate export bans during 1984. The Bolivian ban went into effect on May 1, 1984, for a one-year period and, if maintained, it will have a profound effect on consumers of New World monkeys. Bolivia has become the major exporter of New World monkeys in the 1980's, with squirrel monkeys (*Saimiri boliviensis*), tamarins (esp. *Saguinus labiatus*) and night monkeys (*Aotus* spp.) being the most important exports.

The Malaysian ban went into effect on June 15, 1984, and mainly involves the crab-eating macaque (*Macaca fascicularis*) and much smaller numbers of pig-tailed macaques (*Macaca nemestrina*). The crab-eating macaque has become the most widely-used primate in research since the institution of the Indian ban on rhesus monkeys in 1978, and was being exported from Malaysia in the low thousands per year over the past decade (figures for 1976-1981 range from 2,928 to 13,521 per year). With the closing of the Malaysian trade (all of which originated from Peninsular Malaysia), crab-eating macaques are now available only from Indonesia and the Philippines.

These two bans rate as the most significant primate trade regulations implemented to date in the 1980's.

School For Field Studies Offers Primate Course In Panama

The School for Field Studies is an independent, non-profit program for field training, education and research in the environmental sciences. The School develops and sponsors a series of month-long and semester-long courses in different ecosystems around the world. Since 1981, the School for Field Studies has been able to offer more than 35 different courses to more than 600 students.

Among the courses being offered this year will be several focusing on the rufous-naped tamarin (*Saguinus geoffroyi*) in Panama. There will be two month-long courses held during the summer (June 17-July 16 and July 23-Aug 22, 1985) at Gatun Lake and taught by Dr. Dennis Rasmussen. An additional course will be held during the winter months. These courses will focus primarily upon the distribution, group size and social behavior of this tamarin species, and in particular how these factors relate to the possibilities for reintroduction of wild and captive tamarins.

Tuition fees cover instruction, room and board and group transportation during the course, but not to and from the course site. Financial Aid is available to qualified students in the form of direct grants and/or interest free loans. All School for Field Studies courses carry academic credit available through Northeastern University.

For further information and application materials please write to:

Dr. Elizabeth G. Gibson
Program Manager
School for Field Studies
196 Broadway
Cambridge, Mass. 02139
UNITED STATES

Expedition Advisory Centre Offers Assistance To Primate Conservation

Every year some 250 overseas scientific expeditions are organized by British universities, polytechnic colleges, schools and youth groups. The Expedition Advisory Centre, which is in touch with IUCN/SSC Specialist Groups by collecting information, suggests that many of these expeditions might be more successful if they knew what was wanted and where. In 1983, the Pigs and Peccaries Specialist Group, chaired by William Oliver, circulated the universities with a list of its pro-

jects to determine if summer expeditions might be able to help, and two projects were taken up. Through the Centre, it might be possible to stimulate expedition projects that would directly assist the IUCN/SSC. The Expedition Advisory Centre would be pleased to hear from any group chairman or secretary who would like to pursue the possibilities. For those interested, please contact:

Mrs. Shane Winsor
Information Officer
Expedition Advisory Centre
c/o Royal Geographic Society
1 Kensington Gore
London SW7 2AR
GREAT BRITAIN

Advisory Committee On Gorilla Conservation Formed Within The Primate Specialist Group

A new Advisory Committee on Gorilla Conservation has been established within the Primate Specialist Group, in part as a result of discussions held at the International Primatological Society Congress (IPS) in Nairobi, Kenya. Many field workers who have concentrated on gorilla conservation were present at the meetings, and all recognized the potential benefits of organizing a group of specialists that could furnish information and advice concerning conservation of this important African ape. The main functions of this committee are: 1) to compile and provide current information on the status of gorilla populations and efforts for their conservation; 2) to prepare policy statements on important issues in gorilla conservation (e.g., rehabilitation, reintroduction, exportation, etc.); and 3) to serve as a communication network among field workers involved with the protection of this species.

The committee will be chaired by Amy Vedder, and thus far includes the following PSG members: Rosalind Aveling, Thomas Butynski, J. S. Gartlan, A. H. Harcourt, Caroline Tutin, and A. William Weber. Associate members include Conrad Aveling, Robert Cooper and Michel Fernandez. Further information on the new Gorilla Committee can be obtained from the chairperson:

Dr. Amy Vedder
Dept. of Zoology, Birge Hall
University of Wisconsin
Madison, Wisconsin 53706
UNITED STATES

SSC Selects Top 12 Threatened Animals And Plants Of The World

At the IUCN General Assembly in Madrid this past November, the SSC announced its selection of the world's top 12 threatened animals and plants. With the many endangered species on our planet, it was obviously difficult to make a comprehensive list, so special attention was given to choosing representative plants and animals that were not only endangered but had considerable symbolic value as well. The only primate to make it onto the list was the muriqui (*Brachyteles arachnoides*) of Brazil's Atlantic forest region. It won out over the mountain gorilla and the three

lion tamarins (which are also from the Atlantic forest region) because it is the only representative of an endangered monotypic genus and also serves as the standard bearer of a campaign to save the entire forest region in which it occurs. Other animals and plants selected are listed here:

Threatened Animals

- Bumblebee bat *Craseonycteris thonglongyai* — Only discovered by science in 1974, this tiny bat, weighing only two grams, could be threatened by museum and zoo collectors and by proposed hydro-electric projects which would flood its cave habitat.
- Kouprey *Bos sauveli* — hunting and wars have reduced this large wild ox of south-east Asia, which is believed to be resistant to rinderpest. A small herd was sighted in eastern Thailand in July, 1982.
- Mediterranean monk seal *Monachus monachus* — widely scattered in small groups and persecuted by fishermen, but there is a good chance of improving its status.
- Muriqui or woolly spider monkey *Brachyteles arachnoides* — numbers down from about 3000 in 1972 to a few hundred in 1984. Conserving them would also conserve the remnants of Brazil's Atlantic forests.
- Pygmy hog *Sus salvanus* — a major dam project threatens a key population in the Manas reserves of India and Bhutan. Elsewhere, destruction of its grassland habitat in the Himalayan foothills has severely reduced numbers, which may be under 100. The rare hispid hare *Caprolagus hispidus* would also benefit from protection of the pygmy hog's habitat.
- Northern white rhinoceros *Ceratotherium simum cottoni* — poaching for the horns has reduced the population to only about 10 in Zaire's Garamba National Park, with a few scattered in southern Sudan, Central African Republic and Uganda.
- Sumatran rhinoceros *Didermoceros sumatrensis* — reduced to only a few hundred in Sumatra and continental southeast Asia, principally Malaysia, by poaching for its horn.
- Kagu *Rhynchotus jubatus* — a ghost-grey heron-like bird, which cannot fly. It stalks the forest floor in New Caledonia and is seldom seen. Mining and logging threaten the kagu's habitat.
- Angonoka *Geochelone yniphora* — a large Madagascar land tortoise in imminent danger of extinction. It is collected as a pet in Madagascar. No nests have been found and captive breeding experiments have not so far been promising.
- Orinoco crocodile *Crocodylus intermedius* — severely depleted by the hide trade, a reserve and captive breeding are urgently needed.
- Queen Alexandra's birdwing *Ornithoptera alexandrae* — the world's largest butterfly, restricted to a small forest area in Papua New Guinea that is seriously threatened by expanding oil palm and logging industries.
- Hawaiian, or Oahu tree snails *Achatinella* spp — a genus of 19 varied and beautiful small tree snails, all endangered because of intensive collecting and the ravages of ants and an introduced predatory snail *Euglandina rosea*. Native Hawaiian trees, which are their natural habitat, are vanishing.

Threatened Plants

- African violet *Saintpaulia ionantha* — the African violet, the world's most popular houseplant, is almost extinct in its wild home in the tropical forests of the mountains in Tanzania. Only three plants were found by a recent expedition.
- Bamboo cycad *Ceratozamia hildae* — commercial collectors have removed one of the two known wild populations of this recently described Mexican cycad.
- Drury's slipper orchid *Paphiopedilum druryi* — an Indian slipper orchid, well known in horticulture, but not seen in the wild since 1972.
- Flor de Mayo Lenoso *Senecio hadrosomus* — an attractive florists' plant whose wild population, numbering 60-100, is threatened by over-grazing in its only home in the mountains of Central Grand Canary Island.
- Giant Rafflesia *Rafflesia arnoldii* — the largest flower in the world is in danger from destruction and disturbance of its rain forest habitat in Sumatra.
- Kau Silversword *Argyroxiphium kauense* — an endemic silversword of Hawaii threatened by grazing sheep. One of 822 endangered plants in Hawaii - the highest number for any country in the world.
- Neogomesia cactus *Ariocarpus agavoides* — a Mexican endemic cactus threatened by excessive collecting in its only habitat.
- Philip Island hibiscus *Hibiscus insularis* — only four bushes were left in 1964 because of grazing animals, which have now died out from starvation. Rabbits are still a problem, which is being attacked.
- Palenque mahogany *Persea theobromifolia* — a few specimens of this valuable timber tree, related to avocado, survive in Ecuador's lowland Andean forest.
- Socotran pomegranate *Punica protopunica* — only four ancient trees remain on Socotra island because of over-grazing. Probably an important genetic resource to produce disease resistance in cultivated pomegranate.
- Tarout cypress *Cupressus dupreziana* — More dead than live trees exist in Algeria, its last refuge, because of overgrazing and firewood collecting. A valuable tree for arid areas as it is extremely drought-resistant. Old trees may be 2,000 years old and could provide information on past climates and provide a standard for dating woods.
- Yeheb nut bush *Cordeauxia edulis* — the nutritious nuts of this endangered bush of Ethiopia and Somalia could be a valuable food crop for arid lands, but it has been reduced to dangerously low levels, along with most of the vegetation of the Horn of Africa, because of heavy harvesting of nuts and browsing by goats.

Fifteen Projects Supported Out Of The 1984-1985 WWF-U.S. Primate Action Fund

The WWF-U.S. Primate Action Fund is part of the WWF-U.S. Primate Program and is intended to provide support for worthy primate conservation projects in the \$500-3,000 range. This Fund places special emphasis on projects by researchers from the

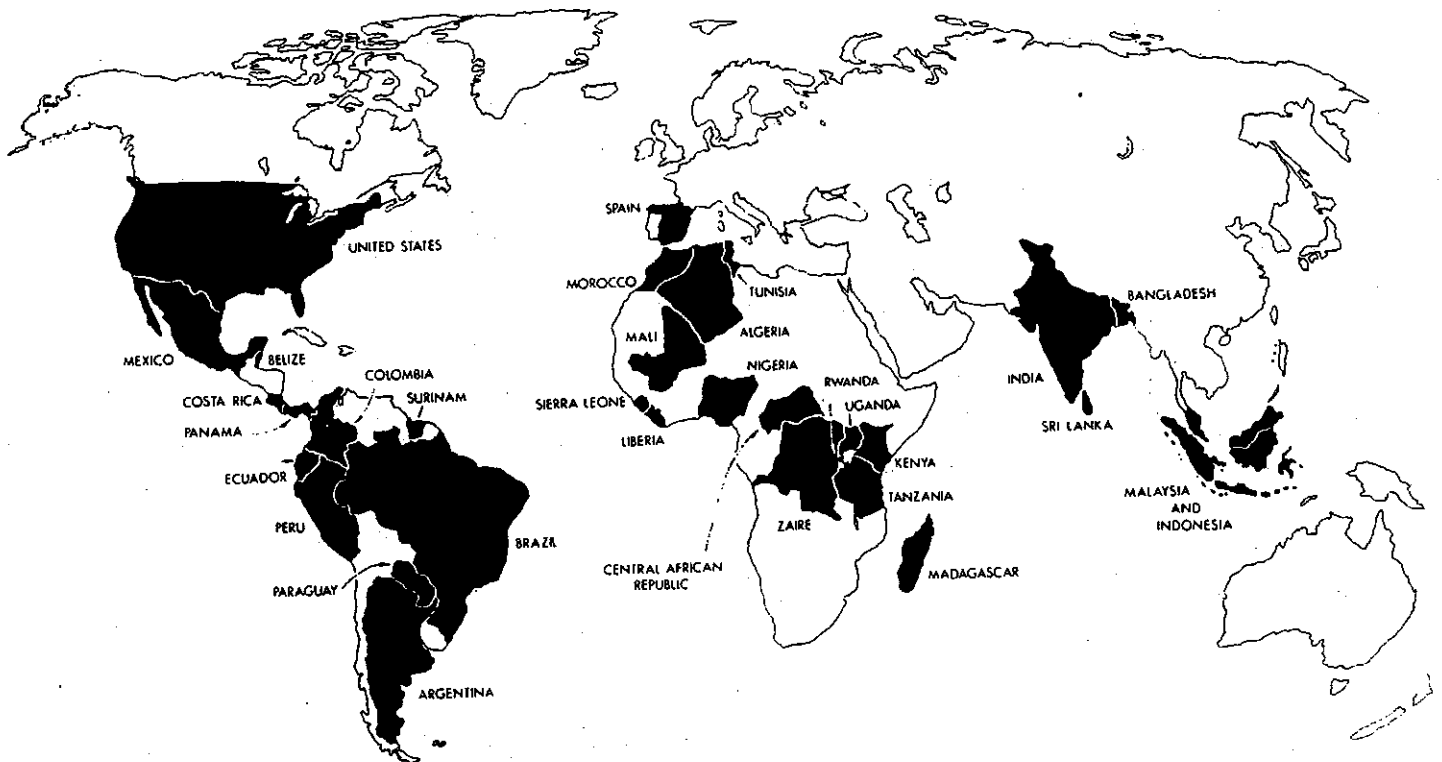


Fig.2: Map showing countries where Primate Action Fund supported projects have been carried out since 1979.

tropical countries where most primates occur and also on short-term pilot projects and surveys needed to lay the groundwork for larger projects. More than 50 projects have been supported out of this Fund since it began in 1979, including 14 since the publication of the last newsletter (Fig. 2). A brief list of the 1984-1985 projects follows; reports on the results of these projects will be included in future newsletters.

South and Central America

1. Distribution and status of the night monkey (*Aotus* sp.) in Argentina
Project leader: Orestes J. Colillas
2. A proposed reserve for black howler monkeys (*Alouatta pigra*) at Bermudian Landing, Belize
Project leader: Robert Horwich
3. Evaluation and conservation of squirrel monkey (*Saimiri oerstedii*) populations in Costa Rica (Second year)
Project leader: Sue Boinski
4. Distribution and abundance of spider monkeys (*Ateles* spp.) and woolly monkeys (*Lagothrix lagotricha* spp.) in Colombia
Project leader: Thomas Defler
5. The conservation status of the brown spider monkey (*Ateles fusciceps fusciceps*) in the Reserva Nacional Cotacachi-Cayapas, northwestern Pacific lowlands, Ecuador
Project leaders: Richard Madden and Luis Albuja
6. A synecological study of a primate community in the Pacaya-Samiria Reserve, Peru
Project leader: Pekka Soini
7. Environmental determinants of population density in the Peru-

vian black spider monkey (*Ateles paniscus chamek*), Manu National Park, Peru

Project leader: Margaret McFarland

8. Patterns of diversity, abundance and habitat use of primates and other selected mammals in undisturbed forests in eastern Peru
Project leader: Carlos Saavedra
9. Fellowship for Peruvian student at the Univ. of Florida at Gainesville
Project leader: Mariella Leo Luna

Africa

10. Behavior and ecology of the lowland gorilla (*Gorilla g. gorilla*) in southwestern Central African Republic
Project leader: Richard Carroll
11. A survey of savanna chimpanzees in Mali
Project leader: James Moore
12. A survey of the Gola Forest, Sierra Leone
Project leaders: John F. Oates and Glyn Davies
13. A preliminary investigation of the conservation status of rain forest primates in central-eastern Madagascar
Project leader: Jonathan I. Pollock

Asia

14. Studies on the habitat, population ecology and social behavior of the lion-tailed macaque (*Macaca silenus*) in south India (Third Year)
Project leader: Ajith Kumar

For further information on the Primate Action Fund and on the WWF-U.S. Primate Program in general, please contact PSG Chairman Russ Mittermeier.

New Primate Studbooks For Ruffed Lemur And Goeldi's Monkey

The first edition of the Ruffed Lemur Studbook for the black-and-white ruffed lemur (*Varecia variegata variegata*) and the red-ruffed lemur (*V. variegata rubra*) was recently completed and includes pedigree information on living and deceased specimens. Although other races of black-and-white ruffed lemurs have been proposed on the basis of color, including *V. variegata subcinctus* and *V. variegata editorum*, the studbook keeper follows current taxonomy and places all of them in synonymy with the nominate race.

The studbook lists animals through December 31, 1983. Currently, there are 242 (142/92/8) black-and-white ruffed lemurs recorded in 45 institutions worldwide. An additional 80 (43/37) red ruffed lemurs are recorded in 7 institutions. Specimens which represent hybrid combinations of both races are *not* included in the studbook, and owners of such animals, most of whom are in Europe, are requested to refrain from breeding them.

For further information contact:

Ms. Diane Brockman
San Diego Zoological Society
P.O. Box 551
San Diego, California 92112
UNITED STATES

The studbook for Goeldi's monkey (*Callimico goeldii*) was recently reactivated by the Chicago Zoological Park. The studbook was originally published in 1969 by Rainier Lorenz, but no data had been available since the 1970's. Beate Rettenberg reactivated the studbook, which includes a detailed analysis of both living and deceased specimens, and information on successes achieved in breeding and raising this species. As of December 31, 1983, there were 196 (93/90/13) Goeldi's monkeys living in 27 institutions in the United States, Europe and Japan.

For further information contact:

Mr. Mark Warneke
Chicago Zoological Park
3300 Golf Road
Brookfield, Illinois 60513
UNITED STATES

New Lion-Tailed Macaque Newsletter Now Available

The first issue of *Lion-Tales*, the Lion-Tailed Macaque Newsletter, appeared in the winter of 1984. *Lion-Tales* is edited by Helena Fitch of the San Diego Zoological Society's Research Department and will be published on a quarterly basis.

The purpose of the newsletter is to facilitate communication among all those involved in maintaining the lion-tailed macaque (*Macaca silenus*) in captivity and conserving it in the wild. The first issue contains announcements regarding the availability of the published proceedings of the Lion-tailed Macaque Symposium held in Baltimore in 1982, updates to the studbook, and t-shirts available from the WWF-US Primate Program. In addition, there is a report by SSP Coordinator, Laurence Gledhill, and news of

a new zoo exhibit and surrogate captive rearing techniques.

Newsletter material and requests to be placed on the mailing list should be sent to the editor at the following address:

Ms. Helena Fitch
Editor
Research Department
San Diego Zoological Society
P.O. Box 551
San Diego, California 92112
UNITED STATES

Two New Books By PSG Members Focus On Two Threatened African Primates

Two new books by PSG members Randall Susman and John E. Fa deal with two threatened African primates, the pygmy chimpanzee (*Pan paniscus*) and the Barbary macaque (*Macaca sylvanus*). The pygmy chimp book is entitled *The Pygmy Chimpanzee: Evolutionary Biology and Behavior* (Fig. 3), and is based

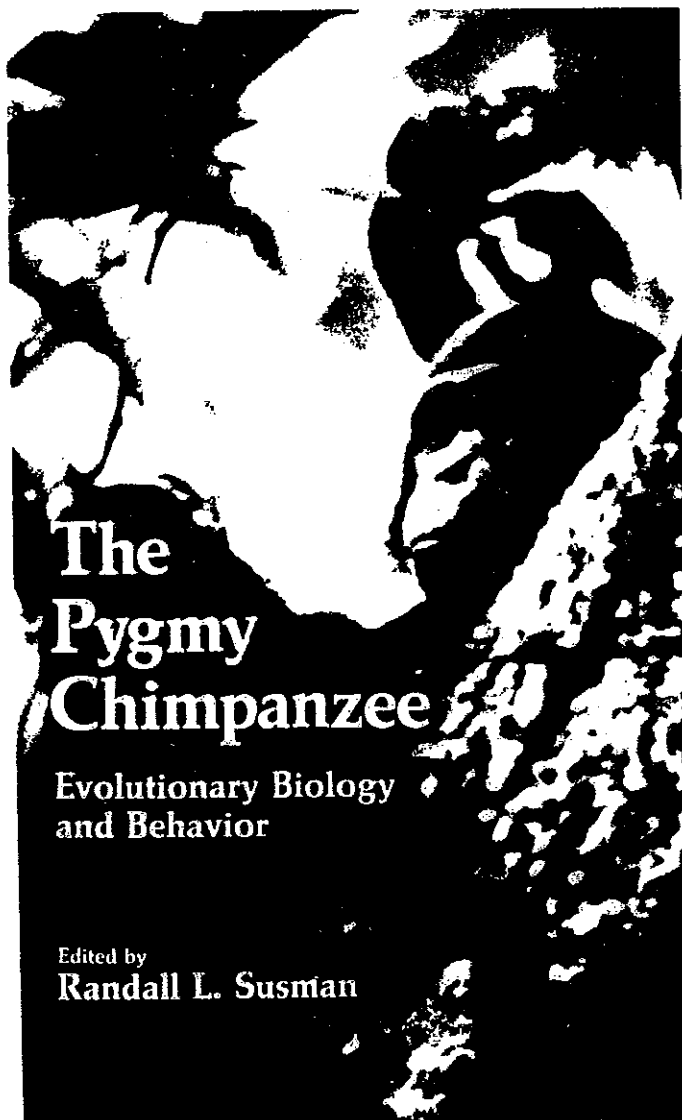


Fig. 3: *The Pygmy Chimpanzee: Evolutionary Biology and Behavior*, edited by Randall Susman.

on a symposium held at the Atlanta meeting of the International Primatological Society in August, 1982 (see Newsletter no. 2, p. 18). The Barbary macaque book is entitled *The Barbary Macaque: A Case Study in Conservation*, and represents the proceedings of a conference held in Gibraltar in June, 1982 (see newsletter no. 2, p. 19 and newsletter no. 3, 8-9, 42-46). Both are published by Plenum Publishing Corporation and can be ordered at the address given below. The pygmy chimpanzee volume is 464 pp. in length and costs \$59.50, and the macaque volume is 388 pp. and costs \$49.50.

Plenum Publishing Corporation
233 Spring St.
New York, N.Y. 10013
or
88/90 Middlesex Street
London E1 7EZ
GREAT BRITAIN

Proceedings Of The First Brazilian Primatology Congress Now Available

The proceedings of the First Brazilian Primatology Congress (Fig. 4), held in Belo Horizonte, Brazil from January 30 -

February 4, 1983 are now available. Edited by the Society's president, PSG member Milton Thiago de Mello, this 402 page book includes 36 articles on various aspects of primatology in Brazil, including conservation, ecology, behavior, captive breeding, systematics, genetics, physiology, morphology and pathology. Most of the articles are in Portuguese, but there are five English articles as well. Copies may be obtained for \$12.00 U.S. from the following address:

Dr. Milton Thiago de Mello
Departamento de Biologia Celular
Instituto de Ciências Biológicas
Universidade de Brasília
Brasília - DF 70.910
BRAZIL

The Second Brazilian Primatology Congress will be held in Campinas, São Paulo from January 29 - February 1, 1985.

New Peruvian Wildlife Magazine

The first issue of a new Peruvian wildlife magazine came out in June, 1984 in Lima. Entitled *Peru Viviente* (Fig. 5), this magazine is produced by Luis Quijano, in collaboration with PSG member Hernando de Macedo-Ruiz, Director of Lima's Natural

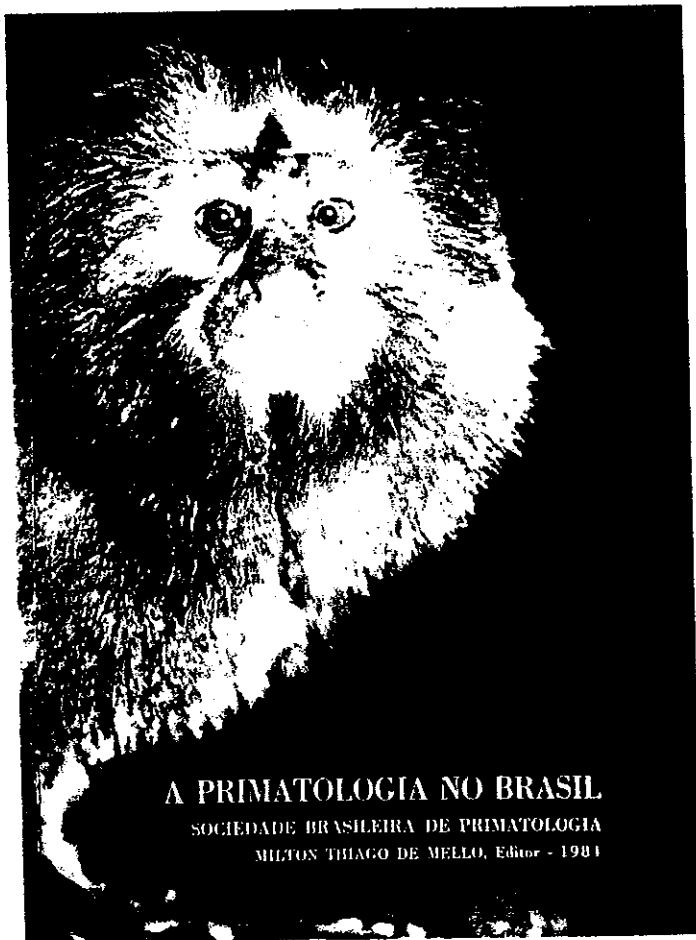


Fig. 4: *A Primatologia No Brasil*, proceedings of the First Brazilian Primatology Congress, edited by Milton Thiago de Mello.



Fig. 5: First issue of *Peru Viviente*, featuring articles on the yellow-tailed woolly monkey and on ethnobotany.

History Museum, and will appear on a bimonthly basis. The first issue features the Peruvian yellow-tailed woolly monkey (*Lagothrix flavicauda*) on the cover, and has a long article on this important Peruvian species by Macedo. For further information on the magazine, write:

Sr. Luis Quijano D.
Peru Viviente
Casilla Postal 467
Lima 100
PERU

New Report On Latin American Trade Laws Available From WWF-U.S.

A new report, entitled *Latin American Wildlife Trade Laws*, has just been published by WWF-U.S. and TRAFFIC (U.S.A.). Edited by Kathryn S. Fuller and Byron Swift of the WWF-U.S. staff, this country by country analysis of the laws that govern wildlife trade in Central and South America provides current information about domestic wildlife restrictions in the entire region. A list of protected and regulated species is included for each country as well.

This report is a must for wildlife importers and exporters, government officials charged with monitoring wildlife imports into their countries, conservationists, and anyone concerned with trade in Latin American species.

Latin American Wildlife Trade Laws has received enthusiastic support from the CITES Secretariat, the IUCN's Environmental Law Centre, and the natural resources agencies of the Latin American countries. U.S. government agencies, such as the Departments of Interior and State, have offered both financial and technical assistance. Other non-governmental groups, including the International Association of Fish and Wildlife Agencies, have also been generous supporters.

Plans are already underway to expand the report's scope to include other regions of the world, notably Asia, Africa, Oceania and the Caribbean. Regular updates of the report will include new developments in Latin American wildlife trade laws and expanded coverage of plant trade laws and regulations.

The 354 page report has been published in both English and Spanish and is available for \$22.50 U.S. per copy. Make checks payable to World Wildlife Fund - Trade Law, and mail to:

TRAFFIC (U.S.A.)
1601 Connecticut Ave., N.W.
Washington, D.C. 20009
U.S.A.

Booklet On Species Conservation Priorities In The Tropical Forests Of Southeast Asia Published By SSC

The first in a series of *Occasional Papers of the IUCN Species Survival Commission* has just appeared, and deals with "Species Conservation Priorities in the Tropical Forests of Southeast Asia" (Fig. 6). Edited by PSG Chairman Russ Mittermeier and Newsletter Assistant Editor Bill Konstant, this 58 page booklet is based on a Symposium held on October 4, 1982 at the 58th Meeting

SPECIES CONSERVATION PRIORITIES IN THE TROPICAL FORESTS OF SOUTHEAST ASIA



Occasional Papers of the IUCN Species Survival Commission (SSC)



International Union for Conservation of Nature
and Natural Resources

Fig. 6: *Species Conservation Priorities in the Tropical Forests of Southeast Asia*, the first in a series of Occasional Papers to be published by the IUCN Species Survival Commission.

of the SSC in Kuala Lumpur, Malaysia, and contains six articles on different countries in the region:

- Peninsular Malaysia*, by Mohd. Khan Bin Momin Khan, Sivananthan T. Elagupillay and Zolkifli Bin Zainal
- Sarawak*, by Kron Mide Aken and Michael Kavanagh
- Sabah*, by John Payne
- Indonesia*, by John Mackinnon and Ismu Sutanto Suwelo
- Thailand*, by Jira Jintanugool, Ardith A. Eudey and Warren Y. Brockelman
- Burma*, by John Blower

Copies can be obtained for \$5.00 U.S. from either of the following addresses:

Robert F. Scott
Executive Officer, SSC
IUCN
Avenue du Mont Blanc
CH-1196 Gland
SWITZERLAND

Bill Konstant
Dept. of Anatomical Sciences
Health Sciences Center
State University of New York
Stony Brook, N.Y. 11794
U.S.A.

Two New Films By The WWF-U.S. Primate Program

Two new films have been produced by the WWF-U.S. Primate Program during the past year. The first, entitled "Monkey of the

Clouds", is 18 minutes in length and deals with the Peruvian yellow-tailed woolly monkey and its Andean cloud forest habitat in northern Peru. It is discussed in more detail in the News from the Field section.

The second, entitled "Amazonia: A Celebration of Life", focuses on the rich biological diversity of the lowland tropical forest of Peruvian Amazonia. This 20 minute production was filmed mainly in Peru's two largest protected areas, the 1,532,806 ha Manu National Park and the 2,080,000 ha Pacaya-Samiria Reserve. It includes footage of a wide variety of wildlife, including the highly endangered giant otter (*Pteronura brasiliensis*), the ocelot (*Felis pardalis*), the tapir (*Tapirus terrestris*), the Amazon river turtle (*Podocnemis unifilis*), the black spider monkey (*Ateles paniscus chamek*), and a variety of other monkeys.

Both films were shot and edited by Andrew Young (Fig. 7), with field coordination by Russ Mittermeier and Isabel Constable. PSG member Hernando de Macedo-Ruiz, Director the Natural History Museum in Lima, served as the Peruvian sponsor for both films.

"Monkey of the Clouds" has already been translated into Spanish and "Amazonia: A Celebration of Life" will be translated in the near future, probably into both Spanish and Portuguese. Both films will be distributed free-of-charge to Peruvian conservation organizations.

For further information on these films, please contact Russ Mittermeier or Bill Konstant at the Stony Brook address.



Fig. 7: Photographer Andrew Young on location in the Andean cloud forests of Peru (photo by Russell Mittermeier)

New Primate Posters And T-Shirts Available From The WWF-U.S. Primate Program

Several new primate educational materials have been produced by the WWF-U.S. Primate Program over the past year. They include t-shirts depicting the endangered white-throated guenon (*Cercopithecus erythrogaster*, Fig. 8) from Nigeria and the lion-tailed macaque *Macaca silenus*, Fig. 9) from south India, and posters of the golden-rumped lion tamarin (*Leontopithecus chrysopygus*, Fig. 10) and the golden-headed lion tamarin (*Leontopithecus chrysomelas*, Fig. 11) from Brazil and the entire primate fauna of Suriname (Fig. 12). All of these materials are being used in public awareness campaigns in the countries where the animals depicted occur, and sales in the U.S. and Europe help to subsidize distribution.

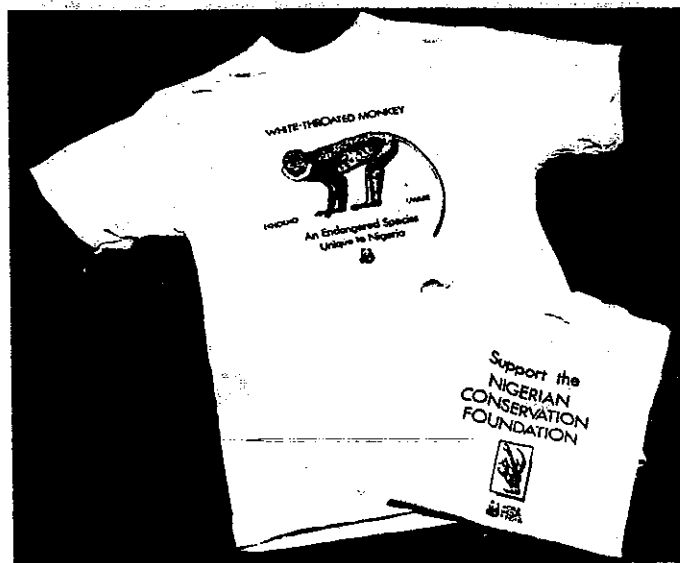


Fig. 8: WHITE-THROATED GUENON T-SHIRT. This t-shirt depicts an unusual species which is endemic to Nigeria and among the most endangered of African monkeys. Price: \$10.00.



Fig. 9: LION-TAILED MACAQUE T-SHIRT. The text of this t-shirt is in the Tamil language, which is spoken in the state of Tamil Nadu, where several of the most important populations of this endangered Indian endemic still survive. Price: \$10.00.



MICO-LEÃO-PRETO

Leontopithecus chrysopygus

O mico-leão-preto que só existe no Estado de São Paulo, é um dos macacos mais raros e mais ameaçados do mundo, devido à destruição das matas em que vivia. Esse belo sagui só sobrevive na natureza em duas reservas pertencentes ao Governo de São Paulo, situadas nos Municípios de Gaúla e de Teodoro Sampaio.

O Instituto Florestal, a Companhia Energética de São Paulo, e a Fundação Brasileira para a Conservação da Natureza, com a cooperação do Fundo Mundial para a Vida Selvagem (WWF-US) e o Centro de Primatologia do Rio de Janeiro (CPRJ) realizam um difícil trabalho para tentar salvá-lo do total extermínio.

AJUDE-OS NESTA NOBRE TAREFA



FUNDO MUNDIAL PARA A VIDA SELVAGEM



FUNDAÇÃO BRASILEIRA PARA A CONSERVAÇÃO DA NATUREZA

C. SP



MICO-LEÃO-DE-CARA-DOURADA

Leontopithecus chrysomelas

O mico-leão-de-cara-dourada somente ocorre em estado selvagem nas regiões de mata que sobraram no sul do Estado da Bahia. Devido às capturas feitas para a venda a comerciantes irresponsáveis e ao intenso desmatamento sóbrio pela região, este pequeno macaco está gravemente ameaçado de completa extinção. Especialmente para protegê-lo, foi criada a Reserva Biológica de Una, pelo Instituto Brasileiro de Desenvolvimento Florestal (IBDF), que juntamente com o Fundo Mundial para a Vida Selvagem (WWF-US), a Fundação Brasileira para a Conservação da Natureza (FBCN), o Parque Zoológico Getúlio Vargas (Bá) e o Centro de Primatologia do Rio de Janeiro (CPRJ) procuram salvá-lo do total extermínio.

AJUDE A PRESERVAR AS MATAS ONDE O MICO-LEÃO-DE-CARA-DOURADA SOBREVIVE E COMBATA SUA VENDA ILLEGAL



FUNDO MUNDIAL PARA A VIDA SELVAGEM



FUNDAÇÃO BRASILEIRA PARA A CONSERVAÇÃO DA NATUREZA

FUNDO MUNDIAL PARA A VIDA SELVAGEM

FUNDAÇÃO BRASILEIRA PARA A CONSERVAÇÃO DA NATUREZA

Fig. 11: GOLDEN-HEADED LION TAMARIN POSTER. This poster depicts the golden-headed lion tamarin, one of Brazil's rarest and most beautiful monkeys, which is found only in the southern part of the state of Bahia in Brazil's Atlantic forest region. The text is in Portuguese. Price: \$5.00.

Posters Of Endangered Brazilian Fauna Available From Brazilian Conservation Foundation

Two attractive posters on endangered Brazilian wildlife were recently produced by the Brazilian Conservation Foundation. One of them (Fig. 13) depicts endangered mammals, reptiles and birds (including the golden lion tamarin and the muriqui), and the other an array of Brazilian parrots and macaws (Fig. 14). Posters are available with either an English or a Portuguese text and can be obtained for \$6.00 each (2 for \$10.00) from the Brazilian Conservation Foundation. Address inquiries to:

Admiral Ibsen de Gusmão Camara
President, Brazilian Conservation Foundation (FBCN)
Rua Miranda Valverde, 103
Botafogo CEP 22281
Rio de Janeiro, RJ
BRAZIL

Fig. 10: GOLDEN-RUMPED LION TAMARIN POSTER. This poster is of the golden-rumped or black lion tamarin, which is found only in a few remnant forest patches in the state of São Paulo, and may be the rarest of all Neotropical primates. The species is on its way to becoming a symbol for conservation in the state of São Paulo. The text of this poster is also in Portuguese. Price: \$5.00.

T-shirts are available in yellow, light blue and beige, and in small, medium, large and extra-large sizes. Prices for all items are given in the figure captions. Anyone interested in these items should contact Bill Konstant at the Stony Brook address:

Bill Konstant
Dept. of Anatomical Sciences
Health Sciences Center
State University of New York
Stony Brook, New York, 11794
U. S. A.

Checks should be made out to World Wildlife Fund.

All the posters and t-shirts shown in Newsletter no. 4 are still available as well.

C. SURINAM FOREST SERVICE, POSTBOX 436, 10 CORNELIS JONGBAW STR PARAMARIBO, SURINAME Phone: 75845/71856



ESPECIES DA FAUNA BRASILEIRA AMEAÇADAS DE EXTINÇÃO

As espécies ameaçadas de extinção são aquelas cujas populações naturais estão diminuindo a ponto de se tornar extremamente raras, podendo desaparecer da face da Terra. A extinção de uma espécie representa a perda de uma unidade irremediável da diversidade biológica. A perda de uma espécie pode alterar o equilíbrio ecológico de um determinado ecossistema, podendo causar o desaparecimento de outras espécies.

As causas da extinção de uma espécie são diversas, sendo as principais a destruição do habitat, a poluição, a caça excessiva e a introdução de espécies exóticas. A destruição do habitat ocorre quando uma área natural é convertida para uso agrícola, urbano ou industrial, eliminando o ambiente necessário para a sobrevivência da espécie. A poluição, especialmente a contaminação da água e do solo, pode afetar diretamente a saúde das espécies e alterar suas condições de vida. A caça excessiva, especialmente para fins comerciais, pode reduzir drasticamente as populações de algumas espécies. A introdução de espécies exóticas, que competem com as espécies nativas por recursos, também pode levar à extinção.

Para evitar a extinção de uma espécie, é necessário tomar medidas de conservação. Isso inclui a criação de áreas protegidas, como parques nacionais e reservas biológicas, onde as espécies podem viver em seu habitat natural. Também é importante implementar leis que proíbam a caça excessiva e a destruição do habitat. Além disso, programas de reprodução em cativeiro podem ser utilizados para aumentar as populações de espécies ameaçadas e, posteriormente, reintroduzi-las no ambiente natural.



Fig. 14: Poster entitled *Psitacídeos Brasileiros* (Brazilian Parrots and Macaws) (lower right).

New Mountain Gorilla Stickers

Two attractive new Mountain Gorilla Project stickers have been produced by the Fauna and Flora Preservation Society (Fig. 15) and the African Wildlife Foundation (Fig. 16). They are being sold to tourists in Rwanda, and also in the U.S. and the U.K.

Information on the ffPS sticker can be obtained by writing:

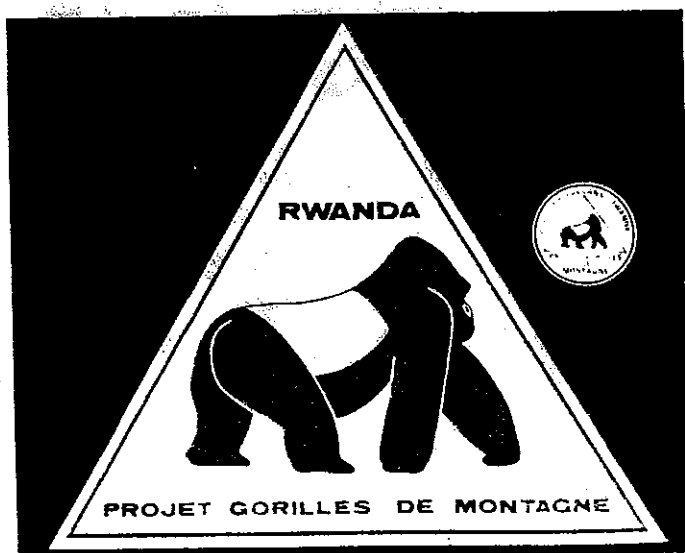
Fauna and Flora Preservation Society
Zoological Society of London
Regent's Park
London NW1 4RY
GREAT BRITAIN

Information on the purchase of the AWF sticker can be obtained from:

African Wildlife Foundation
Suite 602
1717 Massachusetts Avenue, NW
Washington, D.C. 20036
UNITED STATES



Fig. 15: Fauna and Flora Preservation Society sticker for the Mountain Gorilla Project.



New Primate Stamps

Several new primate stamps have been issued during the past year by the governments of Madagascar, Guinea-Bissau, India, Brazil, Peru, and the island of Jersey in the U.K. The very attractive Madagascan series depicts the indri (*Indri indri*), the mouse lemur (*Microcebus murinus*), the aye-aye (*Daubentonia madagascariensis*), the ruffed lemur (*Varecia variegata*) and the sifaka (*Propithecus verreauxi verreauxi*) (Fig. 17), and also includes a souvenir sheet of the potto (*Perodicticus potto*, Fig. 18), a species not found on Madagascar. The seven Guinea-Bissau stamps cover the diana monkey (*Cercopithecus diana*), the black-and-white colobus (*Colobus guereza*), the gelada (*Theropithecus gelada*), the hamadryas baboon (*Papio hamadryas*), the gorilla (*Gorilla gorilla*), the mandrill (*Mandrillus sphinx*) and the chimpanzee (*Pan troglodytes*) (Fig. 19). Two Indian stamps show the lion-tailed macaque (*Macaca silenus*) and the golden langur (*Presbytis geei*) (Fig. 20), and the Jersey stamp, which is part of a wildlife series depicting other non-primate endangered species as well, is of a golden lion tamarin (*Leontopithecus rosalia*, Fig. 21).

The Brazilian and Peruvian stamps are discussed and figured in the News from the Field section.



Fig. 17: Primate stamps from Madagascar (above).

Fig. 16: Mountain Gorilla Project sticker and pin produced by the African Wildlife Foundation (left).



Fig. 18: Potto (*Perodicticus potto*) souvenir sheet.



Fig. 20: Stamps of the lion-tailed macaque (*Macaca silenus*) and golden langur (*Presbytis geei*) from India.



Fig. 19: Seven primate stamps from Guinea-Bissau, West Africa.



Fig. 21: Golden lion tamarin (*Leontopithecus rosalia*) stamp from Jersey, Channel Islands, United Kingdom.

Availability Of Volunteer Field Assistants

As in past newsletters, we are continuing to list people interested in participating in primate field projects on a volunteer basis. We hope that PSG members will be able to place some of these people.

Volunteer field assistants:

Ms. Wendy L. Fineblum
112 Shady Lane
Randolph, New Jersey 07869
UNITED STATES

Ms. Fineblum is available for primate field work up until mid-August of 1985, at which time she is scheduled to begin graduate studies in primate behavioral ecology. She currently holds a B.S. in Biology from Hebrew University, Jerusalem, Israel, where she concentrated on natural history of local flora and fauna.

Ms. Janet Herbruck
4419 Narragansett
San Diego, Calif. 92107
UNITED STATES

Ms. Herbruck is interested in a long-term commitment to

primate field research. She has volunteered and conducted independent research at the San Diego Zoo, and has also had some field experience working with orangutans in Borneo (summer, 1984). She speaks some Indonesian and Spanish.

Ms. Pamela Hutt
1919 Banyan Boulevard Circle NW
Boca Raton, Florida 33431
UNITED STATES

Available from January 1, 1985, Ms. Hutt is interested in working in South America. She holds a B.A. in Biology from Brown University and has a working knowledge of Spanish.

Mr. Peter Jones
342 Lordship Lane
East Dulwich
London SE 22
UNITED KINGDOM

Mr. Jones is available as a field assistant for at least the first half of 1985. He holds a BSc in Zoology from Kings College and his main interests are in population and behavioral ecology. Mr. Jones is fluent in Danish.

Douglas S. Perkinoff, D.V.M.
Resident Veterinarian
St. Louis Zoological Park
Forest Park
St. Louis, Missouri 63110
UNITED STATES

Dr. Perkinoff is available during a 3-4 week minisabbatical period to engage in primate field work and wishes to offer his services and skills as a veterinarian with experience in exotic animal medicine. Dr. Perkinoff has previous experience working at both Monkey Jungle, Miami, Florida and the Yerkes Regional Primate Center, Atlanta, Georgia.

Mr. Keith C. Pitchford
5925 32nd Street, N.W.
Washington, D.C. 20015
UNITED STATES

Mr. Pitchford is interested in field work which investigates human/wildlife interactions and can volunteer for up to one year. He has a B.S. in Environmental Biology from the University of Colorado at Boulder and an M.S. in Forest Science from the Yale School of Forestry. He has worked as a consultant to the Communications Dept. of WWF-US and as an intern on several environmental planning commissions in the midwest.

Ms. Nicola Printer
25 Logan Terrace
Golf, Illinois 60029
UNITED STATES

Ms. Printer would like to become involved in a field study of free-ranging primates for a period of 6 months to one year prior to beginning graduate coursework. She majored in psychology at the University of Massachusetts and has experience in the laboratory study of rhesus macaques.

Mr. Stefan Warnek
Farberweg 5
4800 Bielefeld 12
WEST GERMANY

Mr. Warnek is particularly interested in participating in field work being conducted on the great apes, yet is available for any tropical forest projects. He studied biology at the University of Bayreuth and in March 1984 received a scholarship for scientific journalism.

Field Assistants Wanted

As another service to PSG members and people interested in primate field research, we are now listing announcements of field positions available, in addition to our usual list of volunteer field assistants.

Field Research at Animal Behavior Research Unit (ABRU) at Mikumi National Park: Tanzania.

A position is available for a field assistant interested in working on an ongoing baboon project.

Mikumi National Park is approximately 1200 square miles and located approximately 5 hours from Dar es Salaam by vehicle. The habitat is largely savanna, including open plains, some scattered woodland and small areas of more dense woodland. Several rivers cut through the Park. Relatively few tourists visit Mikumi, and consequently there is little human interference with the study groups. The home ranges of the groups are in an area of the Park which supports several large mammal species, including feline and canine predators. All field work is done on foot in the company of an armed park ranger. Park fauna include lion, leopard, hyena, wild dog, elephant, buffalo, wildebeest, sable antelope, impala, rhino (rare), warthog, zebra, and jackal.

There are 3 main study groups - Viramba I, Is and II, all originally part of a single large group which divided subsequent to the beginning of the long-term study. Since 1975 these groups have been studied continuously. Groups have been followed daily, all troop members are individually recognizable, the groups have never been provisioned, and have little contact with humans other than observers. All observers can move freely among the baboons, with as little as five feet separating them from the animals.

Living conditions at Mikumi are comfortable. ABRU personnel live in tin huts with thatched roofs, comfortably furnished with bed and mosquito netting, desk, chair and bookshelves. There is a flush toilet and cold water shower. Food is largely vegetarian by consensus. Temperatures in January and February may reach 105 F; in the cooler months evening temperatures may drop into the 50's with pleasantly warm day temperatures.

An assistant is needed for an ongoing project on the yellow baboons. The project involves collecting demographic and behavioral data, and darting, tranquilizing and sampling individuals for a broad series of biological data. Prospective assistants must commit themselves to a minimum of 6 months in the field, although one year is preferred. Permissions in Tanzania usually require a 2-3 month lead period, so students should anticipate the field experience extending well into the academic year of 1985-6. Assistants will have to locate their own funds for travel and support while in Tanzania. Return student airfare

falls within a \$1200-1400 range. Subsistence costs average \$150-200 per month. If interested, contact:

Dr. Jane E. Phillips-Conroy
Associate Professor
Dept. of Anatomy and Neurobiology
Washington University Medical School
Box 8108
660 South Euclid Avenue
St. Louis, Missouri 63110
UNITED STATES
(phone: 314-362-3597)

Position Available For Natural History Illustrator/Graphic Designer

The WWF-U.S. Primate Program is seeking an illustrator to work on a variety of projects carried out by the program at the Stony Brook office.

Activities would include layout, design and preparation of maps, tables and wildlife illustrations (with special emphasis on primates) for various program publications, design of conservation education materials and management of the program's collection of maps, photographs and scientific illustrations.

Preference will be given to individuals with considerable previous experience in drawing primates, and applicants should have the equivalent of an M.A. in Natural History Illustration and at least two years experience in this field. Some familiarity with primate taxonomy is absolutely essential since most of the work done involves this order of mammals.

Salary: \$14,000 per year.

Please send resume and samples of work to:

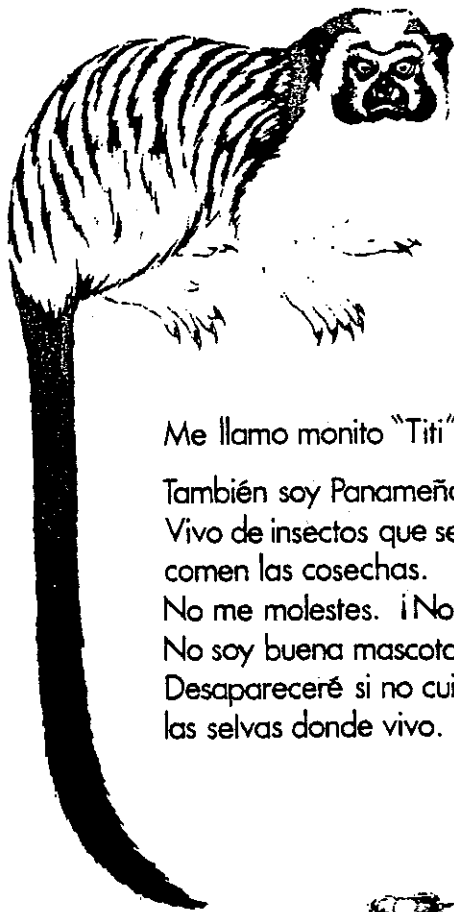
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NEWS FROM THE FIELD

South and Central America

Report On A Field Study Of Geoffroy's Tamarin In Panama

A three month field study of Geoffroy's tamarin (*Saguinus geoffroyi*) in Panama has recently been completed. The study was funded by the Cleveland Zoological Society and World Wildlife Fund - U.S. Primate Action Fund, with additional support from the Cleveland Metroparks Zoo, the Smithsonian Tropical Research Institute and RENARE, the Panamanian governmental agency in charge of national parks and natural resources. The purpose of the study was to assess densities of tamarins and status of the habitat. In addition, the study sponsored the production



Me llamo monito "Titi".
También soy Panameño.
Vivo de insectos que se
comen las cosechas.
No me molestes. ¡No me mates!
No soy buena mascota.
Desapareceré si no cuidas
las selvas donde vivo.



Fig. 22: Sticker distributed as part of the public awareness component of this project. The text reads as follows: "My name is 'Titi.' I am also Panamanian. I live on insects that eat your harvests. Don't hurt me! Don't kill me! I am not a good pet. I will disappear if you don't save the forests in which I live."

of 5,000 stickers (Fig. 22) picturing Geoffroy's tamarin and urging its preservation through conservation of tropical forests. Stickers were distributed to schools and community organizations associated with the University of Panama and the Smithsonian Tropical Research Institute.

Thirty-three different sites were visited (Fig. 23), with efforts concentrated in eastern Panama. In the provinces of Colón and Panama, 22 areas were censused, many in or near the Canal Zone, including Barro Colorado Island. One week was spent in San Blas, at Cartí, Narganá and Ailigandí. Two trips were made to the Darien, one along the Inter-American Highway to its terminus at Canglon, and the second to the areas of Yavisa, El Real and La Palma.

To census an area, existing trails were walked for one, two or three days. When a group of tamarins was encountered, data regarding group size, group age composition, behavior, vocalizations, and modes of detection were recorded. Also recorded were observations on habitat, such as altitude of terrain, estimates of forest age and canopy cover, vegetation types, presence of other vertebrate species, and alteration of nearby habitat by man.

Tamarins were found in 21 sites, all of which were moist tropical forest. This primate has a wide geographical distribution in eastern Panama, and groups were found from the western Rio Chagres Watershed to the Darien, and from the Atlantic to the Pacific coasts. Local distribution, however, is highly variable.

Long-term monitoring of specific groups can yield accurate estimates of absolute density, which can be reliable indicators of population size. The data from broad surveys, such as this, are better used in assessing relative abundances of animals at different sites. Relative abundance, as measured by numbers of groups per transect kilometer per search hour is presented for geographical regions (Table 1).

Table 1. Relative Abundance of Social Groups by Geographical Region

Region	Index
San Blas Reserve	1.0000
Panama Province	0.7206
Darien Province	0.1495
Rio Chagres Watershed	0.1206

An assessment which is more biologically meaningful is that of relative abundance in habitats differentiated by effective degree of protection (Table 2). These categories are:

- 1) *Full Protection* - areas to which general access is excluded, and within which little or no habitat alteration and/or hunting of tamarins occurs.

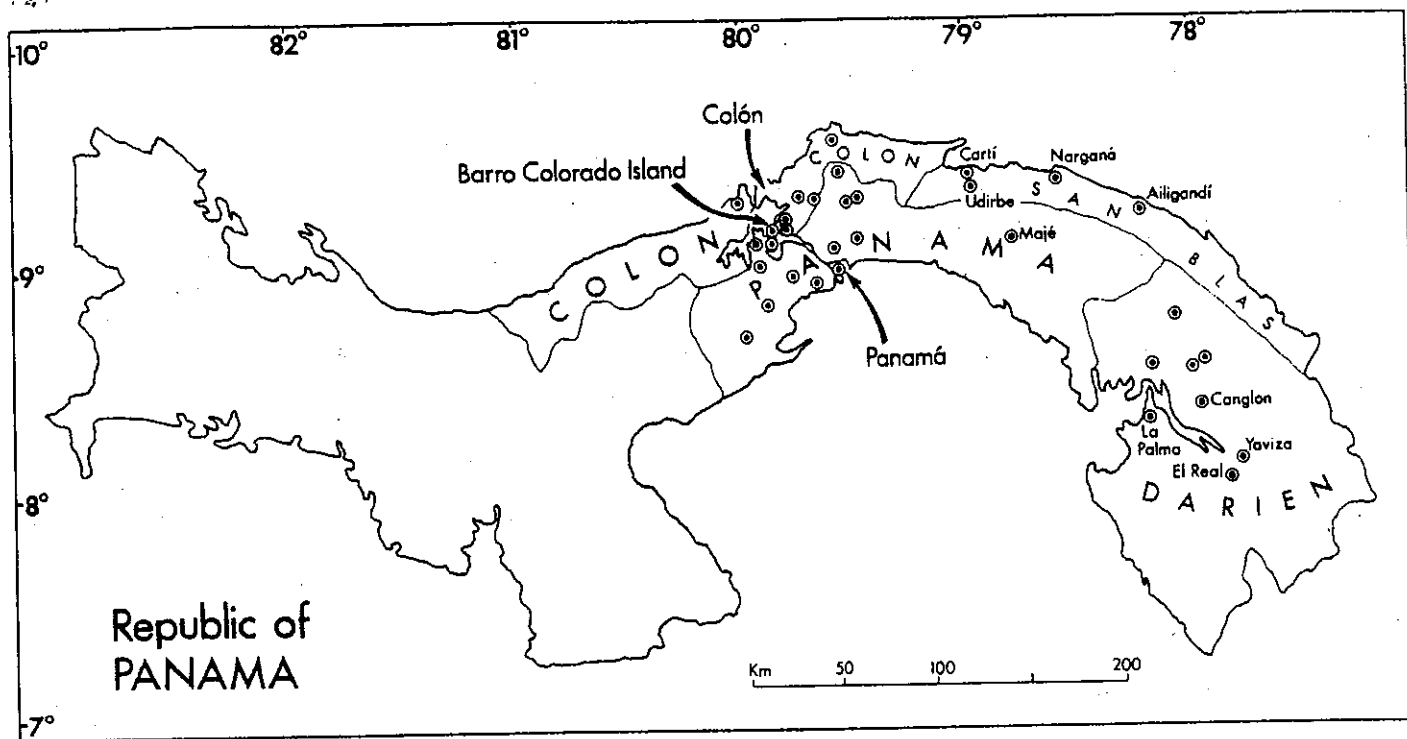


Fig. 23: Map showing the 33 localities visited during the survey discussed in this article.

- 2) *Partial Protection* - areas in which habitat alteration and/or hunting is prohibited, but which are accessible to the general public, and not patrolled regularly.
- 3) *No Protection* - areas in which land or animal use is not restricted in any way.

Table 2. Relative Abundance of Social Groups by Habitat Protection Category

Category	Index
Full Protection	1.0000
Partial Protection	0.4848
No Protection	0.3501

San Blas was categorized as *Full Protection*, Darién as *No Protection*, and regions of Panamá Province and the Rio Chagres included habitats in all three categories.

The population appears to be composed of 90-95% adults and 5-10% pre-reproductives. Since no longevity data are available for free-living populations, further monitoring is required before reliable trends can be predicted. These data indicate a stable population only if the animals live, on average, nine or more years.

Observations on habitat indicate that forest age also influences tamarin density. Young forests have fewer large canopy trees; more sunlight reaches the interior and a dense understory develops. Due to a higher percentage of canopy cover, older forests are shadier and have a more open understory. Forests with canopies of 40-60% had greater numbers of tamarins than older, shadier forests. In addition, all areas with tamarins also supported large, emergent trees. Besides being important food sources, these large trees provide cover and sleeping sites, and act as transit routes across open areas, such as trails and streams. In general, forests aged 30-80 years supported significantly more tamarins

than did younger or older forests.

Moist tropical forests once covered 32% of the total area of Panamá. It is estimated that 17% of the total area of Panamá, less than 13,000 km², is currently suitable habitat for Geoffroy's tamarin. Of this, more than 11,000 km² are vulnerable to rapid conversion for slash-and-burn agriculture, lumbering, and cattle production. Historically, most of the deforestation has occurred in the western provinces. With the extension of the Inter-American Highway across eastern Panamá to within 26 km of Yaviza, the spread of *campesinos* practicing slash-and-burn techniques and timber removal continues into the Darién, adjacent to the roadside. Also, along the shore of Lake Bayano, near Majé, there are at least two commercial lumber companies, one a government facility. These provide the total livelihood for the people of the area, mostly Bayano Cuna. In addition, an aerial transect from Panamá City to Cartí, San Blas, revealed that large expanses of forest have been cleared for cattle pasture along the Rio Chepo, east of Panamá City. If current conversion rates continue, it is estimated that Panamá will lose 85% of its forests by the year 2000.

The San Blas Reserve encompasses about 1410 km². The area is an autonomous reservation belonging to the Cuna Indians. Accessibility is limited to Cuna and selected outsiders. The Cuna do not hunt tamarins anymore, although a few may be taken as pets. Clearing for small agricultural plots of crops like cacao and plantain are scattered throughout the forest. No mechanized vehicles operate in the reserve, no commercial lumbering is done, and there is no cattle-raising. Cuna live on the islands of the archipelago and commute to their mainland farms by canoe. However, the Cuna population is increasing, and it is predicted that within 10 years significant habitat degradation will become apparent.

Based upon the results of this study, the following recommendations are presented:

- 1) Enforcement of existing laws should receive increased em-

phasis. Poaching of animals and illegal timber extraction occurs in national parks, and although commerce in *Saguinus geoffroyi* is illegal, the animals are readily available in the markets, presumably for use as pets.

2) Educational materials regarding prudent use of natural resources should be developed and distributed. Children should be a priority group to target. Schooling is mandatory through grade 6 in Panama, but children do not have access to materials of this nature. Based on the reception given the sticker, children are highly receptive to this method of instruction.

3) Habitat and population trends should be monitored by conducting continuing studies. Loss of habitat is the most serious threat to Geoffroy's tamarin. Where moist tropical forest was once common, only remnant patches remain as borders along pastures and rivers in much of Panama.

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Conservation Areas Protecting Primates In Brazilian Amazonia

Since 1979, the number of conservation areas in Brazilian Amazonia has increased from just two national parks (Amazônia and Araguaia) to 7 national parks, 5 biological reserves and 12 ecological stations (Table 1; Fig. 24). The national parks and biological reserves are administered by the Department of National Parks and Equivalent Reserves of the Brazilian Forestry Development Institute (IBDF), Ministry of Agriculture, and the ecological stations are administered by the Special Environmental Agency (SEMA) of the Ministry of the Interior. The total area covered by national parks (N.P.) is 7,831,114 ha, that for biological reserves (B.R.) is 1,936,150 ha, and that for ecological stations (E.S.) is 1,817,653 ha. The area protected by all these reserves is 11,584,917 ha, accounting for approximately 2.3% of the region known as Legal Amazonia in Brazil. Legal Amazonia covers 4,975,527 km², 68% of which is tropical rain-forest and the rest savannas, *cerrado*, and other non-forest vegetation types.



Fig. 24: The national parks and equivalent reserves of Brazilian Amazonia.

Table 1. The national parks and equivalent reserves in Brazilian Amazonia.

	Decree	Area (ha)
1. N.P. Amazônia, Pará	1974	1,258,000
2. N.P. Cabo Orange, Amapá	1980	619,000
3. N.P. Jaú, Amazonas	1980	2,272,000
4. N.P. Pico da Neblina, Amazonas	1979	2,200,000
5. N.P. Pacáas Novos, Rondônia	1979	764,802
6. N.P. Araguaia, Goiás	1959	562,312
7. N.P. Lençóis Maranhenses, Maranhão	1981	155,000
8. B.R. Rio Trombetas, Pará	1979	385,000
9. B.R. Jarú, Rondônia	1979	268,150
10. B.R. Abufari, Amazonas	1982	288,000
11. B.R. Lago Piratuba, Amapá	1980	395,000
12. B.R. Guaporé, Rondônia	1982	600,000
13. E.S. Anavilhanas, Amazonas		350,000
14. E.S. Iquê-Juruena, Mato Grosso		200,000
15. E.S. Maracá, Roraima		101,312
16. E.S. Rio Acre, Acre		77,500
17. E.S. Maracá-Tipioca, Pará		72,000
18. E.S. Piria-Gurupi, Pará		31,000
19. E.S. Caracaraí, Roraima		80,000
20. E.S. Cunã, Rondônia		100,000
21. E.S. Jarí, Pará		207,370
22. E.S. Juari-Japurá, Amazonas		273,284
23. E.S. Coco-Javaés, Goiás		37,000
24. E.S. Jutai-Solimões, Amazonas		288,187

Abbreviations: N.P. - National Park; B.R. - Biological Reserve; E.S. - Ecological Station.

Examination of the known or supposed distributions of primates in the Amazonian region indicates that these reserves protect 16-19 species and subspecies of callitrichids (including *Callimico goeldii*) and 30-32 species and subspecies of cebids (Rylands, in press). This analysis includes the latest revisions by Hershkovitz for *Saguinus imperator* (1979b), *Saguinus nigricollis* (1982) and *Aotus* (1983), but not for *Pithecia* (1979a) nor *Saimiri* (1984). The four subspecies of *Alouatta belzebul* are included and the remainder are listed by Mittermeier and Coimbra-Filho (1981).

The following callitrichids remain unrepresented in reserves in any of the Amazonian countries:

Callithrix humeralifer chrysoleuca (Brazil)
Callithrix humeralifer intermedius (Brazil)
Saguinus fuscicollis primitivus (Brazil)
Saguinus fuscicollis acensis (Brazil)
Saguinus fuscicollis melanoleucus (Brazil)
Saguinus fuscicollis nigrifrons (Peru)
Saguinus nigricollis hernandezi (Colombia)
Saguinus bicolor bicolor (Brazil)
Saguinus bicolor ochraceus (Brazil)

S. b. bicolor (Fig. 25) does occur in two forest reserves of the National Institute for Amazon Research (INPA), Manaus (see Ayres, et al., 1982). The distributions of *Saguinus fuscicollis crandalli* and *S. f. cruzlimai* are not known.

Of 38 species and subspecies of callitrichids considered, only seven or eight occur in more than one reserve in Amazonian countries. They are:

Callithrix argentata melanura - in 5 reserves
(occurs in Brazil, Bolivia and Paraguay)
Saguinus fuscicollis weddelli - in 5 reserves
(occurs in Brazil, Bolivia and Peru)

Saguinus fuscicollis tripartitus - in 2 reserves
(occurs in Colombia, Ecuador and Peru)

Saguinus nigricollis graellsii - in 3 or 4 reserves
(occurs in Colombia, Ecuador and Peru)

Saguinus midas midas - in 12, possibly 14 reserves
(occurs in Brazil, Guyana, Suriname and French Guiana)

Cebuella pygmaea - in 11 or 12 reserves
(occurs in Brazil, Colombia, Ecuador, Peru and Bolivia)

Callimico goeldii - in 5, possibly 7 reserves
(occurs in Brazil, Colombia, Ecuador, Peru and Bolivia)

Saguinus imperator subgriseus (Fig. 26) - in the Manu National Park, Peru (1,532,806 ha) and possibly the Manuripi Heath Nature Reserve, Bolivia (1,844,375 ha) (occurs in Peru, Bolivia and Brazil)



Fig. 25: *Saguinus bicolor bicolor* is protected only in the Adolfo Ducke and Walter Egler Forest Reserves of the National Institute for Amazon Research (INPA) (photo by R. A. Mittermeier).



Fig. 26: *Saguinus imperator subgriseus* is found in Manu National Park in Peru and possibly in the Manuripi Heath Nature Reserve in Bolivia. This subadult is from the Los Angeles Zoo (photo by Neal Johnston, courtesy of the Los Angeles Zoo).

Four reserves in Brazilian Amazonia are important in terms of the protection they provide for callitrichids. They are:

- B.R. Abufari - *Saguinus fuscicollis avilaparesi*, *Saguinus mystax pileatus* and *Cebuella pygmaea* on the west bank of the Rio Purus and *Saguinus fuscicollis weddelli* and *Saguinus labianus labiatus* or *Saguinus mystax pluto* on the east bank.
- E.S. Rio Acre - *Saguinus fuscicollis weddelli*, *Saguinus imperator imperator*, *Cebuella pygmaea* and *Callimico goeldii*.
- E.S. Jutai-Solimões - *Saguinus fuscicollis fuscicollis*, *Saguinus mystax mystax* and *Cebuella pygmaea*.
- E.S. Juari-Japurá - *Saguinus fuscicollis fuscus*, *Saguinus labiatus thomasi* and *Cebuella pygmaea*.

Excluding these reserves, protection is given to only 5-7 of the 32 species and subspecies of callitrichids in Brazilian Amazonia. They are:

- Callithrix argentata melanura*
- Callithrix argentata leucippe*
- Callithrix humeralifer humeralifer*
- Saguinus midas midas*
- Saguinus bicolor martinsi*
- Saguinus midas niger* (possibly)
- Saguinus inustus* (possibly)

Amazonian callitrichids in the Red Data Book (IUCN, 1982) are protected in the following Brazilian reserves:

- N.P. Amazônia - *Callithrix humeralifer humeralifer* to the west of the Tapajos and *Callithrix argentata leucippe* to the east.
- E.S. Rio Acre - *Saguinus imperator imperator* and *Callimico goeldii*.
- B.R. Trombetas - *Saguinus bicolor martinsi*.

Callithrix humeralifer chrysoleuca, *Callithrix humeralifer intermedius*, *Saguinus imperator subgriseus* and *Saguinus bicolor ochraceus* populations in Brazil remain without any protection. The Adolfo Ducke and Walter Egler Forest Reserves of the National Institute for Amazon Research (INPA), Manaus, include populations of *Saguinus bicolor bicolor* (Ayres, et al., 1982).



Fig. 27: *Cacajao calvus calvus* is currently not protected in any Amazonian reserve (photo by R. A. Mittermeier).

There are four cebids without any protection in reserves in any of the Amazon countries. They are:

- Callicebus torquatus medemi* (Colombia)
- Pithecia albicans* (Brazil)
- Cacajao calvus calvus* (Fig. 27) (Brazil)
- Aotus myconax* (Peru)

It is not known if *Chiropotes satanas satanas* and *Alouatta belzebul belzebul*, both restricted to Brazilian Amazonia, occur in the Piriá-Gurupi Ecological Station.

Callicebus moloch moloch (Brazil), *Callicebus moloch hofmannsi* (Brazil), *Cebus albifrons albifrons* (Colombia), *Ateles belzebuth marginatus* (Brazil) and *Alouatta belzebul nigerrima* (Brazil) are protected in only one reserve each.



Fig. 28: *Ateles paniscus chamek* apparently occurs in 7 different protected areas in Amazonia (photo by Andy Young).

Brazilian Amazonian cebids listed in the Red Data Book (IUCN, 1982) are protected in the following Brazilian reserves:

- N.P. Amazônia - *Chiropotes albinus*, *Ateles belzebuth marginatus* (east of the Rio Tapajos) and possibly *Lagothrix lagothricha cana* in the south of the reserve.
- N.P. Jauí - *Cacajao melanocephalus*.
- N.P. Pico da Neblina - *Cacajao melanocephalus*, *Ateles belzebuth belzebuth* and *Lagothrix lagothricha lagothricha*.

- N.P. Pacáas Novos and B.R. Guaporé - *Ateles paniscus chamek* (Fig. 28) and *Lagothrix lagotricha cana*.
- B.R. Rio Trombetas, E.S. Aravilhanas and E.S. Jari - *Ateles paniscus paniscus*.
- B.R. Jarú and E.S. Iquê-Juruena - *Chiropotes albinasus*, *Ateles paniscus chamek* and *Lagothrix lagotricha cana*.
- B.R. Abufarí - *Lagothrix lagotricha cana* and possibly *Ateles paniscus chamek*.
- E.S. Maracá - *Ateles belzebuth belzebuth* and *Lagothrix lagotricha lagotricha*.
- E.S. Rio Acre and E.S. Cuniã - *Ateles paniscus chamek* and *Lagothrix lagotricha cana*.
- E.S. Piriá-Gurupí - possibly *Chiropotes satanas satanas*.
- E.S. Caracará - *Ateles paniscus paniscus* and/or *Ateles belzebuth belzebuth*.
- E.S. Juamí-Japurá - *Cacajao calvus rubicundus*, *Ateles paniscus chamek* and *Lagothrix lagotricha cana*.
- E.S. Jutai-Solimões - *Cacajao calvus rubicundus*, *Ateles paniscus chamek*, and *Lagothrix lagotricha poeppigii* (Fig. 29).



Fig. 29: *Lagothrix lagotricha poeppigii* is protected only in the E.S. Jutai-Solimões (photo by Andy Young).

It should be noted that the impecunious situation of both IBDF and SEMA and the enormous area under their jurisdiction means that the majority of parks are as yet unguarded and those which do have some sort of infrastructure are severely understaffed and underfinanced. As colonization and destruction of Amazon forests continues, pressure on these conservation areas will increase. The threats to reserves come not only from invasion by settlers but also from hydroelectric schemes, highways and mineral prospecting. The following are some reported examples: mineral prospecting authorized by the Ministry of Agriculture within the Rio Trombetas Biological Reserve (Anon. 1982a); studies for a hydroelectric scheme at the Cachoeira Porteira on the western boundary of the Rio Trombetas Biological Reserve (Anon., 1982a); government authorization for the construction of a highway bisecting the Araguaia National Park (Anon., 1982b); plans for the construction of a State highway through the Jarú Biological Reserve and three State highways through the Guaporé Biological Reserve in Rondônia (Feamside and Ferreira, in press); and the construction of a highway through the Pico da Neblina National Park (Anon., 1982a).

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Current Status Of The Southern Bearded Saki (*Chiropotes satanas satanas*)

The southern bearded saki is accorded "endangered" status in the IUCN Red Data Book because its restricted geographical range (Fig. 30) coincides with one of the most densely populated and heavily disturbed regions of Brazilian Amazonia. A high percentage of its range has already been clear-felled for agriculture and cattle pasture, and much of the remaining forest has been selectively logged. Since February, 1984, WWF-U.S. has funded a study of the effects of habitat disturbance on Amazonian primate populations. The results to date underline the precarious position of *C. s. satanas*.

The taxonomic position of *C. s. satanas* is currently under review (P. Hershkovitz, pers. comm.). The distinctive grey-backed form occurring west of the Rio Tocantins may merit subspecific status. The chestnut-backed form occurring on the east bank of the Rio Tocantins grades into an all-black form east of the Belém-Brasília Highway (BR-010). The western population is least threatened at present, since comparatively large areas of forest remain, particularly in the region of Serra dos Carajás where mining operations are fairly localized. There are no totally protected areas in the range of the eastern form. The Gorupí Forest Reserve, which presently supports moderate populations of the all-black form, is severely affected by ranch encroachment and is also a timber-production area.

The southern bearded saki has been reported as intolerant of any form of habitat disturbance. It is most often observed in high *terre firme* forest, but it may make extensive use of riverine and *igapó* forests in the wet season, and may exploit secondary growth in cleared areas adjacent to tall forest. Our surveys indicate that it has been exterminated from heavily logged forest (where approximately 50% of the trees are destroyed). The few individuals that survive usually associate with groups of other primate species. Populations are found, however, to be only slightly reduced in lightly logged forest (around 15% of trees destroyed) and groups appeared to be reproducing normally. This is despite the fact that many of their important food trees (e.g. massaranduba, *Manilkara huberi*) are also important timber trees. The sakis do not emigrate from lightly logged forest, or if they do they return shortly afterwards. They may, however, suffer from increased access by hunters brought about by the presence of logging roads in the region. Although a few hunters operate during daylight, and sakis are nowhere a preferred food item, saki-tail dusters are still marketed in some areas.

In September, 1984, wild populations were dealt a severe blow with the closing of the much-publicized Turcuruí dam on the Rio Tocantins. This flooded some 2400 km of land, around 70% of its primary rainforest occupied by *C. s. satanas* at populations of 0.5 to 1.1 groups (15 to 35 individuals) per square kilometer. The "well-intentioned" rescue operation that was carried out released stranded animals at the nearest convenient point, usually into forests already possessing resident groups. This added to the pressure placed on groups in forest adjacent to the lake, which had already been affected by animals forced back from the rising waters and possibly resulted in the mixing of genetically distinct populations from different sides of the river. Agricultural schemes planned for the periphery of the lake will continue to exacerbate the loss of habitat.

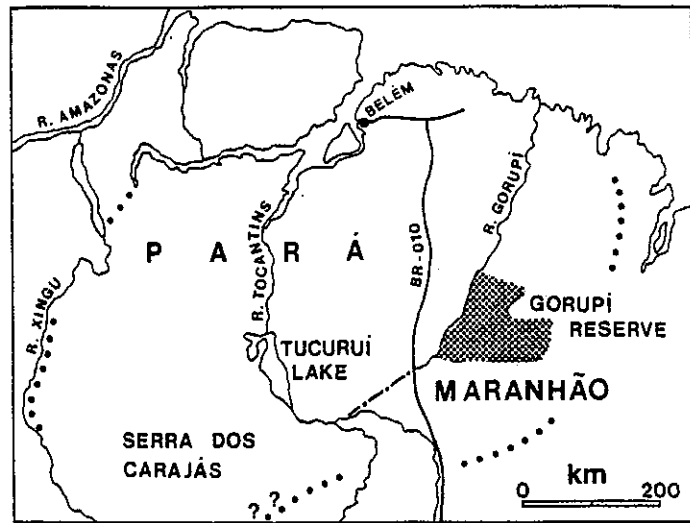


Fig. 30: Geographical range of *C. s. satanas*. Approximate borders to the subspecies' range are indicated by dotted lines.

The status of *C. s. satanas* is best described as precarious in the extreme. The chestnut-backed form will probably become extinct in the wild in a few years time. The survival of the other forms will depend on adequate protection of reserve areas at Serra dos Carajás, and careful exploitation of the forest at Gorupí. The southern bearded saki is able to persist in proximity to humans and even in lightly-logged forest, but its long-term viability demands preclusion of further tree-felling, and of casual hunting.

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Update On The Muriqui

The muriqui (*Brachyteles arachnoides*, Fig. 31) is the largest and most endangered Neotropical primate and is found only in remnant forest patches in Brazil's Atlantic forest region. It has been the focus of a special public awareness campaign since 1982, and this effort has succeeded in attracting a lot of attention to it and its Atlantic forest habitat (see newsletters 2, 3 and 4 for other muriqui reports).

During 1984, the muriqui continued to attract attention. It appeared on a telephone book in the state of Minas Gerais (Fig. 32) and was the subject of two Brazilian postage stamps (Fig. 33). An attractive book of photos and poems on the Atlantic forest region and its fauna and flora (including the muriqui and several other primates) was published by the Banco Lar Brasileiro S.A. (Fig. 34), an affiliate of the Chase Manhattan Bank, and the annual report of the Electric Company (CEMIG) of the state of Minas Gerais dealt entirely with nature conservation and, once again, featured the muriqui. In addition, the muriqui has been appearing regularly in Brazilian newspapers and magazines, as has the golden lion tamarin, another endangered Atlantic forest



Fig. 31: The muriqui at Fazenda Montes Claros, Minas Gerais (photo by Andy Young).

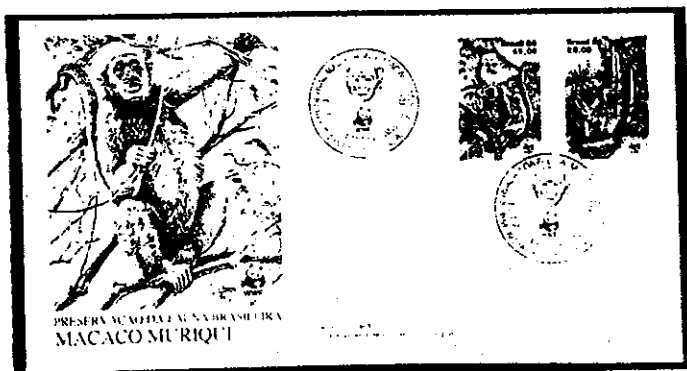


Fig. 33: Two muriqui stamps issued by the Brazilian government, and the first day cover accompanying them (note the WWF logo).

1984

LISTA TELEFÔNICA DA ZONA DO RIO DOCE



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Fig. 32: The muriqui on the cover of a phone book from the state of Minas Gerais.

primate that is the focus of a campaign in the state of Rio de Janeiro (a report on this campaign and the golden lion tamarin reintroduction program with which it is associated will be included in the next issue of the newsletter). The attention that these species and their habitat have received of late is very gratifying, especially since they were virtually unknown to the Brazilian populace as recently as three to four years ago.

Survey work on the muriqui carried out by a joint WWF/UFMG team has also succeeded in locating several new muriqui populations, raising to nine the total number of forest areas in which the species is still known to survive. An in-depth report on the status and distribution of the muriqui will be included in the next issue of the newsletter.

Research on this species continues as well. Katherine Milton's ecological study on the muriqui at Fazenda Barreiro Rico in São Paulo appeared in the *International Journal of Primatology* (Vol. 5 (5):491-514; 1984) and Karen Strier completed a year long study of the Fazenda Montes Claros population in Minas Gerais in July, 1984. Results of an earlier project at Fazenda Montes Claros appear in the article section of this issue.

Finally, work on a muriqui breeding project at the Rio de Janeiro Primate Center is well under way. A large cage is under construction, with funds from Wildlife Preservation Trust International, and should be completed in late 1985.

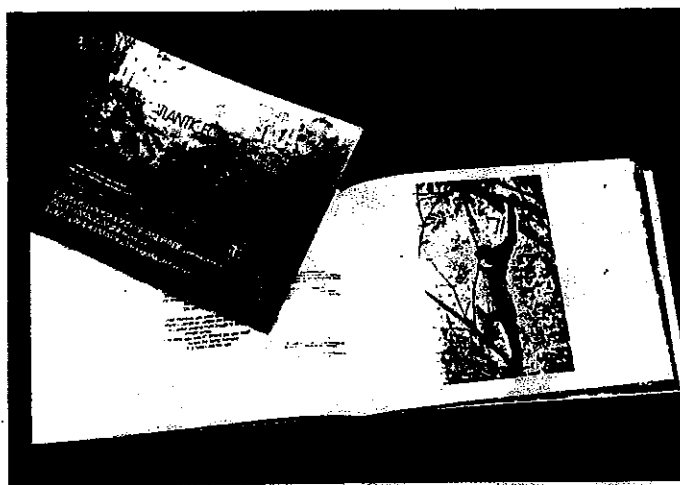


Fig. 34: Book on the Atlantic forest published by the Banco Lar Brasileiro.

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Campaign For The Yellow-Tailed Woolly Monkey Begins In Peru

The Peruvian yellow-tailed woolly monkey (*Lagothrix flavicauda*) is the largest mammal endemic to Peru, and also the most endangered Peruvian monkey. Its history and plans to launch a campaign on its behalf were discussed in newsletter no. 4 (pp. 19-22). Since then, there have been several new developments. The film on this species, entitled "Monkey of the Clouds", was completed by filmmaker Andy Young in May, 1984, and PSG Chairman Russ Mittermeier travelled to Peru to launch the film and the yellow-tailed woolly monkey conservation campaign on the occasion of the 10th anniversary of the rediscovery of the species. As it turned out, there were two campaign launches - one at the Museo de Historia Natural in Lima, hosted by museum director, Dr. Hernando de Macedo-Ruiz, and the other in the Banco Continental, hosted by the Peruvian Conservation Association (APECO) and APECO's Anthony Luscombe and Susanna

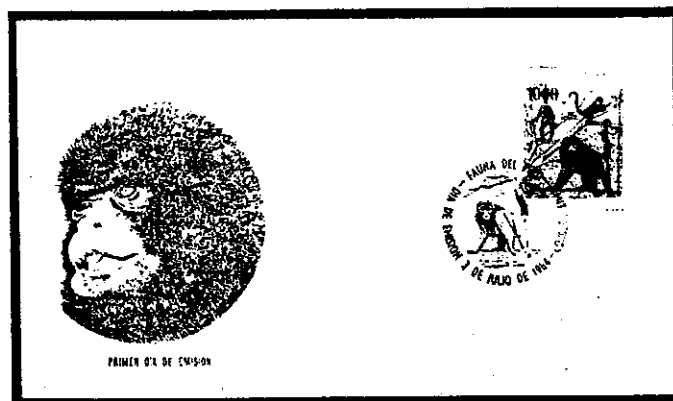


Fig. 35: Peruvian postage stamps and first day cover depicting the yellow-tailed woolly monkey.

Moller-Hergt. Both Macedo and Luscombe were members of the 1974 expedition that led to the rediscovery of the yellow-tailed woolly monkey, and both continue to be active on its behalf. These two launches attracted some 500 Peruvians and a good deal of press coverage in Peru, and the monkey has also appeared on the cover of the first issue of a new Peruvian wildlife magazine, *Peru Viviente* (see p.13).

In July, the Peruvian government even issued a special postage stamp depicting the yellow-tailed woolly monkey (Fig. 35), and the design used was an exact replica of the poster produced by WWF-U.S. for the campaign (Fig. 36).

At the same time, the Lima Zoo, known as the *Parque de las Leyendas*, has taken an active interest in the conservation of the species, thanks to enthusiastic support from the Zoo's president, Felipe Benavides, and Alice Dentener, a Dutch volunteer work-



MONO CHORO DE COLA AMARILLA (*Lagothrix flavicauda*)

Nombres locales: Pacu-runtu, Tupamono, Upa, Quille corota, Maquisopa chusco
Este mono existe solamente en el Perú. Está en peligro de desaparecer para siempre
porque los bosques donde vive se están destruyendo. ¡Ayúdanos a salvarlo!

WWF-USA

WORLD WILDLIFE FUND
PERU PROJECT

Fig. 36: WWF-U.S. poster upon which the postage stamp was based.

ing at the zoo. A special moated island is now under construction to house the world's only captive yellow-tailed woolly monkey, (Figs. 37-38) and an education exhibit is being prepared to inform visitors of the importance of this species and its cloud forest habitat.

Peruvian researcher Mariella Leo Luna has now completed her masters degree at the University of Florida at Gainesville, and has returned to Peru to begin the yellow-tailed woolly monkey campaign in the northern Peruvian Andes where the monkey actually occurs. As part of the WWF-US supported project, she will be visiting towns and villages throughout the region, showing a Spanish version of "Monkey of the Clouds", lecturing to local villagers and schoolchildren, and distributing posters, stickers, t-shirts and other educational materials (Fig. 39). She will also be carrying out surveys to determine the most appropriate sites for reserves in two of the cloud forest areas remaining within the yellow-tail's range, and will be making recommendations to the Peruvian government as to where and how these reserves can best be established. This important project should be instrumental in ensuring the survival of the yellow-tailed woolly monkey and the cloud forest habitat upon which both it and the local human population depend for their survival.

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Fig. 37: The moated enclosure at the Parque de las Leyendas Zoo in Lima which will house the world's only captive yellow-tailed woolly monkey (photo by R. A. Mittermeier).



Fig. 38: Dr. Hernando de Macedo-Ruiz and Peruvian student volunteers working on the yellow-tailed woolly monkey and other zoo projects. Standing on the right is Alice Dentener, a Dutch volunteer coordinating zoo education activities (photo by R. A. Mittermeier).



Fig. 39: The yellow-tailed woolly monkey campaign in action. Mariella Leo Luna distributing posters and stickers to local people (photo by R. A. Mittermeier).

Swamp Monkeys Of The Lomako Forest, Central Zaire

Allen's swamp monkey (*Allenopithecus nigriviridis*) and De Brazza's monkey (*Cercopithecus neglectus*) are two of Africa's least known primates. While conducting synecological research funded by WWF-U.S. as part of the Lomako Forest Pygmy Chimpanzee Project in Zaire (see Susman and Kabongo, 1984), I was able to make some observations of these species in their riverine swamp habitat.

Since it is extremely difficult to approach swamp monkeys quietly on foot, most observations were made from dugout canoes along the river. In the Lomako, Allen's swamp monkey and De Brazza's monkey occur only in swamp and gallery forest. However, the monkeys that were the main subjects of my study (black and white colobus, *Colobus angolensis*; Wolf's monkey, *Cercopithecus wolfi*; redtails, *Cercopithecus ascanius*; and black mangabeys, *Cercocebus aterrimus*) often cross from their preferred habitats in primary and secondary forests to the swamps, where they are sometimes found in association with the swamp monkeys. Talapoin monkeys (*Miopithecus talapoin*) also use the swamp and may be found with both species of swamp monkeys.

Allen's swamp monkey and De Brazza's monkey are both heavily-built, medium-sized monkeys exhibiting marked sexual dimorphism, males being larger than females. They are also both extremely competent swimmers and divers, and spend much time on the ground. We once encountered a De Brazza's monkey swimming in a wide shallow area; upon seeing us, it swam several hundred meters underwater and remained submerged for several moments before popping its head out of the water to eye our canoe. It then submerged again and swam away to disappear in the dense vegetation at the water's edge. Another animal, upon seeing us, dove from a small tree, swam over 10 m underwater to the riverbank, and climbed into the low branches of the vegetation to flee. On other occasions, animals of both species seen feeding or resting in trees would descend to the ground or to the lowest branches just above the water's surface to flee (see Brennan, 1984). Since swamp monkeys are hunted, they are extremely wary and easily alarmed by approaching humans.

Swamp monkeys have a varied diet. Fecal analysis revealed fish bones, fish eggs, insect fragments, seeds and plant matter all in the same sample. Both Allen's swamp monkey and De Brazza's monkey walk along river beds during the dry season to scoop out fish hatchlings from muddy pools in the evening and pre-dawn hours. Fruits are taken from low riverine bushes and trees, and much plant and insect food is collected on the ground in the gallery forests and swamps; pith and roots, and beetles and worms dug out of the leaf litter and mud are regular foods. Small groups of 2-6 monkeys will travel together to forage.

Local hunters, aware of these terrestrial habits, set traps on the forest floor for swamp monkeys in addition to hunting them with bows and arrows along the edges of rivers. They consider it hazardous to chase monkeys with hunting dogs since a male De Brazza's monkey was reported to have killed a dog (F. Christiaans, pers. comm.). Natives ranked both Allen's swamp

monkey and De Brazza's monkey highly when asked which monkeys they liked to eat (Fig. 40).

Allen's swamp monkey is restricted to the Central Congo Basin in Zaire and the eastern Congo (Verheyen, 1963), and is sparsely



Fig. 40. Native children along the road in Equateur Province, Zaire, offering *Allenopithecus nigriviridis* for sale as meat (photo by Thomas F. Kulesa).

distributed" throughout this range (Hill, 1966). Information on this species is almost nonexistent. Horn (1978, in Wolheim, 1983) reported a solitary male and group of 3-6 individuals near Lake Tumba; Malbrant and MacLachy (1949) record its habitat as confined to regularly inundated riverine forests and swampy areas. There are no published accounts of population estimates or conservation action. To my knowledge there are no conservation measures currently taking place in Zaire to protect this species.

De Brazza's monkey, often exported to zoos because of its striking coloration, has a larger range than Allen's swamp monkey, being found in central Africa from Cameroon to southern Ethiopia and southwards through Zaire and northern Angola (Wolheim, 1983). Kingdon (1971) speculates that this species once may have occupied many different forest types, but that destruction of forest in Kenya and Uganda has restricted it to isolated swampy areas. Expanded agriculture and settlements along streams have reduced

its numbers in East Africa (Leakey, 1969). Brennan (1984) estimates the total population in Kenya to be 100-150 animals and predicts that without increased conservation effort De Brazza's monkey will become extinct in that country, despite legal protection of a small population in Saiwa Swamp National Park. In Ethiopia, although it is legally protected, land cleared for coffee plantations has destroyed much of this monkey's habitat (Bernahu, 1975). In Cameroon, it occurs in the Dja Reserve, but is not reported in other protected areas. In many countries throughout its range, De Brazza's monkey is hunted for food or as an agricultural pest in addition to being threatened primarily by habitat destruction (Wolfheim, 1983). Like Allen's swamp monkey, De Brazza's monkey is not currently protected in Zaire.

Despite human predation, swamp monkeys still appear to be fairly numerous in the riverine area around the Lomako Forest study site. Although it is difficult to observe them, their vocalizations are a common sound echoing along the rivers and swamps. The area around the Lomako is relatively unpopulated and an agreement with the local people restricts the hunting of primates in the main study site. The area may also be successfully protected from deforestation by commercial logging concerns (Susman and Kabongo, 1984). As both Allen's swamp monkey and De Brazza's monkey's ranges are centered in Zaire, this country is very important for the conservation of these primates. Further censusing and study will reveal much more information about these two elusive species.

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Rehabilitation And Release Program For Chimpanzees

A program has been initiated for the rehabilitation and release of chimpanzees which have been used in hepatitis B vaccine studies at Vilab II, the primate laboratory of the New York Blood Center located at the Institute for Biomedical Research in Robertsfield, Liberia.

To prepare for this program chimpanzees held at Vilab II are never caged alone, unless they are ill. They are usually held in groups of 2-4 animals or, when not in studies, in groups of 6-10 animals. The use of outdoor cages and holding compounds provides continuous visual contact with nature and other chimpanzees. Almost all of the animals were originally caught in the wild.

For further resocialization and preparation for life in the wild, animals are first introduced in groups onto islands in a river several miles from the laboratory. One such group of 11 animals has lived on a 4 ha island for the past 5 years; 4 babies have been born on this island. In the spring of 1983, three additional islands (10, 17 and 35 ha) were acquired for use in resocialization. All have sufficient trees to allow the chimps to practice climbing, nest building skills, and to provide a supplementary source of wild food. Under the direction of the head of the release program — Mr. Knut Hentschel, a German mammalogist — a second group of 19 animals 5-8 years of age was released onto one of these islands in May of 1983. This group has adapted well to the island, rapidly beginning to build nests for sleeping and to forage for food. It is planned that these animals will remain on this island for 9-12 months prior to release in a national park area chosen for paucity of existing chimpanzee population, and maximal isolation from farms and villages.

A third group of 20 animals (10 male, 10 female) aged 7-10 years have recently been released on an island near the Asagny National Park in the Ivory Coast. This program is being done in collaboration with Dr. Harold H. Roth, Director of the Asagny National Park World Bank Project. These animals are to be released into the main park during June of 1984. A proportion will wear radio transmitters to assist in their followup by aerial and on the ground surveillance.

The Vilab II release project is in an early and obviously experimental stage. We have found that wild born chimpanzees have little difficulty in adjusting to the semiwild life on the islands. We are hopeful that use of these islands for resocialization of groups of about 20 mature subadult or adult animals will favor their ability to defend themselves against groups of wild chimpanzees when subsequently released into national park areas. Whether this is a realistic goal remains to be determined by careful surveillance and follow-up during the coming years. A second danger will come from future human contacts: either poachers entering park areas, or farmers if these animals stray from the interior of the parks. Initially these animals have little fear of man, however, with minimal human contact the animals so far released onto islands have become progressively wilder and appear to be developing increasing fear and hostility toward people. Whether this will be sufficient to engender an appropriate fear of man after final release remains a major concern.

We welcome enquiries from graduate students and primatologists interested in participating in the follow-up and study of these released chimpanzee groups.

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Asia

Wildlife Rehabilitation Center Maintained By Sarawak Forest Department

Orang-utans (*Pongo pygmaeus*), gibbons (*Hylobates muelleri*), proboscis monkeys (*Nasalis larvatus*), slow lorises (*Nycticebus coucang*) and tarsiers (*Tarsius bancanus*) are totally protected animals in Sarawak. As a result, captive individuals are regularly confiscated from the public by the National Parks and Wildlife Office of the Sarawak Forest Department. Most of these confiscated animals are apes, but they also include a few of the other species.

The Forest Department maintains a wildlife rehabilitation center at Semenggoh near Kuching, to which the confiscated primates are sent after they have received any necessary veterinary treatment. However, this is not the complete solution to the problem of what to do with them. Some individuals are not suitable for rehabilitation. For example, there is a subadult male orang-utan there which is too dangerous to release from its cage, and most of the primates have had no experience of living in the wild since early infancy. In the Sarawakian context, releasing these animals into the wild is irrelevant to the conservation of natural forest communities.

At the present time, the Forest Department is not in a position to set up a public education center along the lines of those at Sepilok in Sabah or Bohorok in Sumatra, both of which provide good reasons for rehabilitating primates (especially orang-utans) into the wild. Nevertheless, the Department does what it can to rehabilitate its charges, although its resources are limited and Semenggoh Forest Reserve is not a large area. However, records to date suggest that the survival rate after release, especially for gibbons, is not satisfactory.

What, therefore, should be done? Could these animals be given a better fate in the world's best zoos, and could they play a role for conservation by contributing to captive breeding stock? Bornean gibbons are relatively rare in zoos, and the captive genetic pool of orang-utans is dangerously low.

Qualified persons who have constructive suggestions to make are encouraged to write to:

The National Parks and Wildlife Officer
(for the Director of Forests)
Forest Department
Jalan Gartak
Kuching, Sarawak
MALAYSIA

Applications to keep these animals as pets or to use them in laboratory research programs will not be entertained. Please also note that any suggestions which involve moving the animals out of Sarawak could not be considered should they not comply with the rules of CITES.

This notice is written with the permission of the National Parks and Wildlife Officer.

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Establishment Of A Rainforest Ecology Program In The Danum Valley, Sabah

A five-year agreement was signed on October 10, 1984, between three bodies in the Malaysian State of Sabah - the Forest Department, Universiti Kebangsaan Malaysia (Sabah Campus), the Sabah Foundation - and the Royal Society, London, to develop a cooperative program of research and training in rainforest ecology. The program will be based at a Field Studies Center in the 438 km² Danum Valley Conservation Area, near Lahad Datu.

The Danum Valley is perhaps the most important refuge in Sabah for the conservation of lowland flora and fauna, including such endangered species as the orang-utan (*Pongo pygmaeus*), elephant (*Elaphas maximus*), banteng (*Bos javanicus*) and Sumatran rhinoceros (*Dicerorhinus sumatrensis*). Nine species of primates are also known from the area, including a recent sighting of proboscis monkeys (*Nasalis larvatus*) close to the Segama River in lowland forest over 180 km by river from the sea.

A survey of the Danum Valley in 1976, sponsored by World Wildlife Fund - Malaysia, documented some of the diversity of the area and called for its establishment as a national park. Most of the land lay within the timber concession of the Sabah Foundation, which is a statutory body charged with improving education and welfare in the state with revenues generated largely from sales of logs and processed timber. After some preliminary moves had been made towards excising the Danum Area, the Foundation's Trustees decided, in 1981, that it would not be released, but would be managed as a special conservation area within the concession for purposes of wildlife conservation, education and research. These objectives are in line with the Foundation's wider mission in Sabah.

To develop the educational potential of Danum Valley, the Foundation, in 1983, approved plans for a Field Studies Center to be built at the edge of the Conservation Area, beside the Segama River. An all-weather road has since been built to give access to the site from the town of Lahad Datu, 80 km away, and a foot-bridge has been built over the river. Construction of a resthouse, a laboratory and a student hostel is currently in progress and should be completed in 1985.

The implementation of a program to make use of the center is the responsibility of the Management Committee, representing the principal parties to the agreement, together with the Sabah Parks Department and the Sabah Museum. The initial emphasis is to be on higher level research and training, with the center becoming a field station of the Universiti Kebangsaan Malaysia (Sabah Campus). An invitation to specialists and postgraduate students from Great Britain to carry out research projects, under an agreement with the Royal Society, is seen as a valuable element in stimulating fundamental studies and in improving local expertise through collaboration. The main theme of research is the recovery of forest following disturbance, by comparison of ecological processes in primary forest and adjacent logged over areas.

Training and recreation of a simpler kind will also be encouraged through courses for school parties which combine natural history studies with elements of adventure training. This will supplement the Forest Department's existing program of school talks and visits to Sepilok Nature Education Center, near Sandakan. Thus the aim of the program and the protected area is to supple-

ment the work of the Sabah Parks and Sabah Forest Department with particular emphasis on education.

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Sabah Foundation
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Publication Of Tanjung Puting National Park Management Plan For Development

The Tanjung Puting National Park Management Plan for Development, which was prepared by John Mackinnon (PSG), Birute M. F. Galdikas (PSG), Peter Cockburn and Effendy A. Sumardja, was published in 1983 by the World Wildlife Fund - Indonesia Program for the Directorate of Nature Conservation, Directorate-General of Forestry, Indonesia. Galdikas and Sumardja prepared the material and recommendations on the fauna, Cockburn on the flora, soils and geology, while Mackinnon edited the material into a comprehensive whole. The initial surveys for the management plan were conducted at Tanjung Puting Reserve in November and December, 1978 by Cockburn and Sumardja and in January, 1982 by Mackinnon. Galdikas has been studying wild orang-utans and rehabilitating ex-captive animals in the Reserve since 1971.

Tanjung Puting is the largest and most diverse protected area of coastal heath and peat swamp forests, which used to cover much of southwestern and southern Borneo. The 300,000 ha game reserve, originally declared in 1935 by the Dutch colonial government, was extended 25,000 ha southwards by the Indonesian government in 1980 to provide wider coverage of habitat types, including mangrove and beach forests. Further coastal extensions are recommended in the management plan.

Tanjung Puting is particularly notable for its diverse primate populations, including orang-utans, gibbons and the endemic and endangered red leaf monkeys and proboscis monkeys. While the reserve has had a chequered history of weak protection leading to considerable disturbances in some parts, it still remains substantially wild. Protection measures have greatly improved during the last six years, during which time the Nature Protection branch of the Indonesian Forestry Department has increased its staff from 3 to 12 guards and built 7 guardposts.

The new management plan recommends the upgrading of the reserve to the status of National Park and its development during the Fourth Indonesian Development Program, which runs from 1984 to 1989. Such development of the Park involves increasing the staff to a total of 68 guards. The creation and development of a National Park in Tanjung Puting will constitute a valuable step for the entire region, as the area surrounding the present reserve is devoid of major developments, being of little use as agricultural land and having no known mineral or oil wealth.

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Orangutan Research and Conservation Project
Tanjung Puting Reserve
Kalimantan Tengah
INDONESIA

Rhesus Monkeys In Burma

A small and apparently isolated population of rhesus monkeys was observed in central Burma in February, 1984, in the vicinity of Buddhist Temples on the slopes of Mt. Popa. Mt. Popa is an ancient volcanic cone nearly 5,000 feet in elevation rising from the agricultural plains of the Irawaddy river valley. It is 40 km southeast of Pagan and 120 km southwest of Mandalay (Fig. 41). Three groups of rhesus were seen, frequenting the forested hillsides and temple areas around the village of Mt. Popa. The temples of Mt. Popa have a dramatic setting on top of a steep-sided volcanic "plug" that rises sharply above the village. The village and volcanic plug are approximately one-third the way up the slopes of Mt. Popa.

The groups were small, from 9 to 26 monkeys per group, and the total composition of all groups was 7 adult males, 14 adult females, 10 infants, and 15 juveniles. This age distribution suggests that the population is self-sustaining, but the small group sizes indicate that it is not especially thriving or increasing.

The possibility exists that other rhesus groups occur on the rather extensive slopes of Mt. Popa, but brief field surveys at two places, one in an entirely forested area and one along the outskirts of another village, failed to find any monkeys. We were also given reports by local people that another type of brown monkey occurred further up the slopes of Mt. Popa, and the description of its appearance and behavior suggested that it might be *Macaca nemestrina*. Furthermore, Tun Yin (1967) stated that Phayre's leaf monkey (*Presbytis phayrei*) was known to occur near the summit of Mt. Popa. Unfortunately, we could not confirm either of these possibilities.

We also searched the delta region south of Rangoon and east of Syriam for rhesus and crab-eating macaques, but did not find any. Monkeys were reported to occur in and around Rangoon 25 years ago, and a prominent place name in Rangoon is "Monkey Point" at the confluence of the Rangoon River and Pazundaung Creek. Neither this point, nor the Royal Lake Gardens, also known to have monkeys 25 years ago, have monkeys at the present time. The Rangoon zoo has a sizeable collection of primates with breeding colonies of *M. fascicularis*, *M. nemestrina*, *M. mulatta*, *M. speciosa*, and several hybrid specimens. It is likely that most of these macaques were obtained within Burma.

Burma is an intriguing unknown in Asian field primatology. Most of the country has been closed to foreigners for many years. Even now only 7-day visas are permitted, and less than half of the country is open to travel by westerners. Burma is especially interesting, since it occupies a central position between southeast Asia, the Indian subcontinent, and China. According to Yin (1967) Burma has a rich primate fauna with five species of macaques (*M. mulatta*, *M. fascicularis*, *M. nemestrina*, *M. speciosa*, and *M. assamensis*), five species of langurs (*Presbytis phayrei*, *P. melalophos*, *P. obscurus*, *P. pileatus* and *P. cristata*), two species of gibbons (*Hylobates lar*, and *H. hoolock*), and the slow loris (*Nycticebus coucang*).

We know virtually nothing about the distribution and abundance of any of these species in Burma. The extent of geographic and ecological sympatry of Burmese primates would be fascinating to study. One of the last wildlife surveys was completed in 1960 by Milton and Estes, and it concentrated on large wildlife species

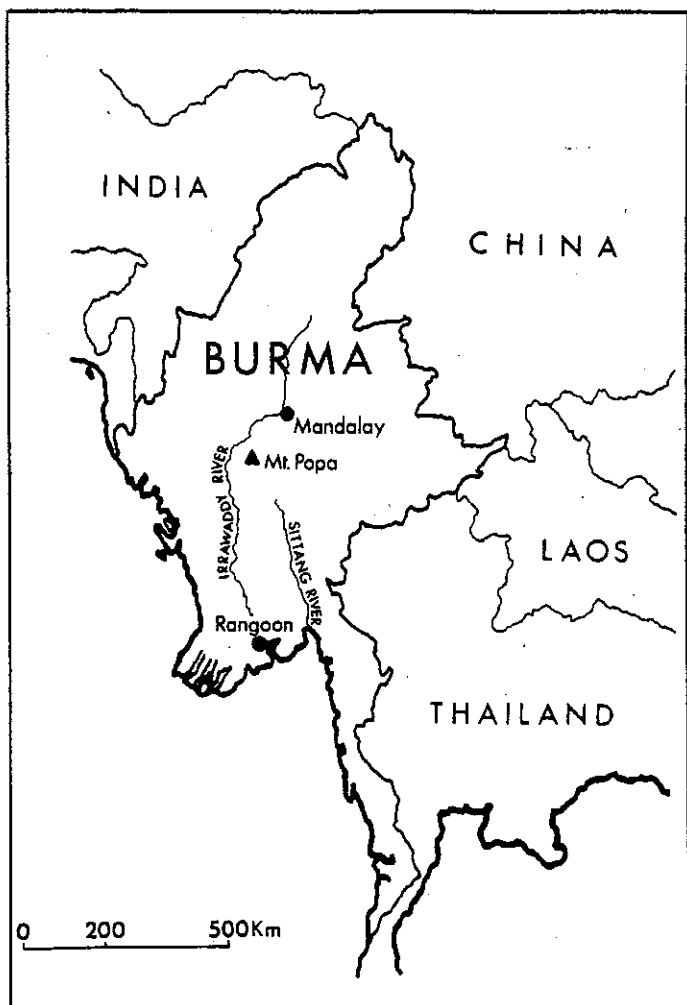


Fig. 41: The location of Mt. Poba in relation to other localities mentioned in the text.

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such as rhino and sambhar (Milton and Estes, 1963; Milton *et al.*; 1964). Milton and Estes (1963) make occasional reference to monkeys, but the statements are general, e.g. "Monkeys were frequently seen . . ." in Pidaung Wildlife Sanctuary. None of the primates is identified by species, and no data are given on actual numbers observed.

Burma has extensive forests in the hill regions, but travel is restricted in many of these areas. Although these forests probably contain excellent primate habitat, they also have local peoples who hunt primates for food. Hence, it is impossible to make any statements at this time about the abundance of primates in the hills and mountains of most of Burma. If and when Burma opens more fully to travel by westerners, some very interesting opportunities for primate field work will exist.

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NEWS FROM CAPTIVITY

Chinese Golden Monkeys At San Diego Zoo

A pair of Chinese golden monkeys (*Rhinopithecus r. roxellanae*) are on public display at the San Diego Zoo for the first time ever outside mainland China (Fig. 42). The four-month loan was arranged through the China Wildlife Conservation Association and the Chengdu Zoo, a sister zoo of San Diego in the capital of Sichuan Province. Min-Min, a 10-year-old male (Fig. 43) weighing 17 kg, and Rong-Rong, a 4-year-old female weighing 6.5 kg, arrived November 16, 1984 and will stay through May, 1985.

GOLDEN MONKEY

FROM THE PEOPLE'S REPUBLIC OF CHINA

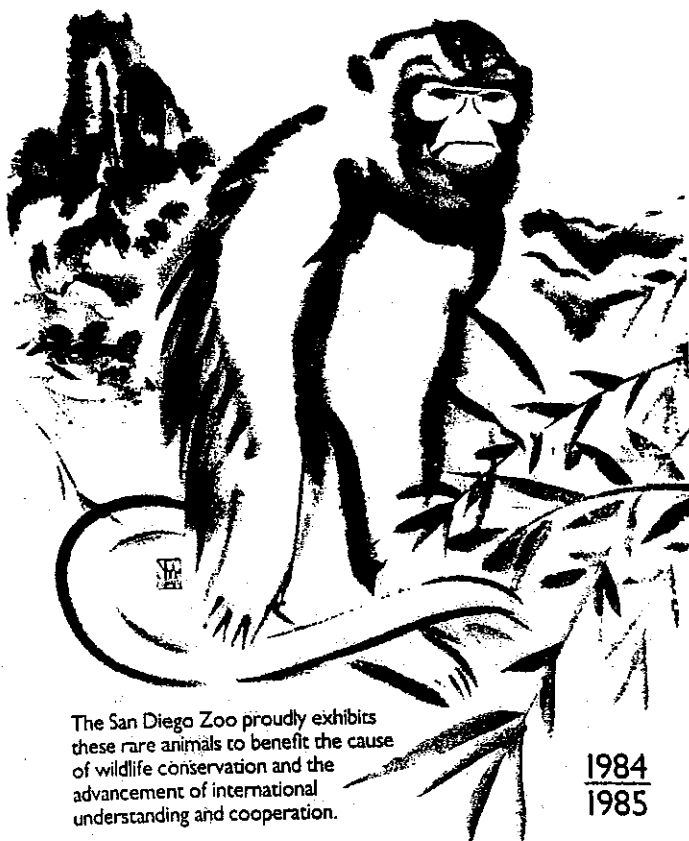


Fig. 42: San Diego Zoo poster depicting the golden monkey and commemorating the first-ever exhibition of this species outside its native China.

The first noticed features of this handsome monkey are its pastel blue face, its upturned nose, and its long, reddish-gold hair. Males display impressive canine teeth and fleshy flaps on the upper lips which make them appear to be pouting. The fur is long and thick, becoming longer and more brightly colored with age. Capes of

gold and gray fur curl down from the males' shoulders, reaching lengths of 450 mm or more.

French zoologist Alphonse Milne-Edwards, amazed by the odd primate skin sent him in 1869 by Père David, coined the name *Rhinopithecus roxellanae* in reference to Roxellane, a Russian-born slave, mistress and later the only wife of the great Turkish Sultan, Suleiman the Magnificent. Roxellane was a woman of legendary beauty and charm, whose pug nose and strawberry-blond hair struck Milne-Edwards as sufficiently similar to features of the Chinese golden monkey.

Although Chinese vases and silk paintings up to 4,000 years old depict golden, human-like creatures with long tails and snub noses, and ancient Chinese myths included a powerful golden monkey figure capable of changing into 72 different shapes and leaping across the entire earth, the first encounter recorded by Western science was not until 1868. Père Armand David, a French missionary to China (who also discovered the giant panda), shot three golden monkeys and sent the skins to the Natural History Museum in Paris. Theodore and Kermit Roosevelt, sons of the former president, shot 10 Chinese golden monkeys for museum collections during a 1929 expedition. A handful of other expeditions into China's wilderness succeeded in bringing out golden



Fig. 43: Min-Min, one of the pair of golden monkeys (*Rhinopithecus r. roxellanae*) on loan to San Diego Zoo from the Chengdu Zoo, China (photo courtesy of the San Diego Zoological Society).

monkey specimens for taxidermy and scientific study, but, in all, fewer than two dozen Chinese golden monkeys exist in museums worldwide.

The San Diego Zoo's current exhibit is the first-ever for this rare primate outside of China. One other live golden monkey made it to a Western zoo in 1939, when a sickly infant was delivered to the London Zoo by an explorer named Tangier Smith. The London Zoo golden monkey lived for just two weeks and was never displayed. It died of tuberculosis, as did Smith shortly thereafter.

In China, breeding groups of golden monkeys are kept at zoos in Chengdu, Beijing, Shanghai, Wuhan, Tsingtao and Kunming Intong. In 1979, a pair of golden monkeys was loaned to Ocean Park in Hong Kong for three months. A similar loan is planned to a Japanese zoo following the golden monkeys' San Diego visit.

Golden monkeys occur at higher altitudes than most other primates, living at elevations up to 3,650 m in pine forest and bamboo thickets. Each autumn, they grow a new, longer fur coat as insulation against the cold, snowy winters. Fur covers the monkeys' hands and feet. Added warmth is gained by hugging one another, a common behavior.

The species travels in troops containing the largest number of animals ever reported for an arboreal primate. During optimal feeding sessions, golden monkey groups of more than 600 individuals have been observed. Mating occurs from August to October and gestation takes six months.

Golden monkeys are robust, lanky animals which often walk upright. Their legs are longer than their arms, lending a human appearance. Weights range up to 18 kg for males and 10 kg for females (see Tan Bangjie, this issue).

Chinese golden monkeys make a sound reminiscent of a wailing human baby. The yellow-throated marten is the golden monkey's chief natural predator.

In the wild, the golden monkey feeds predominantly on the leaves, fruits and flowers of nearly 100 types of plants in the pine, bamboo and rhododendron forests they inhabit. When snow covers the ground and leaves become scarce (about six months of the year), the golden monkeys turn to pinecone seeds, tree bark, small birds, worms, lichens and insects.

In captivity, Chinese zookeepers have found golden monkeys favor mulberry leaves, along with leaves of poplar, elm and apricot trees. A variety of vegetables and fruits are fed, including apples, pears, persimmons, peaches, apricots, grapes, bananas, oranges, cabbage, spinach, eggplant, cucumbers and carrots. Millet bread and biscuits, peanuts and sunflower seeds, hard-boiled eggs and beetle larvae are also given to golden monkeys to pick and choose. One golden monkey diet delivered to San Diego Zoo curators suggested supplementary feedings of "bone powder, cod-liver oil, table salt and yellow mud at appropriate time frames."

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The History And Status Of The Lion-Tailed Macaque In North America

Information submitted to the studbook for the lion-tailed macaque (*Macaca silenus*, Fig. 44) indicates that this species was first exhibited on December 3, 1839 at the Artis Zoo in Amsterdam, Netherlands, and has since been maintained continuously in zoological institutions. The first North American zoo to exhibit lion-tailed macaques was the Philadelphia Zoo in 1899, where the first captive birth was recorded in 1932. Between 1899 and the end of 1983, 500 specimens had been held in North American zoological institutions. Today, 225 of the approximately 400 lion-tailed macaques held in captivity throughout the world are in North America.

The reproductive status of the population has always been poor, as indicated by the fact that between 1970 and 1979 the worldwide captive population increased by only 100 animals, an average increase of slightly over 11 animals per year. A factor which must be considered in assessing the reproductive status of this population is that the majority of births recorded are to 15-20 year old females with a very limited reproductive life remaining.

Since 1901, a total of 103 animals (42 males, 45 females, 16 of unknown sex) have been imported from the wild into North American zoos as the foundation of the current population. In addition, 11 males and 10 females have been received from European and Asiatic zoos, making a total of 124 potential founders. Forty-five of these animals have reproduced and, of these, 18 individuals plus 21 additional animals of unknown parentage (but assumed to be unrelated to each other and to the imported animals) are currently represented in the gene pool. Therefore, the existing population of lion-tailed macaques in North



Fig. 44: Female lion-tailed macaque with infant at Woodland Park Zoological Gardens, Seattle, Washington (photo by Carol Beach).

America has been derived from only 39 animals.

The major captive populations of lion-tailed macaques are located in five North American zoos (Baltimore, St. Louis, San Diego, Seattle and Winnipeg), one European zoo (West Berlin) and one Indian zoo (Delhi). These seven zoos account for approximately 40% of the total captive population and 50% of the total births.

Concern for the future of the lion-tailed macaque was first expressed in 1970, and continued to grow until 1981 when the directors of the IUCN and the International Union of Directors of Zoological Gardens (IUDZG) were petitioned to establish an international studbook. This was approved in January, 1982.

In May, 1982, an International Symposium on the lion-tailed macaque was sponsored by the Baltimore Zoological Society. It resulted in a recommendation being forwarded to the American Association of Zoological Parks and Aquariums (AAZPA) to designate the lion-tailed macaque as a Species Survival Plan (SSP) animal. This recommendation was readily adopted and work began on establishing a masterplan for the management of this species in North American zoos. Currently, twenty-six institutions are actively participating in the SSP program. As the majority of North American zoos had submitted information to the studbook keeper regarding their collections, the decision was made to first establish a North American Regional Studbook to aid SSP, and then, when significant information had been received from outside North America, the international edition would be published. The North American Studbook was published during 1983. The first international edition is scheduled for publication during 1985.

The last two years have been devoted primarily to establishing the SSP propagation group and analyzing the studbook data. The founder representation of individual animals and of the overall population has been determined, in addition to the inbreeding coefficients for the majority of the population. Reproductive performance has also been analyzed by Lyles and Lindburg of the San Diego Zoo and has provided many valuable insights into reproductive trends and management strategies.

This analysis has been very encouraging. It indicates that, since 1970, population size and total number of births have consistently increased, while the average inbreeding coefficient of newborn infants since 1976 has declined. A major concern facing the current captive population is the extremely disproportionate representation of the founding stock. As a result of very prolific breeding groups at the Seattle and Winnipeg zoos, four of the 39 founders account for 23% of the total representation.

This over-representation problem is now being addressed by suggesting animals be relocated or removed from the North American reproductive population. Exchanges with English and other European zoos are being explored as a possible method to effect these removals, while providing an increased founder base for the North American population.

When the demography of the current captive population is determined, a management master plan will be established to expand the population to a size and structure which will optimize stability and ensure its future. This will take several years to complete, and is an essential project for the survival of the species in captivity. Optimistically, the next two years will see much progress toward this goal.

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Interspecies Communication And Conservation

The possibility of extinction is the plight of the gorilla. At the present time, somewhere between 300-400 mountain gorillas (*Gorilla gorilla beringei*) remain in Africa, living both in the Virunga Volcanoes on the border of Rwanda, Uganda and Zaire, and in the Impenetrable Forest of Uganda. The present population has declined over the past 25 years, and this is due to such factors as poaching and the reduction in size of the Parc National des Volcans in Rwanda, as the demand for its resources has increased. Already, as many as 780 people live and work on each square mile surrounding this park, making the human population density the highest in Africa. Since no mountain gorillas are reproducing in captivity, the species' situation can only be described as desperate. The lowland gorilla (*Gorilla gorilla gorilla*), though not so immediately endangered, is also threatened in many parts of its African range.

The Gorilla Foundation is dedicated to the preservation and welfare of all gorillas. The Foundation's unique studies of the behavior and linguistic capabilities of lowland gorillas have generated a wealth of information that is certain to affect the world's attitude toward the gorilla. Not only does the Foundation's work offer a unique opportunity to augment derivative knowledge with direct interspecies communication, it also presents an unprecedented view of the world from the perspective of a species other than man. The studies have revealed not only the gorilla's intellectual ability, but also its sensitive emotional character. The Foundation's work proceeds from the belief that a better understanding of the gorilla and its behavior will help in taking the steps necessary to preserve this species.

For the past twelve years the Gorilla Foundation has conducted studies of two gorillas. Taught to use American Sign Language (ASL), Koko, a thirteen year old female gorilla (Fig. 45), has a vocabulary of over 500 ASL signs and communicates in statements averaging three to six signs in length. Michael, an eleven year old male, has acquired over 250 ASL signs. Both of the gorillas initiate most of their conservation with humans and use their ASL vocabulary in creative and original sign combinations to describe their environment, feelings, desires, and even what may be their personal past histories (Patterson, 1978; Patterson and Linden, 1981). They also comprehend spoken English and are being taught to read the printed word (Longman, 1983; Peterson and Tanner, 1984).

The research results of the Gorilla Foundation are unique and rare in the history of animal studies in that the animals themselves provide direct communication that serves to confirm or contest the findings of other primate research projects. Jane Goodall has already employed the new research tool by using Koko and Michael as informants. She wanted to confirm for native observers at the Gombe Stream Reserve that apes were more comfortable in the presence of humans crouching or sitting than with people



Fig. 45: Koko signs "otoscope" (little finger to ear), a gesture she invented for the device used by Francine Patterson to examine Koko's ears during an illness (photo by Ronald H. Cohn).

who were standing. She asked us to question Koko about her preference. On several occasions Koko was asked, "Do you like people to stand up or sit down when they're with you?" Koko clearly and emphatically responded "Down" —signing with both hands— to each inquiry with the exception of one, when she stressed her point even more by prostrating herself (Patterson, 1979).

The research of the Foundation has at least two direct implications for the cause of conservation. First, it is now possible to learn an unprecedented amount about the psychological and physical needs of the great apes. We have a new tool. We can ask them directly about their behavior. Second, through language, the appealing character of these magnificent animals is being revealed. Because of their great human interest value, interspecies communication studies such as Project Koko generate greater respect and concern not only for gorillas, but for other wildlife as well.

Public interest in Project Koko has been considerable. The study has been featured on several television documentaries and news reports including *60 Minutes*, *Nova* and *National Geographic*. It has also been the subject of books, including *The Education of Koko* and *Apetalk and Whalespeak*. Public sympathy and commitment is of immeasurable help in the politics of survival of all

endangered species given the funding problems and limited resources available to conservationists.

The work of the Gorilla Foundation is of further assistance in that it can increase our understanding of communication among gorillas in the wild. The first step in such an understanding, recognition of semantically significant gestures and sounds, becomes easier as we become more familiar with gorillas as communicators. Koko and Michael share a number of gestures with wild gorillas which have communicative value. For example, two shared gestures communicate "invitations to play." One involves crouching, bowing and slapping the ground with the hands. The other, which seems to mean "hurry come play" is expressed by one open hand shaken vigorously. Heretofore, field researchers have not always recognized the significance of semantic gestures observed in wild gorillas because they were unfamiliar with their communicative habits. A study of communication between feral gorillas by an investigator familiar with Koko's and Michael's signs could be immensely enriched.

The Gorilla Foundation seeks grants and private funding on a continuing basis, for processing the tremendous amounts of data it has generated and continues to accumulate. This involves recording, sorting, transcribing and analyzing the information. The Foundation is also currently seeking funds for relocation of the Project to a more natural setting in Hawaii, where the climate more closely approximates that of the gorilla's native habitat.

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ARTICLES

Global

Primate Diversity: The World's Top Countries

Wild populations of nonhuman primates occur in some 90 countries around the world, mainly in the tropical belt but extending into several temperate areas as well. However, the vast majority of the roughly 200 primate species currently recognized is found in relatively few tropical countries, and usually (though not always) in those countries with large areas of tropical forest. The purpose of this article is to identify all of those countries with at least 10 genera and/or 20 species of nonhuman primates, and to rank them according to overall primate diversity (Table 1; Fig. 1). A table of the top countries for tropical forest (Table 2) is included as well, and lists of the primate species found in each of the countries in Table 1 are given in Table 3.

TABLE 1: The top countries in the world for primate diversity
(includes all countries with at least 20 species or 10 genera of primates). See Table 3 for the species occurring in each of these countries.

Country	No. of species	No. of genera
BRAZIL	51	16
ZAIRE	29-32	13-15
CAMEROON	28-29	14
MADAGASCAR	28	13
PERU	27	12
COLOMBIA	27	12
INDONESIA	27-30	8
NIGERIA	23	13
CONGO	22	14
EQUATORIAL GUINEA	21-22	12
CENTRAL AFRICAN REPUBLIC	19-20	11-12
GABON	19	11
UGANDA	19	11
BOLIVIA	17-18	11-12
ANGOLA	18-19	10-11

It should be emphasized that all these lists are preliminary, since the information for many countries is incomplete at best. Furthermore, since there is no general agreement on the number of genera and species recognized, especially in the Old World, the totals for some countries are given as a range rather than a single figure. If any readers have information that could add to these tables, please send it to us so that it may be incorporated into future articles of this kind.

The main goal of the IUCN/SSC Primate Specialist Group is to maintain the current diversity of the Order Primates, with dual emphasis on:

1. ensuring the survival of particular endangered and vulnerable species wherever they happen to occur; and
2. providing effective protection for large numbers of primates in areas of high primate diversity and/or abundance.

In many respects, the top countries listed in Table 1 hold the key to conserving a major portion of the primate diversity of our planet. That is not to say that we should ignore other countries with less diverse primate faunas; however, given the high species diversity and especially the high levels of endemism in the top countries, we will definitely have to place a great deal of emphasis on these countries if we are going to succeed in saving representative populations of all living primate species. Indeed, a look at Table 1 and the species lists in Table 3 will indicate that just five countries (Brazil, Zaire, Cameroon, Madagascar and

TABLE 2: The top countries in the world for closed tropical forest
(includes all countries with over 10,000,000 ha in forest; Office of Technology Assessment, 1984).*

Country	Area of closed forest (ha)
BRAZIL	357,480,000
INDONESIA	113,895,000
ZAIRE	105,750,000
PERU	69,680,000
INDIA	51,841,000
COLOMBIA	46,400,000
MEXICO	46,250,000
BOLIVIA	44,010,000
PAPUA NEW GUINEA	34,230,000
BURMA	31,941,000
VENEZUELA	31,870,000
CONGO	21,340,000
MALAYSIA	20,995,000
GABON	20,500,000
GUAYANA	18,475,000
CAMEROON	17,920,000
SURINAME	14,830,000
ECUADOR	14,250,000
MADAGASCAR	10,300,000

*Five countries that appear on the primate list have less than 10,000,000 ha of forest cover. These are all African countries: Nigeria (5,950,000 ha), Equatorial Guinea (1,295,000 ha), Central African Republic (3,590,000 ha), Angola (2,900,000 ha) and Uganda (765,000 ha).

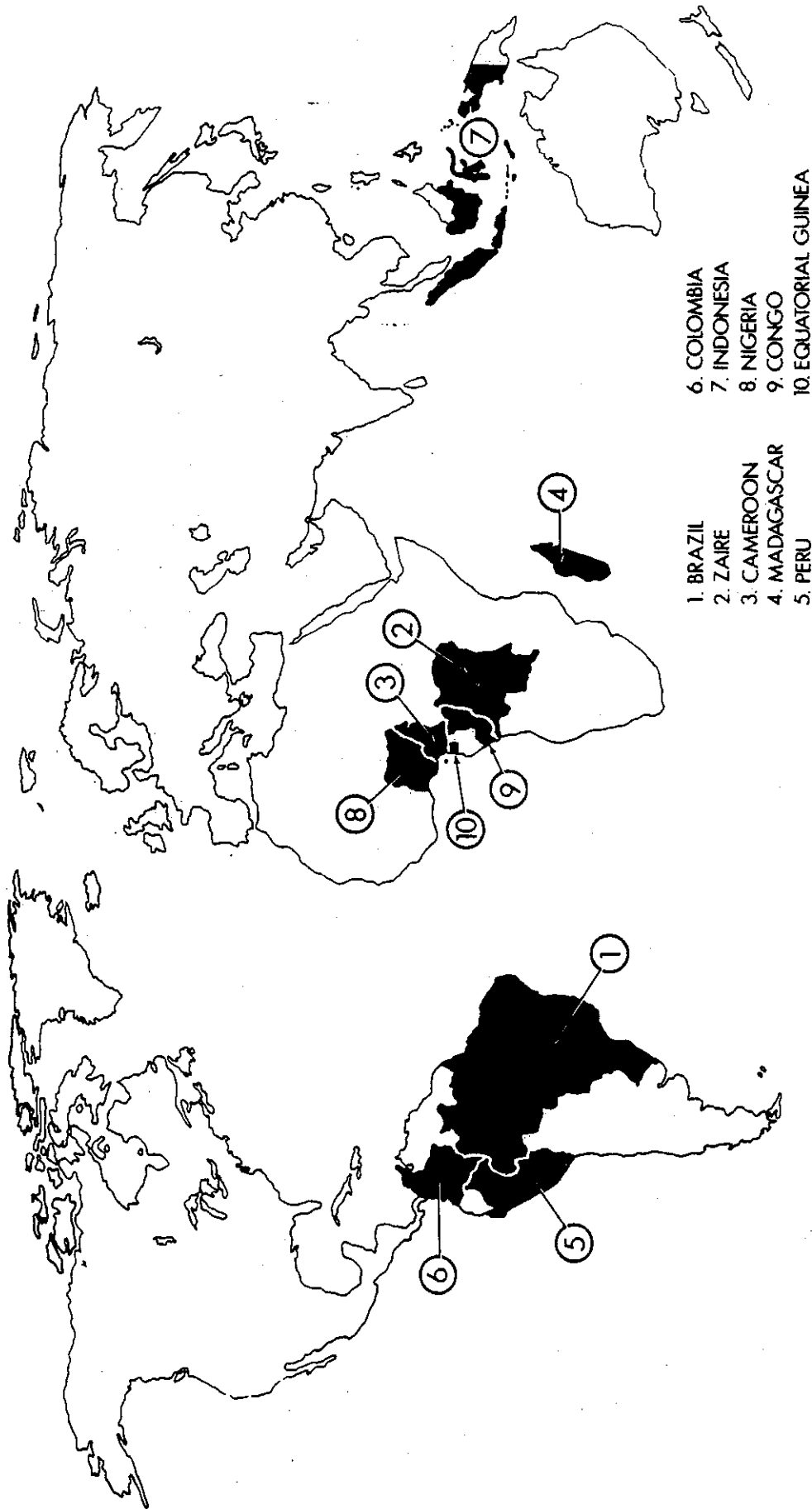


Fig. 1: The world's top countries for primates and tropical forest.

Indonesia) account for about 150 species, or 75% of all living primates, and that the three countries with the highest levels of endemism (Brazil, Madagascar and Indonesia) alone account for more than half.

Of the 15 countries in Table 1, eight (Brazil, Zaire, Madagascar, Cameroon, Indonesia, Peru, Gabon and Uganda) have major primate projects already underway at least somewhere within their borders, but none of these can be considered to even approach total species coverage. In three other countries (Colombia, Nigeria and Central African Republic), only a handful of projects are underway. And in four countries on the list (Congo, Equatorial Guinea, Bolivia and Angola), there are no current primate conservation projects whatsoever. Indeed, we have virtually no information on the three African countries, and information from Bolivia is little better.

Clearly, much more needs to be done in all cases, and we feel that focusing attention on these highly diverse countries is one of the ways in which the Primate Specialist Group can achieve its goal of maintaining the current diversity of the Order Primates

and preventing the extinction of any primate species.

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TABLE 3: Species lists for the top 15 countries for primate diversity (from Table 1).

*Endemic species

Brazil

Family Callitrichidae

Cebuella pygmaea
Callithrix argentata
**Callithrix aurita*
**Callithrix flaviceps*
**Callithrix geoffroyi*
**Callithrix humeralifer*
**Callithrix jacchus*
**Callithrix kuhlii*
**Callithrix penicillata*
**Saguinus bicolor*
Saguinus fuscicollis
Saguinus imperator
Saguinus inustus
Saguinus labiatus
Saguinus midas
Saguinus mystax
Saguinus nigricollis
**Leontopithecus rosalia*
**Leontopithecus chrysomelas*
**Leontopithecus chrysopygus*

Family Callimiconidae

Callimico goeldii

Family Cebidae

Callicebus moloch
**Callicebus personatus*

Callicebus torquatus

Aotus infulatus
Aotus nancymai
Aotus nigriceps
Aotus trivirgatus
Aotus vociferans
**Pithecia albicans*
Pithecia hirsuta
Pithecia monachus
Pithecia pithecia
Chiropotes satanas
**Chiropotes albinasus*
Cacajao calvus
Cacajao melanocephalus
Cebus albifrons
Cebus apella
Cebus nigrivittatus
Saimiri sciureus
Saimiri boliviensis
**Saimiri ustus*
**Alouatta belzebul*
Alouatta caraya
**Alouatta fusca*
Alouatta seniculus
Ateles belzebuth
Ateles paniscus
Lagothrix lagotricha
**Brachyteles arachnoides*

Zaire

Family Lorisidae

Subfamily Lorisinae

Perodicticus potto

Subfamily Galaginae

Galago demidovii

Galago inustus

Galago senegalensis

Galago thomasi

Otolemur crassicaudatus

Family Cercopithecidae

Subfamily Cercopithecinae

Cercocebus galeritus

Cercocebus albigena

Cercocebus aterrimus

Papio anubis

Papio cynocephalus

*?*Cercopithecus salongo*

Cercopithecus neglectus

Cercopithecus hamlyni

Cercopithecus lhoesti

Cercopithecus mitis

Cercopithecus nictitans

Cercopithecus cephus (in area N. of R. Congo, S. of Rep. of Congo)

Cercopithecus ascanius

Cercopithecus pogonias

Cercopithecus aethiops

Miopithecus talapoin

Allenopithecus nigroviridis

Erythrocebus patas

Subfamily Colobinae

Procolobus badius, *rufomitatus* group

Colobus guereza

Colobus angolensis

Family Pongidae

Pan troglodytes

**Pan paniscus*

Gorilla gorilla

In addition, *Arctocebus calabarensis* and *Euoticus elegantulus* are possibly, but doubtfully, present in the area of Zaire north of the R. Congo south of the Rep. of Congo. Needs checking.

Cameroon

Family Lorisidae

Subfamily Lorisinae

Arctocebus calabarensis

Perodicticus potto

Subfamily Galaginae

Galago alleni

Galago demidovii

Galago senegalensis

Galago thomasi

Euoticus elegantulus

Family Cercopithecidae

Subfamily Cercopithecinae

Cercocebus torquatus

Cercocebus galeritus

Cercocebus albigena

Papio anubis

Mandrillus sphinx

Mandrillus leucophaeus

Cercopithecus neglectus

Cercopithecus preussi

Cercopithecus nictitans

Cercopithecus erythrotis

Cercopithecus cephus

Cercopithecus ascanius

Cercopithecus mona

Cercopithecus pogonias

Cercopithecus aethiops

Miopithecus talapoin/*Miopithecus* sp.

Erythrocebus patas

Subfamily Colobinae

Procolobus badius, *pennanti* group

Colobus guereza

Colobus satanas

Family Pongidae

Pan troglodytes

Gorilla gorilla

Madagascar

Family Cheirogaleidae

**Allocebus trichotis*

**Cheirogaleus major*

**Cheirogaleus medius*

**Microcebus murinus*

**Microcebus rufus*

**Mirza coquereli*

**Phaner furcifer*

Family Lepilemuridae

**Lepilemur dorsalis*

**Lepilemur edwardsi*

**Lepilemur leucopus*

**Lepilemur microdon*

**Lepilemur mustelinus*

**Lepilemur ruficaudatus*

**Lepilemur septentrionalis*

**Hapalemur griseus*

**Hapalemur simus*

Family Lemuridae

**Lemur catta*

**Lemur coronatus*

Lemur fulvus

**Lemur macaco*

Lemur mongoz

**Lemur rubriventer*

**Varecia variegata*

Family Indriidae

- **Indri indri*
- **Avahi laniger*
- **Propithecus diadema*
- **Propithecus verreauxi*

Family Daubentonidae

- **Daubentonia madagascariensis*
-

Peru

Family Callitrichidae

- Cebuella pygmaea*
- Saguinus fuscicollis*
- Saguinus imperator*
- Saguinus labiatus*
- Saguinus mystax*
- Saguinus nigricollis*

Family Callimiconidae

- Callimico goeldii*

Family Cebidae

- Callicebus moloch*
 - Callicebus torquatus*
 - Aotus azarae*
 - **Aotus miconax*
 - Aotus nancymai*
 - Aotus nigriceps*
 - Aotus vociferans*
 - Pithecia hirsuta*
 - Pithecia monachus*
 - Cacajao calvus*
 - Cebus albifrons*
 - Cebus apella*
 - Saimiri boliviensis*
 - Saimiri sciureus*
 - Alouatta palliata*
 - Alouatta seniculus*
 - Ateles belzebuth*
 - Ateles paniscus*
 - **Lagothrix flavicauda*
 - Lagothrix lagotricha*
-

Colombia

Family Callitrichidae

- Cebuella pygmaea*
- Saguinus fuscicollis*
- Saguinus geoffroyi*
- Saguinus inustus*
- **Saguinus leucopus*
- Saguinus nigricollis*
- **Saguinus oedipus*

Family Callimiconidae

- Callimico goeldii*

Family Cebidae

- Callicebus moloch*
 - Callicebus torquatus*
 - **Aotus brumbacki*
 - Aotus lemurinus*
 - Aotus trivirgatus*
 - Aotus vociferans*
 - Pithecia hirsuta*
 - Pithecia monachus*
 - Cacajao melanocephalus*
 - Cebus albifrons*
 - Cebus apella*
 - Cebus capucinus*
 - Saimiri sciureus*
 - Alouatta palliata*
 - Alouatta seniculus*
 - Ateles belzebuth*
 - Ateles fusciceps*
 - Ateles geoffroyi*
 - Lagothrix lagotricha*
-

Indonesia

Family Tarsiidae

- Tarsius bancanus*
- **Tarsius spectrum*

Family Lorisidae

- Nycticebus coucang*

Family Cercopithecidae

Subfamily Cercopithecinae

- Macaca fascicularis*
- Macaca nemestrina*
- **Macaca pagensis*
- **Macaca maura*
- **Macaca nigra*
- **Macaca ochreata*
- **Macaca tonkeana*

Subfamily Colobinae

- **Presbytis aygula*
- Presbytis cristata*
- Presbytis frontata*
- Presbytis hosei*
- Presbytis melalophos*
- **Presbytis potenziani*
- Presbytis rubicunda*
- **Presbytis thomasi*
- Nasalis larvatus*
- **Simias concolor*

Family Hylobatidae

- Hylobates agilis*
- **Hylobates klossii*
- Hylobates lar*
- **Hylobates moloch*
- Hylobates muelleri*
- Hylobates syndactylus*

Family Pongidae
Pongo pygmaeus

The species number for Indonesia increases from 27 to 30 if three other Sulawesi macaques (*Macaca brunnesens*, *Macaca hecki*, *Macaca nigrescens*) are recognized as full species.

Nigeria

Family Lorisidae
Subfamily Lorisinae
Arctocebus calabarensis
Perodicticus potto
Subfamily Galaginae
Galago alleni
Galago demidovii
Galago senegalensis
Euoticus elegantulus

Family Cercopithecidae
Subfamily Cercopithecinae
Cercocebus torquatus
Papio anubis
Mandrillus leucophaeus
Cercopithecus preussi
Cercopithecus nictitans
**Cercopithecus erythrogaster*
Cercopithecus erythrotis
Cercopithecus mona
Cercopithecus pogonias
Cercopithecus aethiops
Erythrocebus patas

Subfamily Colobinae
Procolobus badius, *pennanti* group
Procolobus verus
Colobus vellerosus
Colobus guereza

Family Pongidae
Pan troglodytes
Gorilla gorilla

Congo Republic

Family Lorisidae
Subfamily Lorisinae
Arctocebus calabarensis
Perodicticus potto
Subfamily Galaginae
Galago alleni
Galago demidovii
Euoticus elegantulus

Family Cercopithecidae
Subfamily Cercopithecinae
Cercocebus torquatus
Cercocebus galeritus
Cercocebus albigena

Papio anubis
Mandrillus sphinx
Cercopithecus neglectus
Cercopithecus nictitans
Cercopithecus cephus
Cercopithecus pogonias
Cercopithecus aethiops
Miopithecus talapoin/*Miopithecus* sp.
Allenopithecus nigroviridis

Subfamily Colobinae
Procolobus badius, *pennanti* group
Colobus guereza
Colobus satanas

Family Pongidae
Pan troglodytes
Gorilla gorilla

Equatorial Guinea

Family Lorisidae
Subfamily Lorisinae
Arctocebus calabarensis
Perodicticus potto
Subfamily Galaginae
Galago alleni
Galago demidovii
Euoticus elegantulus

Family Cercopithecidae
Subfamily Cercopithecinae
Cercocebus torquatus
Cercocebus galeritus
Cercocebus albigena
Mandrillus sphinx
Mandrillus leucophaeus
Cercopithecus neglectus
Cercopithecus preussi
Cercopithecus nictitans
Cercopithecus erythrotis
Cercopithecus cephus
Cercopithecus pogonias
Miopithecus sp.

Subfamily Colobinae
Procolobus badius, *pennanti* group
Colobus guereza (doubtful)
Colobus satanas

Family Pongidae
Pan troglodytes
Gorilla gorilla

Central African Republic

Family Lorisidae
Subfamily Lorisinae
Perodicticus potto

Subfamily Galaginae

- Galago alleni*
- Galago demidovii*
- Galago senegalensis*
- Euoticus elegantulus*

Family Cercopithecidae

Subfamily Cercopithecinae

- Cercocebus galeritus*
- Cercocebus albigena*
- Papio anubis*
- Cercopithecus neglectus*
- Cercopithecus nictitans*
- Cercopithecus cephus*
- Cercopithecus ascanius*
- Cercopithecus pogonias*
- Cercopithecus aethiops*
- Erythrocebus patas*

Subfamily Colobinae

- Colobus guereza*
- Procolobus badius oustaleti* (rufomitratu group)

Family Pongidae

- Pan troglodytes*
- Gorilla gorilla*

In addition, *Arctocebus calabarensis* is possibly, but doubtfully, present in C.A.R. Needs checking.

Gabon

Family Lorisidae

Subfamily Lorisinae

- Arctocebus calabarensis*
- Perodicticus potto*

Subfamily Galaginae

- Galago alleni*
- Galago demidovii*
- Euoticus elegantulus*

Family Cercopithecidae

Subfamily Cercopithecinae

- Cercocebus torquatus*
- Cercocebus galeritus*
- Cercocebus albigena*
- Mandrillus sphinx*
- Cercopithecus neglectus*
- ?*Cercopithecus* sp. (*lhoesti-preussi* group)
- Cercopithecus nictitans*
- Cercopithecus cephus*
- Cercopithecus pogonias*
- Miopithecus* sp.

Subfamily Colobinae

- Colobus guereza*
- Colobus satanas*

Family Pongidae

- Pan troglodytes*
- Gorilla gorilla*

Uganda

Family Lorisidae

Subfamily Lorisinae

- Perodicticus potto*

Subfamily Galaginae

- Galago demidovii*
- Galago inustus*
- Galago senegalensis*
- Otolemur crassicaudatus*

Family Cercopithecidae

Subfamily Cercopithecinae

- Cercocebus albigena*
- Papio anubis*
- Cercopithecus neglectus*
- Cercopithecus lhoesti*
- Cercopithecus mitis*
- Cercopithecus ascanius*
- Cercopithecus campbelli*
- Cercopithecus pogonias*
- Cercopithecus aethiops*
- Erythrocebus patas*

Subfamily Colobinae

- Procolobus badius*, *rufomitratu* group
- Colobus guereza*
- Colobus angolensis*

Family Pongidae

- Pan troglodytes*
 - Gorilla gorilla*
-

Bolivia

Family Callitrichidae

- Cebuella pygmaea*
- Callithrix argentata*
- Saguinus fuscicollis*
- Saguinus imperator*
- Saguinus labianus*

Family Callimiconidae

- Callimico goeldii*

Family Cebidae

- Callicebus moloch*
- Aotus azarae*
- Aotus nigriceps*
- Pithecia hirsuta*
- Pithecia monachus*
- Cebus albifrons*
- Cebus apella*
- Saimiri boliviensis*
- Alouatta caraya*
- Alouatta seniculus*
- Ateles paniscus*
- Lagothrix lagotricha* ?

Angola (including Cabinda)

Family Lorisidae

Subfamily Lorisinae

Perodicticus potto

Subfamily Galaginae

Galago demidovii

Galago senegalensis

Galago thomasi

Otolemur crassicaudatus

Family Cercopithecidae

Subfamily Cercopithecinae

Cercocebus aterrimus

Papio cynocephalus

Papio ursinus

Cercopithecus neglectus

Cercopithecus mitis

Cercopithecus nictitans

Cercopithecus cephus

Cercopithecus ascanius

Cercopithecus aethiops

Miopithecus talapoin

Subfamily Colobinae

Colobus angolensis

Family Pongidae

Pan troglodytes

Gorilla gorilla

Euoticus elegantulus may occur in Cabinda.

South and Central America

Observations On The Ecology Of The Muriqui (*Brachyteles arachnoides* E. Geoffroy 1806): Implications For Its Conservation

Introduction

Brachyteles arachnoides (E. Geoffroy, 1806), the largest South American monkey and the largest mammal endemic to Brazil, is also the most endangered Brazilian primate (Mittermeier *et al.*, 1982) and is one of the least known species of Neotropical primates. Although it has been commonly referred to as woolly spider monkey, the preferred vernacular name is "muriqui", the Tupi Indian name. The name "woolly spider monkey" is misleading, implying that the animal might be a hybrid, or some kind of either woolly monkey (*Lagothrix* spp.) or spider monkey (*Ateles* spp.), and does not reflect the uniqueness of this monotypic genus (Mittermeier, pers. comm.).

Brachyteles belongs to the subfamily Atelinae, which contains two other genera, *Ateles* the spider monkey, and *Lagothrix*, the woolly monkey (Hershkovitz, 1977; Rosenberger, 1981). *Brachyteles* and *Ateles* are the only true brachiators of the New World (Hershkovitz, 1977).

The original range of *Brachyteles* covered most of the Brazilian Atlantic forest, from the state of Bahia in the north, to the state of São Paulo, approximately at 25°S (Aguirre, 1971). Aguirre (1971) considered the ideal habitat for the species to be forests between 600 and 1800 m above sea level.

The Atlantic forest region has historically harbored the largest share of Brazil's human population and has experienced large scale development, especially during the last 100 years (Pimenta, 1974). The destruction of its forest habitats and widespread hunting has pushed *Brachyteles* close to extinction (Mittermeier, *et al.*, 1982; Fonseca, 1983).

The prospects for long term survival of the remaining populations of *B. arachnoides* have not been considered good. The species has never bred in captivity (IUCN, 1982), and only now is more detailed field information becoming available (Torres de Assumpcao, 1983; Milton, 1984). *Brachyteles* is presumably dependent on the presence of primary forest (Aguirre, 1971; IUCN, 1982). A recent study by the author, conducted in the state of Minas Gerais, indicates that only 2-5% of native forests may remain in the Atlantic forest region at present, and probably 80% of this remaining vegetation is composed of secondary forests. Another problem that has been thought to threaten the survival of the muriqui is the species' alleged frugivorous diet (Aguirre, 1971), which would render it vulnerable to periods of low fruit abundance, especially when in very small remnant forest patches.

The objective of the present study was to collect data on feeding ecology, social structure and habitat utilization of the muriqui, and to relate these results to the ability of the species to thrive in the remaining forest fragments scattered throughout its range. This study was conducted on two private farms, where *Brachyteles* has been surviving in isolation for several decades (Fig. 1). These and another farm, Fazenda Barreiro Rico, studied by Milton (1984), are preserving at least one-third of the known remaining

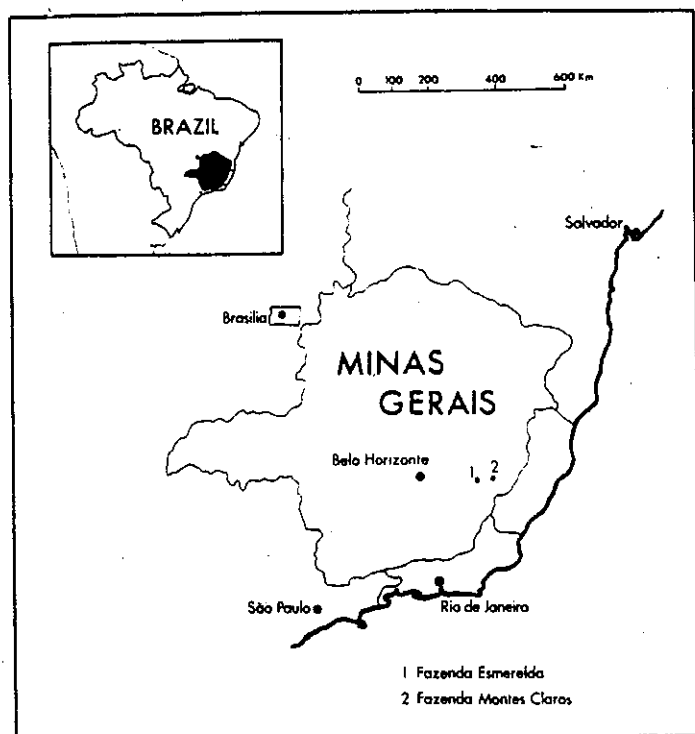


Fig. 1: Locations of Fazenda Montes Claros and Fazenda Esmeralda in the Atlantic forest region of eastern Brazil.

individuals (Fonseca, 1983), and are probably typical of the other isolated *Brachyteles* populations.

Methods

Information on the ecology and behavior of *Brachyteles* was collected mainly at Fazenda Montes Claros (FMC), in the state of Minas Gerais, Brazil. FMC has approximately 860 ha covered with one of the last remnants of the Atlantic forest in that state. I spent 42 days at FMC between May and July of 1983, the dry season for the region. During this time I was able to maintain direct visual contact with muriquis for 38 hours. The data were collected using scan sampling (Altmann, 1974). The sampling periods lasted for 15 minutes and during each period the behavior of each individual in sight was recorded into one of four major behavior categories: moving, resting, feeding or playing. If an animal was feeding, I placed the food item it was consuming into one of six categories: leaves (old/young), fruits, seeds, flowers or stems. Other data gathered included sex and identity (whenever possible) of the individual being sampled, height in the tree and the forest habitat being used. For the purpose of recording habitat usage, the forest at FMC was divided into 4 major types, based on Hatton's (1983) classification. The major forest types were: (1) relatively undisturbed primary forest; (2) heavily disturbed primary forest, with spaced emergents separated by large clearings and/or early secondary forest; (3) older stages of secondary forest, usually with more than one layer; (4) young single-layer secondary forest.

Opportunistic data on group size, composition and habitat usage were collected at another site, Fazenda Esmeralda (FE), about 150 km from FMC, during a period of 3 days, July 27-29, 1983.

Results

Group Structure and Composition

The population observed at FMC is composed of at least 29

individuals (Table 1), but it is probable that up to 45 are present in the forests of this farm (Valle et al., 1983). The data collected during this study indicate that there are two separate and independently ranging groups of *Brachyteles*. The forest where both groups of animals are located is bisected by a main ridge, that separates two valleys ("Jaó" and "Matão") with some portions of good primary forest. I made four complete counts of the "Matão group" and never observed more than 24 individuals. The count was considered complete when the group moved from one major vegetation type to another, usually through a clearing or above a trail or a road. The Matão group, the one more habituated to observers and the one in which virtually all of the systematic observations were made, is composed of 6 adult males, 9 adult females, 2 juveniles and 5 infants (Table 1). At least one of the infants was less than six months old, but the ages of other young animals were not determined.

The group size and composition of the second group, the "Jaó valley group", could not be accurately determined, although it includes at least 5 adult females, one juvenile and one infant (Table 1). I once observed the two groups in their separate valleys within a 1½ hour time period. This time span was not sufficient for animals to cross from one valley to another, indicating that there are two groups and not just a single large group that ranges through both valleys. In the "Matão group", adult males form subgroups and forage and travel in close proximity to each other. Therefore, I may have missed the "Jaó" male subgroup. The population of FMC is thus composed of at least 20 adult individuals.

The population of Fazenda Esmeralda (FE) is limited to one isolated group (Table 1) living in a 15 ha, heavily disturbed, secondary forest (Fig. 2). It is composed of 15 individuals: 5 adult males, 7 adult females, 1 juvenile and 2 infants. Due to the small size of the forest, group counts were likely to be accurate.

Table 1. Group size and composition of *Brachyteles arachnoides* at Fazenda Montes Claros and Fazenda Esmeralda.

	FMC/MATAO*	FMC/JAO**	FE***
Adult Males	6	0	5
Adult Females	9	5	7
Juveniles	2	1	1
Infants	5	1	2
Total	22	7	15

*Most reliable count of Matão group: individuals spent almost 15 minutes crossing the same path over the road that transects the Matão valley forest.

**Incomplete count; other individuals present, but out of sight.

***Small size of FE's forest allowed confidence in group counting.

Although the sample size was small, in both sites I observed that groups of *Brachyteles* are rather spatially cohesive, even though subgrouping occurs. While foraging or resting, subgroups of adult males and subgroups of adult females plus infants were on occasion as far as 800-1000 m apart, but at other times the whole group would congregate in a fruiting tree or forage for leaves in the same tree canopy. When traveling, it appeared as if they closely monitored each other's position by means of loud calls. Adult females and infants almost invariably travelled in the front, followed by the male subgroup. These same trends were observed by Young (1983) in this same population.

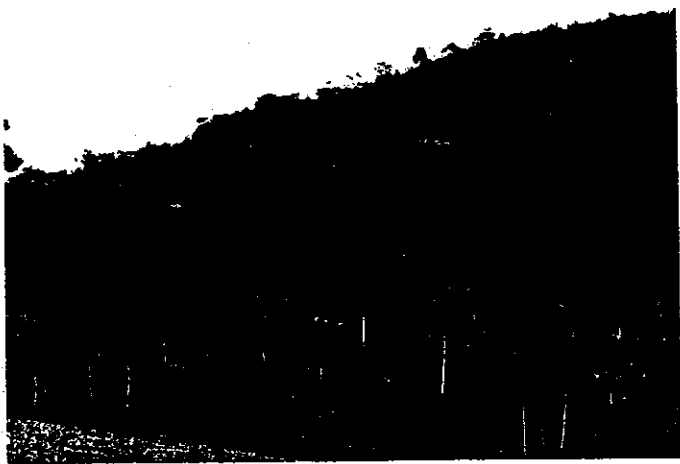


Fig. 2: Heavily disturbed secondary forest at Fazenda Esmeralda, where a *Brachyteles arachnoides* population was observed.

Feeding Ecology

Brachyteles has been referred to as a folivore/frugivore (Aguirre, 1971). The closely related genera *Ateles* and *Lagothrix*, are largely frugivorous (Hernandez-Camacho and Cooper, 1976; Coimbra-Filho and Mittermeier, 1977; Klein and Klein, 1977), even though one study has suggested that *Lagothrix* may consume more leaves than fruits (Kavanagh and Dresdale, 1975). The results of this study indicate that the diet of *Brachyteles* consists of more leaves than fruits. Analysis of the 38 hours of sampling at FMC show that young and old tree leaves and vine leaves account for 56% of their diet (Fig. 3), followed by fruits, comprising 39% of the diet, with the rest being seeds, flowers and vine stems. A previous study (Young, 1983) found an even higher proportion of leaves (66%) in the diet of this same group, also during the dry season. A more detailed field study (Milton, 1984), in another *Brachyteles* population, showed that leaves comprised 50% of the total time spent feeding, and in some periods accounted for over 90% of the feeding time.

The results of the present study should be viewed with cau-

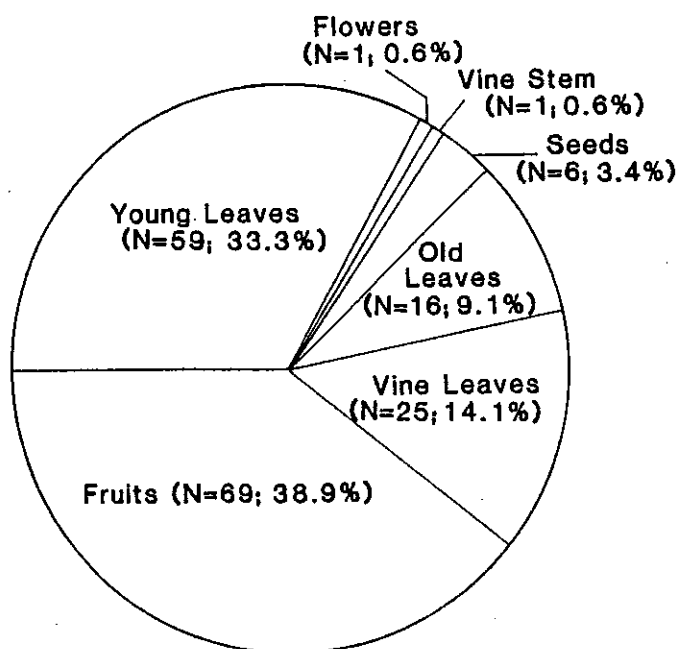


Fig. 3: Diet of the murequi, observed during the dry season at Fazenda Montes Claros.

tion, however, for it was conducted only during the dry season, when fruit availability was presumably lower than at other periods of the year. At any rate, these data indicate that *Brachyteles* can rely heavily on leaves as its main food sources at least during certain periods, yet fruits also constitute a significant proportion of its diet.

Use of Habitat

The relative extent of the different forest types at FMC was estimated from Hatton's (1983) classification. The habitat description and the percentages of each are presented in Table 2. Almost 60% of the forest at FMC is characterized by young and older stages of secondary forest, with primary forest representing only 18.41%.

Table 2. Description of major forest types at Fazenda Montes Claros, as used in the present study, and percentages of the habitats (Modified from Hatton, 1983, unpublished report).

HABITAT #1	Relatively undisturbed primary forests restricted to valleys and lower slopes. Three layers present, with emergents 30-35 meters high.	18.41%
HABITAT #2	Heavily disturbed primary forest, with spaced emergents separated by large clearings and/or early secondary forest.	22.32%
HABITAT #3	Older stages of secondary forest, usually with more than one layer, and trees up to 25 meters high.	31.30%
HABITAT #4	Young mono-layered secondary forest, with high density of stems, vines and bamboo.	27.97%

The total number of observed sightings in each of the habitats and the expected number based on the different proportions of each habitat are presented in Figure 4. *Brachyteles* at FMC showed a clear preference for habitat #3, the multi-layered older stages of secondary forest (Table 3). They also showed a negative preference for habitat #2, the severely disturbed primary forest, and used good primary forest and single-layer young secondary forest (habitats #1 and #4) roughly in proportion to their occurrence at FMC.

The reasons for these preferences could not be accurately identified in this study. As leaves comprised 56% of their diet, one could speculate that the preference was associated with the high foliage density per unit area found in the old secondary forests. For instance, the combined data for all four habitats show that, although they generally spent more time resting than feeding (respectively 31% and 25% of all events), they spent more time feeding in habitat #3 than resting. In addition, 61% of their feeding was done in this old stage secondary forest. Again, this could represent a seasonal phenomenon, and perhaps when fruits are abundant, they might shift their preferences towards the good primary forest.

At Fazenda Esmeralda (FE), *Brachyteles* has been thriving in a habitat much like #4 at FMC for 19 years (Figure 1). Aguirre (1971) visited FE in 1964 and estimated its population, at that time, at 7-8 individuals. Thus, the population has been able to increase in size, nearly doubling in 20 years, despite the type of available habitat and the small size of this secondary forest. It

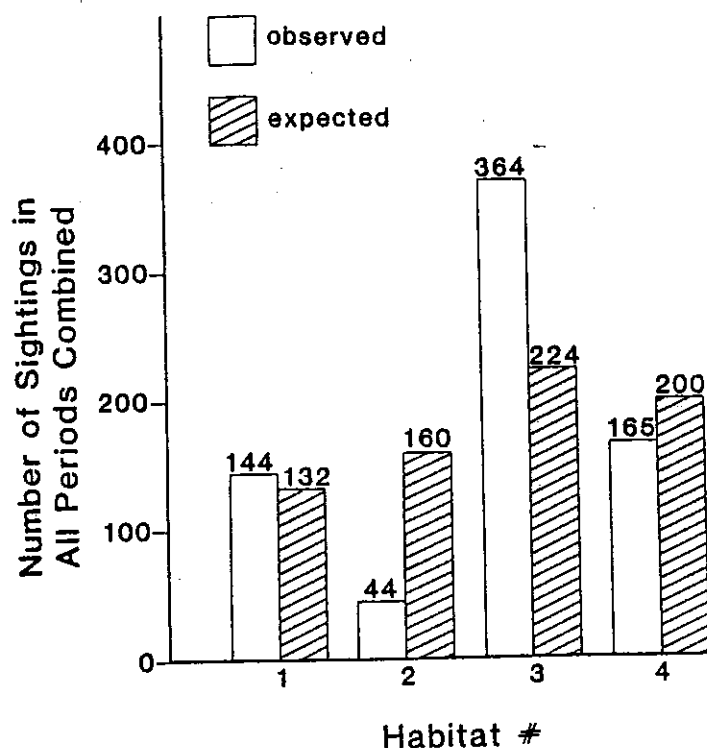


Fig. 4: Total number of observed sightings in each of the habitats at Fazenda Montes Claros, and the expected number based on habitat availability, as presented in Table 2.

	HABITAT #1	HABITAT #2	HABITAT #3	HABITAT #4
Number of sightings in all sampling periods	144	44	364	165
Chi-square	1.09	84.15	86.81	6.30
Direction of Association	0	—	+	0
Probability Associated		p < 0.001	p < 0.001	

should be noted that local workers have observed *Brachyteles* ranging out of the forest to forage on nearby papaya plantations. To reach the papaya fields, the animals have to walk on bare ground, a fact confirmed by residents of FE. A young female was captured during one of these excursions and kept at the local general store for several months before being released back into the forest. Individuals have also frequently been observed descending to the ground to drink water from two local streams that run through this secondary forest, a behavior that has never been reported in the FMC population, or in the population studied by Milton (1984). These observations suggest the existence of some behavioral flexibility by *Brachyteles* that permits it to exploit less than ideal habitats.

Conservation of *Brachyteles*

Study of the diet of a species has profound implications for its conservation since it helps determine what resources are available for the species. Availability of resources in turn directly affects the carrying capacity of the habitat for a particular species' population, i.e., determines how many individuals can coexist in a particular fraction of suitable habitat.

If body size and metabolic rates are constant, one should expect to find more folivores than frugivores per unit of area (Robinson and Ramirez, 1982). Frugivores rely on resources that are usually widely dispersed, while folivores find their resources more ubiquitously distributed (Hladik, 1978). When occurring in a finite area, such as a habitat island, a folivorous species should thus be less prone to go extinct than a frugivorous one, as they are able to maintain larger populations.

If diet and metabolic rates are held constant, then larger species should occur at lower densities than smaller ones (Eisenberg, 1981). They should be less able to maintain stable populations when stressed by habitat availability. Diet and body size, however, are not independent and both variables should be analyzed together (Robinson and Ramirez, 1982). Given the presumably frugivorous diet and large body size of *Brachyteles*, the low density for FMC during this study (3.37/sq km) was expected. The actual density is probably higher, as up to 40-45 individuals (Valle et al., 1983) may occur in the total 860 ha of FMC, and not all of the forest may be used by *Brachyteles* (Young, 1983). Nevertheless, even if we assume the higher density for *Brachyteles* at FMC, it would still be at least one and a half times lower than for the second largest primate at FMC (*Alouatta fusca*: Young, 1983), which is also highly folivorous.

Based on size alone, we would expect to find *Brachyteles*, the largest New World primate, to occur with the lowest densities and to show the largest area requirements. An adult male can weigh as much as 15 kg (Ruschi, 1964) and measure 1 m from head to base of the tail (Aguirre, 1971). Although *Brachyteles* has been previously considered more a frugivore than a folivore (Aguirre, 1969), the contribution of fruits relative to leaves in its diet has not been determined on a year-round basis. In a 10-month study by Milton (1984), leaves predominated in most sampling periods, although fruits comprised an average of 58.8% of feeding time in one of the months. If *Brachyteles* is primarily a frugivore (Aguirre, 1971), this would further increase its space requirements.

This and other studies (Young, 1983; Milton, 1984) have shown that the muriqui is able, if not primarily adapted, to rely heavily on leaves. The presence of a large caecum (Hill, 1962) may indicate that the digestive system of *Brachyteles* is indeed adapted to deal with large quantities of leaves. Milton (1984) suggests the gut flora fermentation might occur in the colon and caecum of the muriqui. The dentition of *Brachyteles* also appears to reflect a diet comprised mainly of leaves (Zingesser, 1973). Nevertheless, fruits constituted a significant proportion of their observed diet in this study and may surpass the amount of leaves in other periods of the year, when fruits are more available (Milton, 1984). The most important consequence of possessing a primarily folivorous diet, however, is that isolated populations of muriquis are less likely to suffer from periodic "bottlenecks" in fruit availability when compared to year-round obligate frugivores, such as *Ateles* (Klein and Klein, 1977). The effects of such a fruit bottleneck could be disastrous for small populations of frugivorous primates. Although demanding larger areas than smaller primates, *Brachyteles* may thus have the ability to maintain population stability in face of fluctuations in the resources available in its habitat. Milton (1984) suggested that muriquis are opportunistic feeders that switch food preferences according to their overall availability. Their large body size, and the adaptations of the digestive system to process large quantities of low energy items,

permit *Brachyteles* to be less selective in their feeding strategy (Milton, 1984).

The possibility of using second growth forest increases the probabilities of small populations of the miqui being able to survive in existing habitats. It has been observed that, with the exception of the Rio Doce State Park, there are no large portions of pristine forest remaining in the Atlantic forest region of the state of Minas Gerais (Fonseca, 1983). Although the ideal habitat for the miqui may be tall pristine primary forest (Aguirre, 1971; IUCN, 1982), the results of this study show that they have been surviving in isolated secondary forests with variable levels of disturbance at FE and FMC for, respectively, 20 and 40 years. In comparison with the present data, density estimates from the 1960's (Aguirre, 1971) indicate that they are not only maintaining their population numbers but that the populations are growing.

The results obtained at FMC show a significant positive association between *B. arachnoides* presence and older stages of secondary forest: yet primary forest was also used. This suggests that the miqui may depend on the existence of a mosaic of primary and secondary forest, even though FE's population is living in a habitat which totally lacks primary forest. Whatever the degree of dependence on primary forest, if any, the possibility of adequately maintaining stable populations in secondary forests most certainly increases the absolute amount of area potentially available to *Brachyteles* populations in the region. This in turn allows us more options for managing the populations.

These results do not, by themselves, make any assurances as to the survival of *B. arachnoides*. The remaining forest patches are small, isolated and relatively unprotected. Other than offering adequate protection to remaining populations, management practices, especially ones directed toward avoiding inbreeding depression and loss of genetic variability (Fonseca, 1983), will be needed in the near future. The hope is that *Brachyteles* will not be considered a species inexorably condemned to extinction, but rather one which, if the necessary decisions are made, will survive into the future. Therefore, present efforts to conserve the miqui need to be increased, because the possibilities of success are considerable.

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Madagascar: Current Projects And Problems In Conservation

Madagascar is located approximately 400 km east of Africa. It is 1,600 km long and 580 km wide at its broadest point, and is the fourth largest island in the world. Because of its large size and diverse climate, geology and vegetation, it is often referred to as a microcontinent.

The geological history of Madagascar has made it evolutionarily and biologically unique. The island separated from Africa approximately 200 million years ago and appears to have been in approximately its present position for about 120 million years (Rabinowitz *et al.*, 1983). For the last 60 million years, it has exchanged few or no plants or animals with Africa. Although we do not know precisely how or when specific groups of plants and animals reached Madagascar, we do know that its isolation generally coincides with the early evolution and dispersal of certain taxa that are widespread today. For example, the angiosperms, or flowering plants, and the earliest primates were just beginning to diversify when Madagascar became isolated. Until the arrival of humans, 1500 to 2000 years ago, these forms were isolated on Madagascar with little competition from mainland species and so, for millions of years, the plants and animals of Madagascar had an independent evolutionary history.

Topographically, Madagascar falls into three major zones: a narrow eastern plain, plus the steep escarpment which demarcates it to the west; a rugged, high central plateau; and a vast sedimentary plain in the west and northwest. The variety of relief and the great size of the island gave rise to wide regional and local variations in climate, and there are variety of vegetation types (Fig. 1). The east coast is covered with wet, evergreen forest, which includes over 1,000 species of orchids, most of which are endemic. In fact, there are many more varieties of orchids in Madagascar than in tropical West Africa. The climax vegetation of the central plateau is characterized by montane forest, though presently there is little of this vegetation remaining. On the west coast there is dry, deciduous forest dominated by tamarind trees. In the semi-arid south and southwest there is desert vegetation, physiognomically much like that found in the southwestern United States, though it is composed of species unrelated to American forms. These xerophytic forests are dominated by succulent Euphorbiaceae and the endemic family, Didiereaceae (Fig. 2). Although the eastern evergreen forest is much richer in plant species diversity, the percent of generic endemism is much higher in the dry forests of the South.

The isolation of Madagascar and its variety of climates has led to an exceptional richness of plant species. There are about 10,000 species of angiosperm and, in some of the original colonizing groups, over 80% of the species are unique to Madagascar (Koechlin, 1972). The flora of Madagascar includes an unusually high percentage of archaic, primitive taxa. Two endemic plant genera are thought by botanists to be among the most primitive living angiosperms. One is *Taktajania*, a relict genus of the mainly Australian, New Zealand and New Caledonian family of

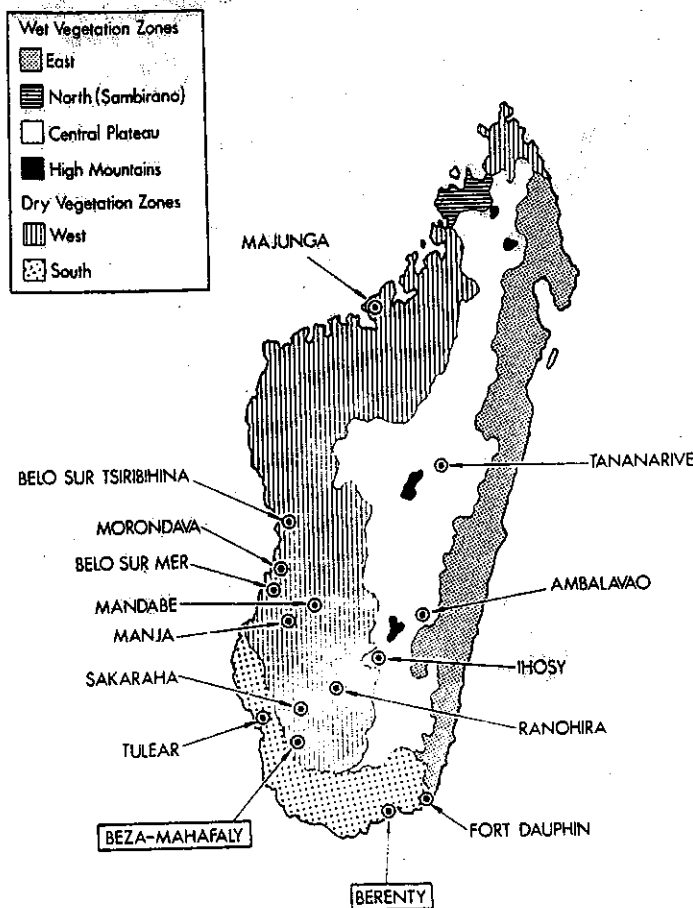
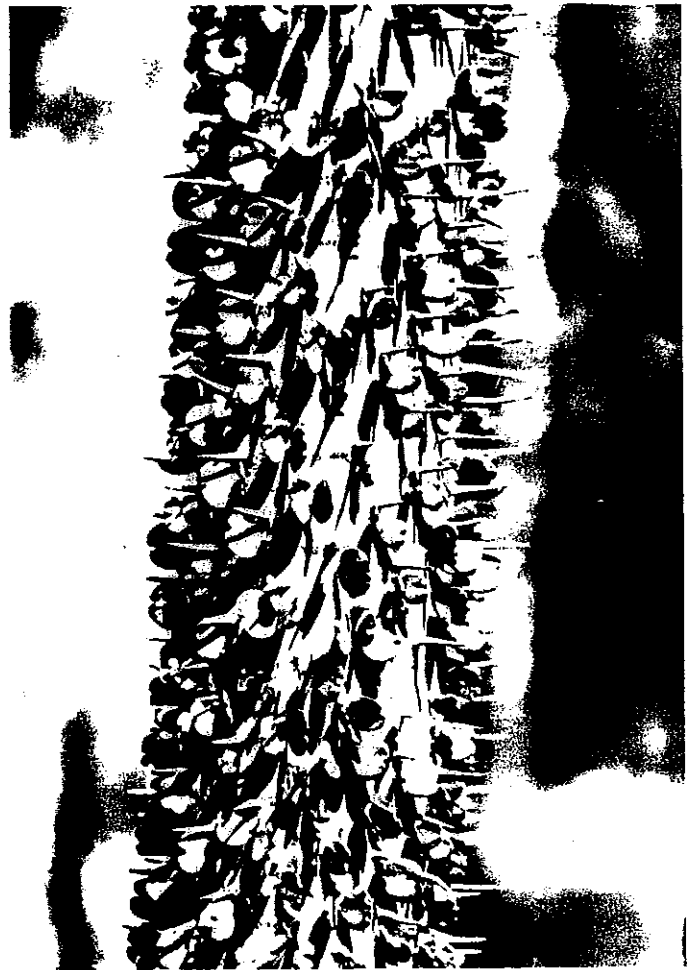


Fig. 1: Vegetation types of Madagascar and the locations of the Beza-Mahafaly and Berenty Reserves.

Winteraceae. *Taktajania* is the only African-area representative of this family and is so primitive that it doesn't even have vessels in its wood (Gentry, pers. comm.). The second is *Ascarinopsis*, a monotypic genus which is the only African or Indian Ocean-area representative of Chloranthaceae. This genus is strikingly similar to recently discovered Cretaceous fossils, which some botanists think may be similar to the earliest flowering plants. In fact some would interpret the male "inflorescence" as a single "preflower".

There are at least four generally accepted plant families and many infrafamilial taxa endemic to Madagascar. One of these, an alliance of the very primitive family Monimiaceae, is especially highly radiated in Madagascar. In fact, this group, which has been claimed to span a range of diversification in floral morphology equivalent to the shift from gymnospermy to angiospermy (Endress and Lorence, 1983), represents a floral equivalent to the lemuriforms. Like the lemurs, species of Monimiaceae fill many ecological niches occupied by later evolving forms in other parts of the world (Lorence, 1980; Gentry, pers. comm.). A non-endemic and highly derived family, the Bignoniaceae, provides another kind of example of adaptive radiation in Madagascar. The family is represented by over 50 species, the second highest



Figs. 2a, b: Cactus-like plants of the family Didiereaceae found in southern Madagascar. The percent of endemic genera is higher in the south than anywhere else on the island. The Beza-Mahafaly project vehicle is shown in the left hand figure (photos by R. A. Mittermeier).

species concentration for any part of the world (after South America). In other areas of the world, most species of this family are wind dispersed. However, on Madagascar, a large majority of species are dispersed by mammals and presumably coevolved with the lemurs on this island continent (Gentry, 1976, 1983).

The story of the animals, of course, is similar to that of the plants. The tenrecs (Tenrecidae) are similar to the most primitive eutherian mammals and the Lemuriformes, found only on Madagascar and the nearby Comoro Islands, are in some ways similar to the earliest primates. In Madagascar, lemurs fill niches occupied by monkeys and apes in Africa, Asia, and the New World. Currently, there are 13 genera and 22 species (some authors say as many as 28) of lemurs. All of them are in danger of extinction, and for some the danger is particularly acute (Table 1). At least 14 species (including some of the largest) have become extinct since man arrived on the island (Table 2). Since all these forms were alive 1,000 years ago, they must be considered part of the adaptive array of modern lemurs.

With the arrival of people on Madagascar in 500 A.D. (Dewar, in press), the long isolation of plants and animals ceased. Since then the environment has been radically altered. Over 80% of the primary vegetation has been destroyed, including untold numbers of plant species. Of 58 million hectares of land, 53 million are currently covered with secondary vegetation and only 5 million hectares of natural vegetation remain (2.5 million in

tropical forest, 1.5 million in desert, and 1.0 million of deciduous forest). Nearly 20 years ago, a minimal estimate of the rate at which the remaining endemic forest was being irreplaceably destroyed was 10,000-20,000 hectares per year (Chauvet, 1972). This was probably an underestimate at that time and is surely an underestimate now.

With the destruction of the natural vegetation came major extinctions of many endemic animal species (Fig. 3). Besides the lemurs, two giant tortoises and a pygmy hippopotamus became extinct during the 500 years which followed the arrival of people. So, too, did the largest birds ever to have walked the earth, the *Aepyornis* or elephant bird, along with between 6 and 12 other ostrich-like species. *Aepyornis* stood 9-10 feet tall, weighed close to 1,000 pounds, and had an egg that weighed over 20 pounds.

Habitat destruction and extinctions will continue and increase unless major changes occur. The current human population in Madagascar is 9.5 million and the growth rate is 3% per year—a doubling rate of 23 years (Kent, 1983). If this rate persists, by the year 2020 there will be 24 million people on the island. The major threats to the remaining forests are clearing for traditional and commercial agriculture, grazing and browsing by domesticated herds, burning to provide new growth for these herds and logging for firewood and home building. Wood remains the major source of energy for heating and cooking for most

Table 1. Data relevant to the survival of Malagasy primates (adapted from Richard and Sussman, 1975). It must be noted that designations of *wide* distribution and *abundant* populations are used in relation to other Madagascan lemurs. In relation to most other primates, lemurs have very small geographic ranges and all species must be considered severely threatened (see Wolfheim 1983).

Species	Geographical range			Social per Ha.	Home range Group Size	or size (Ha.)	Population		Major Threats	
	Wide	Local	Specialized				Abundant(A) Scarce(S)	Declining	Habitat Destruction	Hunting
<i>Lemur catta</i>	x			1.6-2.15	17 (range 5-30)	5.7-23	A	Probably	x	?
<i>Lemur mongoz</i>		x	?	?	2 (+ offspring)	>1.15	?	yes	x	
<i>Lemur macaco</i>		x		0.58	10 (range 4-15)	?	?	Probably	x	
<i>Lemur fulvus</i>	x			0.4-12	9 (range 4-17)	0.75-1	A	Probably	x	
<i>Lemur coronatus</i>		x		?	large, many adult males and females	?	?	Probably	x	
<i>Lemur rubriventer</i>		x	?	?	<5	?	S	Probably	x	
<i>Varecia variegata</i>	?		?	?	2 (+ offspring)	?	S	yes	x	?
<i>Lepilemur mustelinus</i>	x			2-8.1	Solitary	0.1-0.3	A	Probably	x	
<i>Hapalemur griseus</i>	x		x	1.1-1.2	3-5(?)	?	?	yes	x	x
<i>Hapalemur simus</i>		x	?	low	5-10	?	S	yes	x	
<i>Indri indri</i>		x	?	0.09-0.16	2 (+ offspring)	17.7-18	S	yes	x	?
<i>Avahi laniger</i>	x			?	2 (+ offspring)	?	?	Probably	x	
<i>Propithecus diadema</i>	?	?	?	low	3 (range 1-6)	20	S	yes	x	?
<i>Propithecus verreauxi</i>	x			1.1-1.5	5 (range 3-13)	2-8.5	A	yes	x	?
<i>Daubentonia madagascariensis</i>		x	x	low	Solitary	?	S	yes	x	x
<i>Cheirogaleus major</i>		x	?	?	Solitary	?	?	yes	x	
<i>Cheirogaleus medius</i>	x		?	3-4	Solitary	?	?	Probably	x	
<i>Microcebus murinus</i>	x			2.5-36	Solitary, nesting groups	0.07-0.2	A	Probably		
<i>Microcebus rufus</i>	x			?	Solitary nesting groups	?	A	Probably	?	
<i>Mirza coquereli</i>		x	?	0.3	Solitary	8-10	?	Probably	x	
<i>Allocebus trichotis</i>		x	?	?	?	?	S	yes	x	
<i>Phaner furcifer</i>		x	?	1-2	2 (+ offspring)	?	A	Probably	x	

Table 2: Characteristics and Distribution of Extinct Lemuriformes¹

Species	Size ²	Probable Locomotion	Location of Finds	Comments
<i>Varecia insignis</i>	small	arboreal quadruped (cf. modern forms of <i>Varecia</i>)	Southwest	
<i>V. jullyi</i>	small	same as <i>V. insignis</i>	Central Plateau	
<i>Haplemur gallieni</i>	small (size of <i>H. simus</i>)	unknown	Central Plateau	
<i>Megaladupis madagascariensis</i>	large (240 mm cranium)	short limbed, arboreal: possibly modified	South, Southwest	The animals in this genus probably were arboreal browsers, and highly folivorous.
<i>M. grandidieri</i>	large (290 mm cranium)	Koala-like locomotion	Central Plateau	
<i>M. edwardsi</i>	largest of three (300 mm cranium) donkey size		South, Southwest	
<i>Mesopropithecus pithecoides</i>	small	uncertain	Central Plateau	Slightly more robust <i>Propithecus</i> type skull.
<i>M. globiceps</i>	small			
<i>Palaeopropithecus insignis</i> (Fig. 5)	large	arboreal hanger and climber (cf. sloth or orangutan)	Central Plateau, South, Southwest	Long low skull with upturned nasal bones, generally sloth or orang-like, but dentition like other indrids.
<i>Archaeoindris fontoynonti</i>	large	unknown	Central Plateau	1 specimen. Dentition of modern indrid, but very large, high and robust skull.
<i>Archaeolemur majori</i>	medium	arboreal and terrestrial quadruped (cf. <i>Papio</i> baboon)	South, Southwest and Central Plateau	Skull like indrid, but highly derived teeth (cf. cercopithecoid monkey). Premolars-continuous shearing blade unlike any other primate. Molar dentition highly adapted to grinding probably like gelada baboon—manual grazers. Lost tooth comb.
<i>A. edwardsi</i>	medium			
<i>Hadropithecus stenognathus</i>	medium	terrestrial quadruped (cf. gelada baboon)	Central Plateau South, Southwest	
<i>Daubentonina robustus</i>	small	as living species but larger	Southwest and possibly Central Plateau	Only represented by long bones and teeth.

¹All species are probably diurnal except *D. robustus* (for which there is no skull).

²small = equivalent to largest living Malagasy primates or somewhat larger.

medium = size of small baboons.

large = approximately chimpanzee size or larger.

(Source: Tattersall, 1982 and personal communication; adapted from Sussman, in prep.)

Malagasy. These threats, of course, become even more acute as the population increases. Hunting by traditional means has probably never been a major threat to the lemurs. However, as the population grows, traditional taboos are lost, forests dwindle, food shortages spread, and guns are used for hunting. This activity could ultimately bring about the extinction of these remnants of the past.

Most of the threats just mentioned are generated by poor rural people engaged in a range of small scale farming activities. These activities solve the short term problems of survival for most Malagasy. However, since forest clearing as it is practiced leads

to soil erosion and ultimately to sterile soils, the solution is extremely short term. The need to conserve natural forests is not simply a luxury for esoteric research; it is the only means of keeping the soil rich in nutrients and the climate stable. The government of Madagascar is aware of the problems of forest destruction, but the country is very poor and will need assistance to take effective steps to conserve its natural resources. The country needs cooperative projects in pure and applied research, education, and in establishing and patrolling wildlife refuges. Currently there are 11 reserves and 2 national parks covering an area of approximately 600,000 sq. km. There are also 2 private reserves and one recently

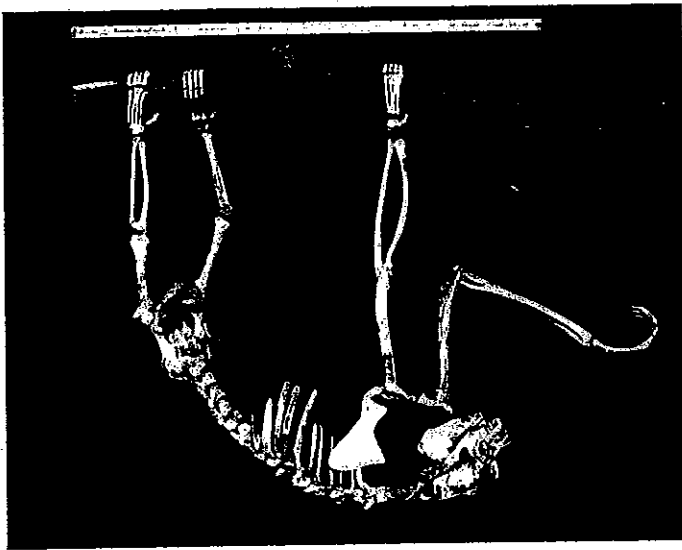


Fig. 3: Skeleton of extinct, large sloth-like lemur *Palaeopropithecus insignis*. This almost complete skeleton was recently discovered by Duke University paleontologists, R. MacPhee and E. Simons (photos by Anthony Benson).

established university reserve and field station. The current state of these reserves is not known, nor is the general status of the flora and fauna within them.

The university reserve mentioned above is the result of a cooperative project between the University of Madagascar, Yale University, and Washington University-St. Louis, and is funded by the World Wildlife Fund-U.S. The reserve, Beza-Mahafaly, is located in southern Madagascar. It includes 600 hectares of gallery forest and *Didierea*, or desert forest. Most of the endemic fauna and flora of the region is represented in the reserve (Figs. 4-5). Small reserves present potential problems in that they are particularly vulnerable to local catastrophes, and they may give rise to inbreeding depression in small populations isolated within them. Yet, because of the high population density of many mammalian species in Madagascar, small reserves may contribute to their conservation by acting as refuge areas and reservoirs. The 100 hectare private Berenty Reserve, created over 40 years ago and still maintained by the DeHeaulme family, where much of the field research on lemurs has been conducted, is an excellent example of the potential success of small reserves. While the truly long term genetic effects of small population size have yet to be studied, the stability of the Berenty populations over the 20 years they have been studied suggests that the reserve is a viable refuge. The Beza-Mahafaly reserve was established in 1977 as part of a project of conservation, education, training and research. Local residents of southwestern Madagascar chose the site and have assisted in creating, managing, and protecting the reserve. The director of Beza-Mahafaly in Madagascar is Dr. Gilbert Ravelojaona, President of the School of Agronomy, University of Madagascar. Currently, Mr. Pothin Rakotomanga, of the School of Agronomy, is working towards a degree of "Superieure Techno-Naturaliste" from the University of "Sciences et Technique" Languedoc, Montpellier. Mr. Rakotomanga is funded by the WWF-U.S. project and will manage the reserve when his studies are completed. A second Malagasy student, Bodo Randrianasolo, partially funded by WWF-U.S., is currently studying for her Ph.D. in primate biology at Washington University.

We hope that the Beza-Mahafaly reserve will serve as an example of the type of "on the ground" project that can make an important and visible contribution to the preservation of this unique habitat, to the training of Malagasy biologists, to the education of the local rural Malagasy, and to conservation and general biological research.

Our initial surveys of the vegetation before the Beza-Mahafaly reserve was enclosed by barbed wire and two years after the enclosure show that the exclusion of cattle and goats for even a short period has permitted a rapid and dramatic explosion of new growth on the forest floor. We are now hoping to study the long term effects of our protective measures on the flora and fauna. We believe that there are several national and regional institutions in Madagascar that would, with support and encouragement, enthusiastically sponsor additional small reserves and that a network of these small reserves would contribute importantly to conservation efforts throughout Madagascar.

Besides the Beza-Mahafaly project, there have been a number of encouraging events and other cooperative projects within the last five years. In 1979, by presidential decree, WWF-International established a Malagasy office in the capital, Tananarive, directed by Mr. Barthelemy Vaohita. The office evaluates and coordinates potential WWF conservation education projects on the island and directs several research projects funded by WWF. In January, 1983, an agreement of collaboration on research relating to nature conservation was signed between the Malagasy Minister of Scientific Research and WWF in



Fig. 4: *Lemur catta*, one of the two diurnal species of *Lemur* at the Beza-Mahafaly field station (photo by R. A. Mittermeier).



Fig. 5: *Propithecus verreauxi*. The second diurnal species at Beza-Mahafaly (photo by R. W. Sussman).

Madagascar. There are currently six projects financed through WWF-International.

Within the past three years, both the Duke University Primate Center, which concentrates on research and breeding of lemurs, and the Missouri Botanical Garden, the official repository of African plant specimens in the U.S., signed agreements with the Direction de la Recherche Scientifique (D.R.S.) of Madagascar. These agreements are for exchange of scientific information, cooperative research, student training, and exchange of equipment and personnel. Dr. Elwyn Simons, Director of the Duke Center, has supplied equipment and training to the Malagasy National Zoo in Tananarive and, with WWF-U.S. assistance, is supporting a Malagasy student, Jonah Andrianarivo in his Ph.D. research at the Duke facility. A portion of Mrs. Randrianasolo's training will also be conducted at the Primate Facility.

The Missouri Botanical Garden has sponsored visits to the U.S. and postgraduate research opportunities for two Malagasy botanists, Mr. Armand Rakotozafy and Dr. Voara Randrianasolo. Mr. Rakotozafy spent five months in St. Louis in 1981. He is director of the herbarium and of the department of Natural History of the Malagasy National Scientific Research Center (CNRT). Dr. Randrianasolo recently completed a stay of 10 months at the Garden. He received his Ph.D. from the University of Illinois and is the "chef de recherche" of CNRT. The Missouri Botanical Garden also sent a botanist, Dr. W. G. D'Arcy, to Madagascar

last year to begin a collaborative botanical project with Mr. Rakotozafy. In January, Dr. Laurence J. Dorr left for Madagascar as the Garden's resident botanist. Dr. Dorr's efforts will be directed at acquiring botanical materials in collaboration with Malagasy scientists and students. He also will be active in assisting foreign and Malagasy scientists' efforts to study and conserve the plant life of the island.

Finally, on Feb. 1 and 2, 1983, at the request of Dr. Berthe Rakotosamimanana, 27 scientists from 7 countries met in Jersey (British Isles) to discuss how foreign scientists could contribute to nature conservation in Madagascar. Among the participants of their meeting were Mr. Vaohita, representing WWF-Madagascar, Mr. Luc Hoffmann, Vice-President of WWF-International, and Mr. Pierre Portas, IUCN-WWF Project Manager for Africa and Madagascar. Our attendance was funded by the WWF-U.S. The meeting was hosted by Gerald and Lee Durrell and the Jersey Wildlife Preservation Trust. At this meeting an International Advisory Group of Scientists (IAGS) of seven members was elected. The IAGS reviews and sends comments on research proposals to Madagascar for final deliberation by the Department of Scientific Research. Dr. Lee Durrell was elected chair of the IAGS. A more detailed description of this advisory group can be found in the March 1983 Primate Specialist Group Newsletter.

With further cooperative projects such as those described here, and with a concerted effort in education, there is a chance that a good proportion of the remaining natural flora and fauna can be saved. Madagascar is an excellent example of the types of problems facing natural habitats worldwide. The success or failure of conservation efforts on Madagascar should be easy to monitor. If conservation projects are successful here, perhaps they can serve as an example to encourage larger efforts. If these projects fail, they will be a sad foreboding of the future. And think of what we will have lost.

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Sightings Of Aye-Ayes And Red Ruffed Lemurs On Nosy Mangabe And The Masoala Peninsula

The aye-aye (*Daubentonia madagascariensis* Gmelin 1788) is the most unusual of all living primates, and was even classified as a rodent for more than half a century after its discovery by Sonnerat in 1780. Not until 1863, with the publication of Sir Richard Owens' anatomical study of the species, was it recognized that the continuously growing chisel-shaped incisors and other uniqueness. For almost a quarter century, from the 1930's to the 1950's, the aye-aye also rates high on the list of international primate conservation priorities. Indeed, since this highly endangered lemur is the only living representative of an entire primate family and the only endangered primate taxon above the generic level, it rates as the highest of all primate (and among the highest mammal) conservation priorities just on the basis of its taxonomic uniqueness. For almost a quarter century from the 1930's to the 1950's, it was presumed extinct. However, it was finally rediscovered by Jean-Jacques Petter and Arlette Petter-Rousseaux in 1957, when they found a live animal after a year of searching (Jackson, 1981).

The IUCN *Red Data Book* lists the aye-aye as endangered and it is also on Appendix I of CITES and on the U.S. Endangered Species List. Within Madagascar, it is legally protected by law no. 61-096 of February 16, 1961, which ranks all lemurs highest priority in the conservation of indigenous fauna (Andriamampianina, 1978). On the basis of museum localities, the species once had an extensive coastal range throughout eastern and north-western Madagascar (Fig. 1), but it is not known if it still exists in most of this area. It appears to be adaptable in choice of habitat, occupying a number of coastal and low-altitude formations (up to elevations of 1000-1200 m; Petter, 1977) including primary rain forest, deciduous forest, secondary growth, plantations of mango, lychee and particularly coconut, and perhaps even entering mangrove swamps and dry scrub forest (Tattersall, 1982). The main threats to its survival appear to be widespread destruction and degradation of its forest habitat, and it is also killed on sight when accidentally encountered by superstitious local people because they believe it brings misfortune.

In 1957, Mahambo, the eastern coastal site where Petter rediscovered the aye-aye, was declared a Special Reserve to help

protect this species. However, the area was subsequently divided and encroached upon, and when Petter returned in 1963 to survey the reserve, he found no aye-ayes. (Later, in 1975, aye-ayes were relocated at Mahambo, but exploration of the area convinced Petter (1977) that extinction there would be inevitable.) As a result, an aye-aye conservation program was planned by the Madagascan Dept. des Eaux et Forêts (Water and Forest Dept.), the Museum of Natural History in Paris, and IUCN, to be funded by WWF. This program included the introduction of aye-ayes onto the small island of Nosy Mangabe (Fig. 2), located 6 km south of Maroantsetra in the Bay of Antongil (15° 29' S, 49° 45' E), and this island was declared a Special Reserve in December, 1966. Its 520 ha are covered in forest, with typical east coast rain forest species such as *Canarium*, *Ocotea*, *Ravenala*, and various palms and ferns (Andriamampianina, 1984), and the terrain is rugged, ranging in altitude from sea level to 331 m. In 1967, nine aye-ayes caught near different coastal villages (4 females and 5 males; Andriamampianina, 1978) were released onto the beach of Nosy Mangabe, and the release process was recorded on film (Petter, 1967). Although there have been no detailed surveys of Nosy Mangabe since the release, there have been a number of sightings of aye-ayes in the past 18 years. Nests have been seen on several occasions, and one individual was located in 1975, two in 1981 (Bomford, 1981) and a mother and infant in 1983 (Kemf, 1983). The purpose of this paper is to report sightings of two aye-ayes on Nosy Mangabe in 1984.

During the course of a WWF-U.S. fact-finding mission to Madagascar, we spent four days on Nosy Mangabe from August 28 - August 31, 1984. On the evening of August 30, we observed two aye-ayes along the western beach of the island, not far from the laboratory building constructed there in February, 1968. The first individual was spotted at 19.15 about 12 m up in a 21 m high "hintsyna" (*Azelia bijuga*, Leguminosae) tree by the beach (Fig. 3). It stayed there for about 15 minutes, while the first observer (JIP) returned to get the other members of our group, but quickly disappeared into a tangle of lianes and epiphytes about two minutes after the other four of us arrived. The second animal, an adult male (Fig. 4), was located by IDC 450 m further south along the beach, 4.9 m up in another 9.7 m high hintsyna tree covered with galls (Fig. 5). We observed this animal from 20.15-21.15, while it fed on these galls, biting vigorously at them, and chewing and swallowing pieces of them while letting other

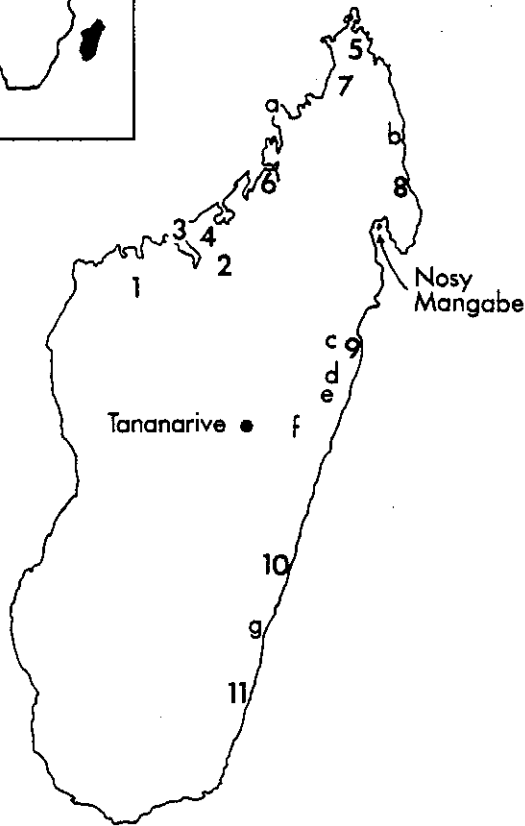
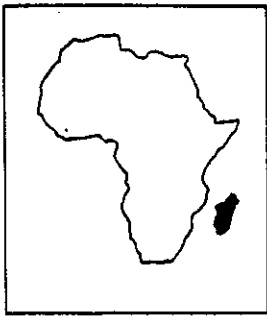


Fig. 1: Localities for *Daubentonia madagascariensis*.

Specimens Collected (Tattersall, 1982)

- a. Ampasimena
- b. north of Sambava
- c. Sahatavy, upper Maningory river
- d. forests west of Tamatave (Kaudern, 1915)
- e. Seranantsera
- f. Beforona
- g. Matitanana river (Decary, 1950)

Sightings Reported (Tattersall, 1982)

- 1. Andranomaro (Lamberton, 1934)
- 2. Ankarafantsika (Kaudern, 1951)
- 3. mangroves near Majunga (Decary, 1950)
- 4. Ankobakabaka
- 5. Mt. d'Ambre

Sightings Reported (Petter, 1977)

- 6. Analalava
- 7. Ambilobe
- 8. Antalaha
- 9. Mahambo
- 10. Mananjary
- 11. south of Farafangana (comm. with Decary)

pieces fall. Under the cork-like galls, we found several large beetle larvae, earwigs, ants and a small frog, which the aye-aye almost certainly fed on as well. Petter (1977) observed aye-ayes scraping and eating sap from galls of this tree species, and it may be that the aye-aye we saw was feeding on hardened sap of the galls



Fig. 2: Aerial view of Nosy Mangabe (photo by R. A. Mittermeier).

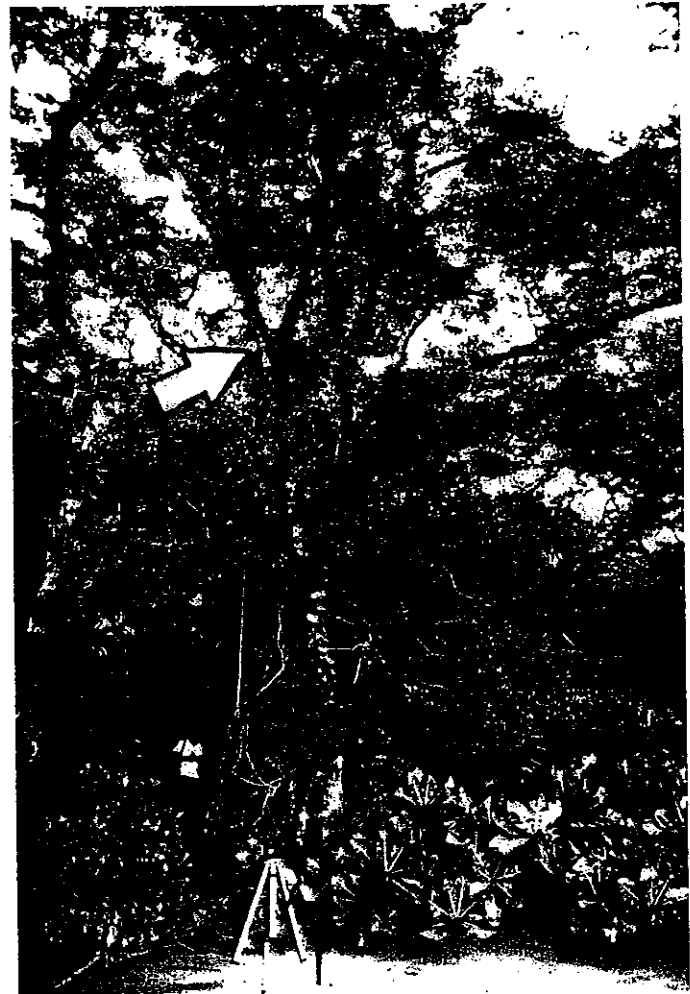


Fig. 3: *Afzelia* tree in which the first aye-aye was located. Arrow shows approximate location in tree in which the animal was seen (photo by R. A. Mittermeier).

in addition to their contents (for more details on these feeding observations, see Pollock *et al.*, in press). In daylight, we could see how even the lowest gall, 55 cm above the sand, had been scraped by the aye-aye and, higher up, the trunk was covered with tooth marks.

The aye-aye continued feeding for one hour, occasionally shifting positions for better access to galls, and did not seem to be bothered by the presence of five observers firing two different



Fig. 4: Adult male aye-aye in the second *Afzelia* tree (photo by R. A. Mittermeier).



Fig. 6: Adult male aye-aye feeding on bamboo shoots (photo by J. I. Pollock).



Fig. 5: *Afzelia* tree in which the second aye-aye was located. Arrow indicates the position of the animal when first seen (photo by R. A. Mittermeier).

flash units and talking in whispers, as long as the observers remained 10-15 m distant. However, when we attempted to approach within 5 m at the base of its feeding tree to obtain close-up photos, it took notice. It walked back and forth along the same branches in a slow but obviously agitated manner, apparently trying to find an escape route but not demonstrating any great agility in doing so. Finally, it found a route, moved into a giant bamboo which it descended head first, and then disappeared into some nearby trees after eating a few bamboo shoots on the way down (Fig. 6).

The tree in which the second aye-aye was observed was located only about 200-300 m from a small house where many boatmen stay while waiting for the tides to rise so that they can enter the port at Maroantsetra. On the night that we made our observations, a boat was docked only about 50 m offshore and its occupants were talking loudly, which apparently did not bother the aye-aye. Our boatman informed us that he had seen an aye-aye (perhaps the same one) right at the edge of the small house two months earlier.

Four other lemur species also occur on Nosy Mangabe, including the rufous mouse lemur (*Microcebus rufus*), the greater dwarf lemur (*Cheirogaleus major*), and introduced populations of white-fronted lemur (*Lemur fulvus albifrons*) and black-and-white ruffed lemur (*Varecia variegata variegata*.) These two species were released on the island in the 1930's (J.-J. Petter,

pers. comm.) and seem to be thriving. We encountered four groups of *Lemur f. albifrons* while walking approximately 4 km to the highest point in the center of the island and back, and another group in a circumnavigation of the island. We estimate that there are at least 8 groups of *Varecia* on the west side of the island, the latter estimate being based on sighting 3 groups and hearing another 5 groups vocalize. Both of these species are restricted to the humid eastern forests of Madagascar and are threatened by habitat destruction and hunting. The status of *L. f. albifrons* is probably not as critical as that of *Varecia*, which is almost certainly endangered, but both species require further investigation. In any case, it is fortunate that these two species exist on Nosy Mangabe, since the island may be an important stronghold for them in the future. The only threat to them at this time appears to be occasional hunting. We found what were probably lemur bones at the edge of the laboratory building during our trip, and heard rumors of hunting parties visiting the island to shoot the diurnal species, although this was not confirmed.

We also observed at least 12 *Microcebus rufus*, but did not see any *Cheirogaleus*, perhaps because of their low activity in the austral winter.

In addition to our investigation of Nosy Mangabe, we spent the day of August 30 on the Masoala Peninsula. We disembarked at a beach directly east of Nosy Mangabe and climbed for about three hours up the slope along trails used by local slash and burn farmers.

On the way up, we located one group of *Lemur fulvus albifrons*, and on the way down found a group of three red ruffed lemurs (*Varecia variegata rubra*). These animals first responded to us with loud vocalizations, but then sat quietly directly above us and ignored us for the half hour that we watched them.

The habitat in this area is a mosaic of forest and agricultural plots, and it appears that lemurs are hunted for food, especially the "varimena", as the red ruffed lemur is called in the region. The traps used to capture the animals are simple but effective, and we saw many of them on our climb. They are prepared by clearing a corridor 5 to 15 m wide and several hundred meters long in the forest along known lemur pathways and then setting up simple sapling runways 1.5 - 2.5 m above the ground. These are set with nooses, which catch the lemurs by the throat as they try to walk through (Fig. 7).

The combination of forest destruction and hunting on the Masoala Peninsula, which is the only place in the world where



Fig. 7: Author Joeline Ratsirarson demonstrates the use of a lemur trap on the Masoala Peninsula (photo by R. A. Mittermeier).

the spectacular red ruffed lemur lives, represents a serious threat to this animal. The only existing reserve on the peninsula was degazetted several years ago, and establishment of a new protected area there should be considered a high priority.

Nosy Mangabe is an important conservation area, both for the lemurs occurring there, as well as for other wildlife and for the forest itself. However, an in-depth investigation of the island is necessary, and a population survey of the aye-aye itself is long overdue. It is unfortunately impossible to know if aye-ayes occupied the island prior to the 1967 introduction, but this does not change the fact that the island is now of considerable importance to the conservation of the species. Aye-ayes are said to still occur on the nearby mainland as well, and a survey of this area, and indeed the entire range of the species, must also be considered a high conservation priority.

It has been proposed that other endangered lemur species be released onto Nosy Mangabe as well, among them *Indri* and one of the *Propithecus diadema* subspecies. Nosy Mangabe appears to have a rich and mature flora with no evidence of recent disturbance, and would probably be appropriate habitat for these animals. However, population densities of *Indri* and *Propithecus diadema* in mainland forest have not been found to exceed 10-15/km². At only 5 km², the island may not be able to support self-sustaining populations of these large species. On the other hand, it may be an ideal home for populations of the smaller nocturnal forms. The status of *Cheirogaleus major*, which is never common in mainland areas and already occurs on Nosy Mangabe, is worthy of further investigation, and consideration should also be given to a carefully-monitored release of the exudate-eater *Phaner furcifer*, whose eastern distribution is apparently limited to part of the unprotected Masoala Peninsula.

In any case, it is obvious that Nosy Mangabe is a very important conservation area for Madagascar and also an ideal location for a field station of the kind that exists on Panama's Barro Colorado Island. Indeed, with the right approach, the island could become a focus for conservation and training activities in Madagascar for a long time to come.

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The Status Of Primates In China

China has a unique zoogeographic position in the world, being split in half by two zoogeographic regions, the Palaearctic and the Oriental. It is mainly because of the mix of these two faunas that China has more primates than any other large, temperate country. The USSR, the USA, Canada and the whole of Europe do not have any indigenous species of non-human primates. China is fortunate to have around twenty species and subspecies of apes and monkeys (see Table 1).

The exact number of primate species in China depends on whether the golden or snub-nosed monkeys (*Rhinopithecus* spp.) are 3 species or 3 subspecies of a single species, and on the systematic status of the white-headed langur (*Presbytis leucocephalus*) and the hairy-faced stump-tailed or Tibetan macaque (*M. thibetana*). If all of these are recognized as full species, the total number of Chinese primate species would be 18.

Several of these species are depicted in Figs. 1-10; the provinces of China are shown in Fig. 11 and known distributions of all Chinese primates indicated in Figs. 12-16.

Table 1. Primates Species of China

Family	Species	Common english name	Protected status
Lorisidae	<i>Nycticebus cougang bengalensis</i>	Slow loris	1
Cercopithecidae	<i>Presbytis leucocephalus</i>	White-headed langur	1*
	<i>P. francoisi</i>	Tonkin or Francois' leaf-monkey	1
	<i>P. entellus lania</i>	Himalayan langur	1
	<i>P. phayrei crespuscus</i>	Phayre's leaf-monkey	1
	<i>Pygathrix nemaeus</i>	Douc langur	1
	<i>Rhinopithecus r. roxellanae</i>	Sichuan golden monkey	1*
	<i>R. r. bieti</i>	Black or Yunnan snub-nosed monkey	1*
	<i>R. r. brelichi</i>	Gray or Guizhou snub-nosed monkey	1*
	<i>Macaca mulatta mulatta</i>	Rhesus monkey	2
	<i>M. m. vestita</i>	Eastern Tibetan rhesus	
	<i>M. m. tcheliensis</i>	Hebei rhesus	
	<i>M. m. brevicaudus</i>	Short-tailed rhesus	
	<i>M. assamensis assamensis</i>	Assamese macaque	2
	<i>M. a. coolidgei</i>	Northern Assamese macaque	
	<i>M. a. pelops ?</i>		
	<i>M. arctoides</i>	Red-faced stump-tailed macaque	2
	<i>M. thibetana</i>	Hairy-faced stump-tailed or Tibetan macaque	2*
	<i>M. cyclopis</i>	Taiwan macaque or Formosan rock macaque	1*
	<i>M. nemestrina leonina</i>	Pig-tailed macaque	2
Hylobatidae	<i>Hylobates hoolock</i>	White-browed gibbon	1
	<i>H. lar</i>	White-handed gibbon	1
	<i>H. concolor concolor</i>	Black-crested gibbon	1
	<i>H. c. leucogenys</i>	White-cheeked black-crested gibbon	
	<i>H. c. hainanus?</i>	Hainan black gibbon	

* indicates endemic to China

? questionable status or distribution

However, the presence of one of these, the douc langur (*Pygathrix nemaeus*), is dubious. According to A. B. Meyer (1892), the Dresden Museum allegedly obtained a specimen from Hainan, but no specimens have been collected from this island ever since. In the 1983 meeting of the Chinese Mammalogist Society, it was pointed out that investigations conducted in recent years not only failed to find any trace of this monkey, but local hunters and old men said they had never heard of its existence. It is now believed that this monkey probably never existed on the island. However, the black-footed douc (*P. n. nigripes*) is still found in the Indo-Chinese countries across the Tonkin Bay.

In analyzing the composition of Chinese primates, one may notice another peculiarity: small on both ends with a big central portion. By this I mean China has few representatives of the lowest prosimian category (only a single species of loris) or the highest anthropoid category (3 species of gibbon), but many macaques and langurs. This is due to the fact that China has only a small tropical region to which the specialized prosimians and anthropoids are more adapted. The few Chinese representatives of these families occur only in the south of the three southernmost provinces of Guangdong, Guangxi, and Yunnan, while the hardier monkeys range through the temperate provinces of Hebei, Henan, Shanxi, Shaanxi, southern Gansu and southern Qinghai, and also into the snow-capped mountains of Sichuan and Tibet. One of them, the Chinese rhesus macaque (*Macaca mulatta*), even inhabits the East Tomb area in northeastern Hebei (40° 50'N), thus sharing with the Japanese macaque (*M. fuscata*) the distinction of being the most northerly distributed monkey in the world.

Among the Chinese apes and monkeys, there are six forms endemic to China. They are the Sichuan or typical golden monkey (*Rhinopithecus r. roxellanae*), the Yunnan or black snub-nosed monkey (*R. r. bieti*), the Guizhou or gray snub-nosed monkey (*R. r. brelichi*), the white-headed langur (*Presbytis leucocephalus*), the Taiwan macaque (*Macaca cyclopis*) and the hairy-faced stump-tailed or Tibetan macaque (*M. thibetana*) (refer to Table 1). In addition, the subspecies *Macaca mulatta vestita* (Tibet-Qinghai) and *M. m. tcheliensis* (East Hebei), if recognized, should perhaps be added.

Some of these endemic species have never been exported or exhibited. The Yunnan and Guizhou snub-nosed monkeys, for instance, have never been exhibited by a foreign or Chinese zoo. A single young Sichuan golden monkey was sent to the London Zoo, and kept alive there for about a month in the late 1930's. (Editor's note: Recently a pair has been loaned to the San Diego Zoo, see News from Captivity). A few white-headed langurs and Tibetan macaques, as I recall, were sent to Moscow as an animal exchange in the early 1950's. I do not know what happened to them later on, but I believe none of them survived long.

All of China's nonhuman primates have been included on the national list of protected species and given either first or second class status (Table 1).

In the rest of this paper, I will briefly review the situation and status of each of China's nonhuman primate species.

Slow Loris, *Nycticebus coucang bengalensis* (Fischer, 1804)

The Chinese name for this prosimian is "lanhou" (lazy monkey) because of its slow motion, or "fenghou" (bee monkey) because of its habit of stealing honey from honeycombs. *N. c. bengalensis* has a head-body length of 330-350mm, a short tail of 20mm and an average weight of about one kilogram.

Its range in China is limited to only two provinces. In Yunnan,

it still occurs in Xishuangbanna and a few counties in the southwestern part of that province. In Guangxi, it was also formerly found in the southwestern part of the province in the counties of Ningming, Longzhou, Pingxiang and Jingxi. However, owing to deforestation and the local habit of eating every kind of wildlife, it has been almost completely wiped out from this area. During the past 20 years, only two are known to have been captured, one in 1964, the other (from Jingxi) on 17 April, 1982. It died after 3 months in captivity at a zoo.

Although no census has been made, the Yunnan population is believed to be no more than a few hundred and the Guangxi population almost extinct. It is therefore assigned the first class status as a protected animal in China. A small number are on exhibit in Chinese zoos.

White-headed langur, *Presbytis leucocephalus* (Tan, 1957)

This monkey was discovered in southwestern Guangxi in 1952 when I was collecting wild animals in South China for the Peking Zoo (Fig. 1). It was described and named as a new species in an article I wrote for *Zoo Life* in 1957 because of the many features which distinguish it from the related Tonkin langur (*P. francoisi*) of China and Vietnam. Although some authors believe that the white-headed langur should be a subspecies of the Tonkin langur, I still reserve my view.

Both langurs are distributed over the same region in southwestern Guangxi. *P. francoisi* has a wider range (eight counties) than *P. leucocephalus* (four counties). Their ranges overlap in some of these counties and both species use the same types of habitat, but they remain in distinctive groups, each with their own territory and usually separated by rivers.

The area of distribution for *leucocephalus* has been variously estimated at between 200 km² to 500 km², occupying parts of the counties Fusui, Chongzuo, Ningming and Longzhou, all located along the Zuojiang River flowing from the Sino-Vietnam border eastward to Nanning, the provincial capital of Guangxi. Surveys conducted in 1977 put the total number of white-headed langurs living in the wild at around 600. However, Wu Mingchuan (1983) said, "owing to ineffective protection," the number has since dropped to about 400. Another report describes a population to the west of this area, near Jingxi county.

The geography of this area is characterized by karst hills and scattered pockets of forests. Many of the hills have vertical limestone cliffs as flat as walls up to 100 m high and thousands of square meters in surface area. The monkeys live in the safety of the innumerable caves and crevices opening high up on these stony walls. Every morning at dawn they emerge from their caves one by one and either climb up or crawl down to the ground to forage. They do not drink often because the foods (mainly fresh leaves and young shoots) contain enough moisture. Feeding takes place in the morning and afternoon with several hours of rest at noon, usually in the shade of the forest. At dusk they return to their cave dwellings.

White-headed langurs live in family groups, each family consisting of an adult male, a few adult females and a number of young. When the young males grow up, they either fight for supremacy within the family group, or split to form new family groups. Infants are born throughout the year, but the number of births peaks in the early spring. Newborn animals are golden yellow in color and gradually change color from head to body within the first year. They begin to eat some solid food at 1-2 months of age and by 4-5 months they can leave their mothers



Fig. 1: White-headed langur (*Presbytis leucocephalus*) female with infant (photo by Li Shuzhong).



Fig. 2: Type specimen of the white-headed langur (*Presbytis leucocephalus*) photographed in 1957 (photo by Tan Bangjie).

to seek food for themselves. Sexual maturity is reached in the third or fourth year, earlier in females than males.

P. leucocephalus and *P. francoisi* can interbreed in captivity. Over six years, a male *P. leucocephalus* of the Beijing zoo mated with 4 female *P. francoisi* and sired 7 hybrids, of which two were aborted and one born dead, the rest being normal births. It is a pity that these hybrids were sold and that two died before reaching maturity, so that nothing is known about their fertility.

Morphologically, *P. leucocephalus* and *P. francoisi* closely resemble each other in size, weight and general build; however, they differ greatly in color pattern. While *francoisi* is glossy black all over except for two narrow white cheek stripes, *leucocephalus* is black with a completely white head, white throat, white nape, white shoulders, one-half to two-thirds of a distally white tail, and also small patches of white on the back of its hands and feet. My type specimen (Fig. 2), a subadult female unfortunately lost during the chaos of the "Cultural Revolution", had a head-body length of 535 mm and a tail length of 792 mm. According to Li Zhixiang and Ma Shilai (1980), of the seven specimens they collected from southern Guangxi in 1976 and 1977, the longest head-body length was 614 mm, the longest tail length was 890 mm and the heaviest weight was 9,450 g. Females are only slightly smaller and lighter than males.

There are also minor cranial differences between the two langurs. For instance, *leucocephalus* has a slightly longer nasal bone than *francoisi*. The outside width across the orbits is greater

than the width of the cranium in *leucocephalus*, whereas *francoisi* has a fuller cranium posteriorly.

Economically, *P. leucocephalus* is believed to have medicinal value. The local people regard all kinds of wildlife, including this langur, as tonic. Up to a few years ago, drug stores purchased as many *leucocephalus* and *francoisi* as they could to produce drug wine and "guilonggao" (Guangxi dragon cake). A young commune member was known to have killed more than 70 white-headed langurs himself. However, conditions have improved since 1980, when both langurs were proclaimed first class protected animals, and a few nature reserves were established in Fusui, Chongzuo, Ningming, Longzhou and Daxin counties. A few offenders have also been fined by the local authorities.

Tonkin Langur or Francois' Langur, *Presbytis francoisi* (Pousargues, 1898)

People in southern Guangxi call *P. leucocephalus* "baiyuan" (white ape) and *P. francoisi* "wuyuan" (black ape). *P. leucocephalus* is not actually entirely white, being half white and half black, but *P. francoisi* is accurately named (Fig. 3). One thing noteworthy is that there is a third form of langur people called "baiwuyuan" (white-black ape) in southern Guangxi. It is called baiwuyuan because while physically similar to a wuyuan, its color is shining white. A few such monkeys were seen living with a group of wuyuans since the 1960's. One of these was captured alive and put on exhibit at the Liuzhou Park in 1977. I visited

this park in 1982 and decided it was actually an albino form of the common *francoisi*, having the typical reddish eyes of an albino. So far up to a dozen albino individuals have been sighted, all in the same region, an area of approximately 50 km² of karst jungle hills in Daxin county, west of Nanning near the Vietnam border. It is interesting to note that not only albino langurs are found there, but also albino rhesus monkeys and albino stump-tailed macaques, which leads to the hypothesis that some sort of radioactivity from the local mines may be the cause of it.

As stated before, the range of *francoisi* is much wider than that of *leucocephalus*. It is not only found in southwestern Guangxi, but also occurs in Guizhou province, from Xingyi and Ceheng counties (25° N, 105-106° E) in the south, to Zheng'an and Yuanhe counties (28° 50' N, 107° 50' - 108° 50' E) in the north. The northernmost locality in Guangxi is the Daming Hills, some distance north of Nanning, on the Tropic of Cancer. Tonkin langurs living in these northern areas, according to animal collectors, have longer and thicker fur, sometimes over 120 mm in length.

P. francoisi occupies a similar habitat to that of *P. leucocephalus*, being found in areas of karst topography with precipitous hills, thick jungles and plenty of caves in the limestone cliffs. These caves vary in depth from a few meters to 30 meters, according to Huang Zintong *et al.* (1983). The caves selected

by *P. francoisi* usually face southeast to avoid the strong wind often blowing from the northwest. In warmer weather the monkeys sleep outside their caves, but when nights are cold (sometimes below 5° C) they will go in to keep warm by embracing each other. Each cave is occupied by a family group, usually from 3 to 10 individuals but occasionally as many as 20 and consisting of an adult male, 4-6 adult females and a number of young.

Remnants of female monkeys' menses and parturient blood found in the caves and known as "wuyuanjie" (black ape node), are collected and used as a drug believed to be good for curing anemia, etc. Medicinal liquor made with monkey bone called "wuyuanjiu" (black ape wine) has a good market in South China and among the overseas Chinese in southeast Asia as a cure for rheumatism. A factory producing wuyuanjiu at Longzhou was successful for a long time. An investigation conducted in 1978 indicated that the annual collection of *P. francoisi* dead and alive totalled up to 1,000 animals in Daxin county, despite its officially protected status. Fortunately, things have been getting better since control measures have been tightened.

Wu Mingchuan (1983) estimates that the total number of Tonkin langurs living in Guangxi province alone is not less than 4,000-5,000 animals.

A few Tonkin langurs have been exported to Japan and the U.S.A. in recent years.



Fig. 3: *Presbytis francoisi* from Guangxi Province (photo by Tan Bangjie).

Himalayan Langur, *Presbytis entellus* (Dufresne, 1797) Phayre's Langur, *Presbytis phayrei* (Blyth, 1847)

Two more species of leaf monkeys occur in China: *P. entellus*, the Himalayan langur, also known as the long-tailed or holy langur or sacred hanuman, and *P. phayrei*, Phayre's langur. Both these species are less well known than the two langurs we have just described, data concerning these monkeys in China being very scanty. The Himalayan langur has never been exhibited in a Chinese zoo, and Phayre's langur is rarely seen. The Beijing Zoo, for instance, exhibited a few Phayre's langurs in the 1950's and early 1960's, but none afterwards. Consequently these descriptions will have to be brief and generalized.

Both these animals have limited ranges of distribution within China. The Himalayan langur is found in two localities: the central section of the Himalayas along the Chinese-Nepal border between Yadong in the east and Nemula in the west, and in southeastern Tibet, to the north of Assam and Burma. The former is believed to be the subspecies *P. e. lania* (Elliot). They live in groups averaging 10-20 (sometimes up to 100) animals in coniferous forests on mountain slopes 2,000-3,000 m above sea level. Since the human population in these areas is very small, not accustomed to eating monkey meat and usually settled far from monkey habitats, the Himalayan langurs can still persist in their mountain abode without much trouble. Scientific investigation on this frontier mountain species has not yet been carried out.

While *P. entellus* is a cold-resistant monkey, often found playing on snow-covered ground in winter, *P. phayrei* is confined to the tropical and sub-tropical regions. Phayre's langur is only found in southwestern Yunnan, mainly in the tropical forest district of Xishuangbanna. There has been controversy over the classification of this monkey. Allen (1938) thought it was "obviously a member of the *P. obscurus* group", and called it *Pithecus obscurus barbei* (Blyth), or Barbe's langur. Tate (1947) changed this to *Trachypithecus phayrei barbei* (Blyth). Now Chinese mammalogists think it is the same animal as the Indo-Chinese

subspecies, *Presbytis phayrei crepusculus* (Elliot), and call it Phayre's leaf-monkey.

Morphologically, this monkey resembles the Himalayan langur in its general build, long tail and lack of tufted hairs over the head. Its face is also blackish, but its body color is grayer, often with a silver tone. Its most distinguishing features are the whitish "rings" around its eyes and lips, owing to the lack of skin pigment. It also has long black hairs across the forehead which protrude like eyebrows.

According to Quan Guoqiang *et al.* (1981), a fair percentage of the 12,727 monkey pelts collected from Yunnan province in 1980 belonged to the Phayre's langur. This hunting and the recent heavy deforestation in Xishuangbanna must make the situation of this species very precarious.

Sichuan golden monkey, *Rhinopithecus roxellanae roxellanae* (Milne-Edwards, 1870)

Yunnan snub-nosed monkey, *Rhinopithecus r. bieti* (Milne-Edwards, 1879)

Guizhou snub-nosed monkey, *Rhinopithecus r. brelichi* (Thomas, 1903)

The golden monkeys, as endemic species of China, have been discussed in an interesting article by F. E. Poirie in *IUCN/SSC Primate Specialist Group Newsletter* No. 3 (1983). Fundamentally, I agree with all his viewpoints and most of his descriptions.

One thing still debatable is whether the Chinese golden monkeys or, more correctly, the snub-nosed monkeys should be classified as three species or a single species. Prior to Ellerman and Morrison-Scott (1951), all authors treated the monkeys as three distinct species. Since the publication of their book, however, most writers (including many Chinese) have followed their viewpoint and treated the monkeys as three subspecies of a single species, *Rhinopithecus roxellanae*. Ellerman and Morrison-Scott argued that, "it's difficult to believe that 3 forms, not occurring together and differing only in details of coloring (which might even be seasonal) are good species". The questionable seasonal color is indicative of the lack of information on these animals. As a matter of fact, all foreign studies and descriptions of *brelichi* were based on a single skin preserved in the British Museum, and there are only a few more *bieti* specimens abroad.

Besides the obvious differences in adult color patterns, the colors of newborn young also differ between the three forms. While *roxellanae* is mainly light grayish brown, *bieti* is pure white and *brelichi* silvery gray.

There are also minor cranial differences between the three forms. Quan and Xie (1981) have pointed out that *brelichi*, as compared with *roxellanae* and *bieti*, has narrower molars, no posterior nasal spine, and an anteriorly arched posterior edge to its palate instead of a medially pointed one. The shape of the muzzle is also quite different, that of *brelichi* being much less swollen than that of *roxellanae*. Furthermore, *brelichi* has a relatively much longer tail compared to its body length. The tail lengths of two adult male specimens preserved in Beijing and Guizhou are 905 mm and 846 mm, as against the head-body lengths of 637 mm and 690 mm (the skin of the type specimen preserved in the British museum measured 970 mm and 730 mm respectively, obviously stretched). On the other hand, the tail lengths of both *roxellanae* and *bieti* are generally shorter than their head-body lengths. The type specimen of *roxellanae*, an adult male

preserved in Paris, had a tail length of 610 mm and a head-body length of 710 mm. Dimensions of an old male and an adult male of *bieti* were given by Milne-Edwards as follows: tail lengths 720 mm and 680 mm, head-body lengths 820 mm and 830 mm.

Allen (1938) was mistaken when he described *brelichi* as "apparently attaining a larger size than either of the two other species of the genus and hence the largest living species outside the anthropoids". His assumption must have been based on the stretched skin of the female type specimen. Actually, neither *brelichi* nor *bieti* ever attain the size of *roxellanae*. The head-body length of the two *brelichi* specimens quoted above was not greater than the average length of *roxellanae* and neither were their weights, the old male, sick and lean, weighing 13.25 kg, and the adult male 15.75 kg. A male *bieti* shot by Yunnan scientists in November, 1979, measured 640 mm (head-body) and 455 mm (tail) and weighed about 15 kg. On the other hand, big male *roxellanae* often weigh more than 20 kg. A particularly big male shot at Beichuan county, northern Sichuan, in 1974, weighed 35 kg. An even bigger one, with a weight of 39 kg, has been reported from Shen-nong-jia, in western Hubei.

The Chinese name is black or Yunnan golden monkey for *bieti*, gray or Guizhou golden monkey for *brelichi*, and Sichuan golden monkey for *roxellanae*. I think the first two names are misnomers because they have no golden hairs at all. They should be called the Yunnan and Guizhou snub-nosed monkeys instead.

The local name for *bieti* is "xue-hou", or snow monkey. This chiefly refers to its habit of playing on snow-covered ground in the winter. The Tibetan name "zhijie" or white monkey must refer to the color of the infant. The local name for *brelichi* is "niu-wei-hou", or ox-tailed monkey, apparently based on the shape of its tail.

Concerning the present status of the Chinese golden monkeys, *roxellanae* (Fig. 4) is of course much more widely distributed and much more abundant than the other two subspecies. According to the *Sichuan Fauna* published in 1980, *roxellanae* is found



Fig. 4: A pair of Sichuan golden monkeys (*Rhinopithecus r. roxellanae*) with infant (photo by Li Shuzhong).

in 16 counties in western Sichuan, south to Luding (30° N) and north to Nanping (33° N) and Qingchuan on the Sichuan-Gansu border. Across the border, it is found at Wenxian and Wudu counties in the southern-most part of Gansu. To the east, it inhabits the Qinling mountains in 5 counties (Foping, Zhouzhi, Ningshaan, Taibai, Yangxian) in Shaanxi province. Several hundred kilometers to the southeast of this area, it is found again in the forests of Shen-nong-jia, on the Hubei-Sichuan border. Its whole range therefore forms a semi-circle around the northern half of Sichuan where no forests exist. The Shen-nong-jia monkey was discovered only in recent years. In an article describing this monkey, Pan Zhenya (1983) has pointed out that in view of its larger size and color variations, there is the possibility of naming a separate subspecies within the *roxellanae* group.

During the 1983 meeting of the Chinese Mammalogist Society, the total population of *roxellanae* in Sichuan province alone was estimated at no less than 10,000. A single county, Wenchuan (where Wolong Nature Reserve is located) may have more than 2,000 according to Prof. Hu Jinchu, the renowned giant panda specialist. According to him, even a single group may include more than 500 individuals.

The population is much smaller in Gansu province, since it occurs only in one nature reserve, Bai-shui-jiang Reserve, across two counties. An investigation conducted in 1974 found only two groups numbering about 80 animals. The monkeys here suffered a heavy blow during the Great Leap Forward Movement in 1958, when a people's commune developed a so called "golden monkey farming project". Several thousand commune members were mobilized to encircle the mountain forest where the monkeys live. By tightening up the cordon, all monkeys big and small, numbering several hundred, were driven into a vast stockade known as the "breeding farm of golden monkeys". According to the original scheme, the monkeys would live and multiply here under human supervision and the goal of 3,000 would be reached by the year 1967. However, owing to the lack of food, space, and scientific management, serious internal fighting and the outbreak of epidemics, the outcome can be imagined. The population diminished rapidly until the farm was forced to close down.

A similar tragedy occurred almost simultaneously in the neighboring province of Shaanxi. According to statistics compiled by Gao Fengchi of the Xian Zoo, three roundups for golden monkeys were held in Zhouzhi county. The first took place in December, 1958. Approximately 200 golden monkeys were captured for export purposes. One hundred and eighty died within two weeks, a loss of 90%. The second roundup took place in January, 1971, when 65 individuals were captured, of which 28 died within the first 2 weeks, a loss of 43%. The third roundup took place in January, 1979, when the golden monkey had already been made a first class protected animal. Altogether, 111 were captured and 16 (or 15%) died within 2 weeks. The authorities didn't appreciate the progress and gave the zoo leaders due punishment.

According to Chen Fuguan *et al.* (1982), the total *roxellanae* population in Shaanxi province, estimated at around 3,400, was divided among the counties as follows: Zhouzhi — 1,000, Ningshaan — 773, Foping — 352, Taibai — 600, Yangxian — 675.

No survey has been made of the golden monkeys at Shen-nong-jia, so their actual number is unknown. Nevertheless, the situation there is largely the same as elsewhere. During the early

1960's, when a forestry station opened, troops of monkey from several dozen up to 300-400 were apparently encountered. Then followed a period of deforestation and unrestricted hunting. At one point, 65 commune members engaged in a three day roundup. Live monkeys were sold to zoos and skins sold to retail stores. Four poachers captured 11 live monkeys in December, 1981. They sold four to the Chongqing Zoo, three to the Shanghai Zoo, with the remaining four confiscated and the poachers detained before a deal was made with the Chengdu Zoo.

Despite all these adversities, *roxellanae* in China is still not an endangered animal. It is fairly numerous and is also a fecund animal, so the population is on the increase. Furthermore, protective measures have become more rigorous and instances of punishment have been reported since 1982. It is also fortunate that the golden monkey shares the same range as the giant panda in Sichuan, Gansu and Shaanxi, and can profit from the protection provided by the nature reserves created for the pandas.

The situation is much more precarious for *bieti*, one of the rarest monkeys in the world. Zoologists from Yunnan province disclosed in the 1983 mammalogist meeting that up to now there is no nature reserve nor any protective measures for this subspecies.

R. r. bieti has a much smaller range than *roxellanae*, and occurs only in a narrow strip of land in northwestern Yunnan bounded by the Jinshajiang (upper Yangtze River) on the east and the Lancangjiang (Mekong River) on the west. The monkey inhabits the high mountain ranges (primarily the Yunling Mountain range) from Yunlong (26° N) north to Mangkang (31° N) in Tibet. Deqin county (28° 50' N, 99° E) is the center of distribution for this species. Seven specimens were collected there for the Paris Museum in 1897, and eight skins were obtained by Chinese zoologists in 1962. Most recently the Kunming Institute of Zoology sent a group of four field workers to Deqin in November, 1979, and succeeded in collecting four specimens at an altitude of 3,600 m on the Baima-xue-shan (White Horse Snow Mountain).

According to Yang Dehua *et al.* (1981), the population of *bieti* in the forests on the eastern slope of Baima-xue-shan numbered more than 800 in the early 1960's. Until then, this forbidden mountain area was still relatively isolated and undisturbed. Groups of over 100 were often met by the natives, who did not molest them out of respect for their close kinship. However, following the "Cultural Revolution", this tradition did not continue with the younger generation. Investigations indicate that 32 monkeys were killed in this area in 1978, 36 in 1979, 25 in 1980 and 27 in the first half of 1981, altogether 139 killed in a period of three and a half years. Similar hunting pressure exists in other parts of the subspecies' range, as commercial agents continue to purchase their pelts and bones for medicine.

The total population of *bieti* has been variously estimated at between 200 and 400, a very endangered primate by any measure.

This is one of the very few animals that has not yet been exhibited alive anywhere.

R. r. brelichi is less threatened than *bieti*, having a larger and better protected population. Quan and Xie (1981) gave an estimate of "more than 200" in their paper published in December. Writing for the *Nature Quarterly*, Tang Xiyang (1982) said he was informed during his visit to the Fanjingshan Nature Reserve during that year that the "most recent survey" put the estimate at 300-500. Then, during the 1983 mammalogist meeting, Xie Jiahua of the Guizhou Teachers College disclosed that surveys



Fig. 5: A pair of *Rhinopithecus r. brelichi* from Guizhou Province, with hybrid of *R. r. roxellanae* and *R. r. brelichi* (photo by Wang Zhefu).

made in 1981-1983 had discovered altogether 8 groups of *brelichi*, totalling 450-500 animals. He added that the total population in the area could be as high as 2,000-3,000, considering that there must be groups that were not encountered during the surveys.

Historically, Fanjingshan was a sacred mountain for pilgrims, which forbid the killing of wildlife, including *brelichi*. Except for a few sporadic cases, there are no records of hunting parties organized against the monkey. The recorded cases show that four were killed in 1962, one trapped in 1964, one caught alive in 1967, one killed in 1969, one caught alive in 1970, two killed in 1975, and three trapped in 1977. The trapped animals were caught in traps meant for other animals such as wild pigs. The killed or captured animals were crop raiders which had come down to the valley villages, since there are no villages on the mountain.

The animals caught alive in 1967 (a female) and 1970 (a male) were donated to the Beijing Zoo (Fig. 5). They were kept in an isolation ward for several years without being exhibited. The female mated with a *roxellanae* in 1969 and gave birth to a hybrid in March, 1970. The male arrived from Guizhou in June, 1970, three months before the female died of overfeeding. During these three months they mated many times but unsuccessfully, probably because the male was weak and old. The male died of old age in January, 1974. All this happened during the so called "Cultural Revolution", and no one cared to exhibit these rare animals, never previously kept in a zoo, to the public.

There have been no more captures since Fanjingshan was made a 38,000 ha nature reserve in 1978. Tang (1982) reported that the reserve administration is doing a good job preserving the virgin forests intact and the majority of the *brelichi* population is young or subadult, a hopeful sign. His guide twice met a large group composed of 100-200 individuals and four times encountered smaller groups of 8 individuals each. He confirmed the observation that most of the monkeys were young or subadults. Tang added that the provincial authorities were right to decide not to build highways in the reserve and not to open it to tourism.

The following is a review of information on the ecology of the golden monkeys. *R. r. bieti* has been observed living in much smaller groups than *roxellanae*. A typical group encountered by Li Zhixiang *et al.* (1981) during November, 1979, while camped 3,800 m up a snow covered mountain where temperatures ranged from -25.4°C to -27°C , consisted of 23 individuals. This

group was composed of 3 adult males, 7 adult females, 9 subadults and 4 infants. The infants were believed to have been born in July or August, indicating a more or less fixed breeding season.

Yang Dehua and Mu Wenwei (1981) reported that summer feeding hours for *bieti* begin between 5.30-6.00 and continue until 9.00-9.30, gradually slow down between 10.00-10.30, then resume again until 11.00-11.30, when there is a 3½ to 5 hour rest period followed by another active feeding period which ends between 19.30-20.30. Feeding activities begin later and noon siestas are shorter on overcast days. Most of the monkeys rest on the ground in the shade and a few rest in trees. Yang *et al.* also explained that these monkeys inhabit such high altitudes (3,400-4,000 m.) because their favored foods are restricted to the coniferous forest belt between these altitudes. They are particularly fond of *Usea longissima*, a species of lichen which grows on pine trees, and after that favor tender fir twigs and pine needles. In another article, Mu Wenwei and Yang Dehua (1982) said *bieti* can find sufficient food in the coniferous forests even in mid-winter, and therefore does not need to move lower down. In analyzing the contents of their excreta, Mu *et al.* found no animal substance of any kind but only undigested remnants of pine and fir needles, and therefore concluded that *bieti*'s diet is simpler than that of *roxellanae*. In this connection, Li Zhixiang *et al.* (1981) observed that *bieti* is the only monkey that eats conifer greens as a diet staple.

In contrast to Li Zhixiang's assertion that *bieti* is a typical arboreal animal and that it takes to the trees in flight, Yang Dehua (1984) pointed out the *bieti* is morphologically unlike the gibbons and colobines and can move quadrupedally on the ground with ease. He stated that not only do *bieti* choose to rest on the ground during the siesta hours, but they prefer to escape on the ground when approached by hunters. When dogs accompany the hunters, the able-bodied monkeys will run away as usual, and the old and the females with young will take shelter in tall trees. Yang Dehua, therefore, proposed that *bieti* and *roxellanae*, both morphologically and behaviorally, are not typical arboreal species but semi-terrestrial animals like the macaques.

The *brelichi* subspecies lives in a lower, warmer climate than *bieti*, where broad-leaf vegetation dominates instead of conifers. Quan and Xie (1981) describe 10 encounters with *brelichi* between 1960-1981, and these range in altitude from 500 m in an evergreen broad-leaf forest to 2,570 m in a deciduous broad-leaf mixed forest. Most frequently, they encountered *brelichi* between 1,400-1,800 m, but seasonal changes in climate and food availability often force groups to move up and down, though not in a migration pattern. The territory for each group varies from 4 km² to 13 km², according to the size of the group.

Both Quan and Xie (1981) and Tang (1982) describe *brelichi* as an arboreal animal, feeding, resting, playing and sleeping in tall trees, rarely coming down to drink. Tang reports it can swing along the branches in a brachiation style similar to the gibbon and almost as fast, but it avoids water and will not cross creeks 10 m wide. Quan and Xie describe the monkeys as unafraid of men ("they wouldn't run away even when men come to as near as a few dozen meters away"). Young monkeys may even keep at a distance of 10 meters or so and peep through the branches."

R. r. brelichi has a more varied diet, which includes many kinds of leaves, buds, fruits, tender bark, insects and small invertebrates. They are particularly fond of these last items, as confirmed by keepers at the Beijing Zoo, where two *brelichi* from Guizhou

stayed for several years. From the food items offered daily, these monkeys almost always chose animal foods (such as crickets, locusts, mealworms) first. Occasionally they would catch, with speed and accuracy, dragonflies or grasshoppers that entered their cages.

R. r. brechili is not as resistant to extremes in weather as the other two subspecies of golden monkey. On cold windy days, they prefer to stay in their dens, where the temperature remains between 5°-12° C. During the summer they also avoid strong sunlight and take shelter in the shade.

The ecology and social structure of *R. r. roxellanae* does not seem to differ greatly between areas, even though the subspecies is widely distributed. Studies by Shi Dongchou *et al.* (1983) on the Sichuan groups, Gao Fengchi (Xian Zoo) on the Shaanxi groups and Pan Zhenya (1983) on the Shen-nong-jia groups, have resulted in similar observations.

Shi Dongchou *et al.*, working in the Baihe Natural Reserve (Nanping county, Sichuan) in 1978-1979, found *roxellanae* ranges in altitude from 1,500 m-3,400 m but spends most of its time between 2,800 m-3,200 m. At different altitudes the monkeys occupied coniferous forests as well as coniferous, broad-leaf mixed forests. The climatic conditions in this area are as follows: cold months October-March (mean temperature for January, -5° C); warm months June-August (mean temperature for August, 16° C); annual rainfall, 1,300 mm.

Shi *et al.* (1982) denied reports that the *roxellanae* in Sichuan, Gansu and Shaanxi "move down to the mixed forest when snow covers the heights in winter, and return to the coniferous forests again when snow is melted in the summer." According to their observations, the golden monkeys in this area do not seasonally migrate because of the cold, but "stay in the coniferous forest at 2,800-3,400 m in the winter or during the breeding season." They did, however, descend "for one or two weeks in March or April when the plants begin to sprout at the low altitude. Then they would return to their coniferous abode above 3,000 m again." They also move to lower altitudes during September and October, when most of the shrubs are in berry for about a month. There can be a third descent in mid or late November when, with the first snow of the season and the sudden drop in temperature, they may move down to altitudes of around 2,000 m for less than a week's time before returning to the higher altitudes for the rest of winter. The coniferous trees in this high zone are generally 20-30 m tall, and dense enough to provide shelter from heavy snow or rain. The temperature inside the forest is often 11°-12° C, higher than outside during the snowy season; it was 3.5° C inside the forest and -8° C outside on 28 November, 1978.

The daily activity period of *R. r. roxellanae* varies with the weather, but is generally defined by sunrise and sunset. Thus, from July to August the group is often active from 6.00-20.30 or 21.00, while in December and January activity does not begin until 8.00-8.30 and lasts until 17.00.

Usually *roxellanae* groups move 1,000-1,500 m or occasionally 1,500-2,000 m per day, larger groups tending to move more slowly. When fleeing from enemies, however, they can cover 35-40 km in one day. Natural enemies here include leopards, brown bears, yellow-throated martens and falcons, but these predators do not threaten the survival of the species.

Gao Fengchi has reported on the conditions of *roxellanae* in the Qinling Mountains in Shaanxi. Here he found the monkeys from 1,200 m in mixed forest up to 3,000 m in sub-alpine con-

iferous forests. Climatic conditions recorded at 2,600 m are as follows: highest temperature 29.7° C; lowest temperature -19° C; January mean temperature -5.4° C; July mean temperature 17.8° C; annual mean temperature 6.4° C; annual rainfall 1001.7 mm; snow accumulation 250 mm; frost days 184.

The report confirmed the view that golden monkeys often come to the ground, not only to play and interact but also to feed. Gao Fengchi found that they are fond of eating tender grasses under the trees. A group of 150 monkeys, feeding on grasses on a slope at 2,850 m above sea level in Zhouzhi county, was filmed by the Xian Studio on 19 January, 1979. The animals were then surrounded by crowds of people on three sides and forced to flee downhill out of the forest belt into an ambush where more than 100 were captured on the ground.

R. r. roxellanae eat tender twigs, buds, leaves, flowers, grasses, roots and bamboo shoots in spring and summer, and different kinds of nuts, berries, barks and leaves in autumn and winter.

In Qinling, group size was found to vary from several dozen to a few hundred animals. Each group has a monkey "king" who leads the travelling group and selects feeding sites, and a number of "assistants" that act as sentries. These "assistants" usually post themselves 30-40 m from the feeding group and are the first to give an alarm call at the approach of danger. Upon receiving the alarm signal, the "king" jumps to the top of a tall tree, looks around, and then issues an order for retreat. The whole group follows him, quickly running away. The groups have no well defined core area, but each group has a territorial range of roughly 10-20 km², depending on the size of the group.

Golden monkeys in the Shen-nong-jia region range between 1,100 m-2,400 m in altitude, from the lower mixed forest belt to the higher coniferous forest belt. Their natural enemies include leopards, clouded leopards, black bears and lesser pandas. Leopards and bears hunt monkeys alone, but lesser pandas, according to Pan Zhenya (1983), usually attack in small groups of 3-5 animals.

Qi Jingfin (1980, 1982) has reported on the breeding of *roxellanae* in captivity at the Beijing Zoo. Between 1964-1981, a total of 8 females were impregnated 17 times; eight of these resulted in abortions or stillbirths, but the remaining nine produced normal births. Golden monkeys display sexual behavior throughout the year, but most copulations occurred from August to October and births resulted in March to May (five of the nine births took place in April). Gestation ranged from 193 to 203 days. Only single young were born, which weighed on average close to 500 g at birth. Newborn infants were fondled by all members of the family group. Female menstrual cycles ranged from 22 to 30 days. There is no menstruation during lactation, but females were often forced to mate by the males, either in periods of lactation or pregnancy. Copulation usually lasts 1-2 minutes.

Rhesus monkey, *Macaca mulatta* (Zimmermann, 1780)

M. mulatta is the most numerous, widespread and familiar species of monkey in China. In many writings, both ancient and modern, it is known as "mi-hou" (macaque), or "heng-he-hou" (monkey from the Ganges). Chinese zoological gardens more commonly refer to it as "Guangxi-hou", because most exhibit animals came from the province of Guangxi (Fig. 6). However, within the species' own range it is better known as "huang-hou" (yellow monkey). Since the hairs on its lower back are golden yellow, people in Guangxi and Guangdong often also call it the



Fig. 6: Male rhesus monkey from Guangxi Province (photo by Tan Bangjie).

golden-haired monkey, creating a confusion with *R. r. roxellanae*.

The number of subspecies of *M. mulatta* occurring in China is controversial. Allen (1938) denied the validity of *icheliensis* from Hebei, *brevicaudus* (or *brachyurus*) from Hainan Island, *lasiotis* from Yunnan, *vestitus* from eastern Tibet, *littoralis* from Fujian and *sancti-johannis* from some Guangdong islands. Even though he didn't assert that there is only one subspecies existing in China, he believed that all these names are synonyms of the typical *M. m. mulatta*. It is difficult for me to agree that animals having such a wide range of distribution belong to only a single subspecies. Rhesus from the Qinghai mountains (Fig. 7) are obviously paler and grayer in color, with a much longer winter coat, than rhesus from south China. They also look larger and heavier, although I have no actual figures.

Napier and Napier (1967) list two subspecies of *M. mulatta* for China. Besides the typical *mulatta*, which they say occurs in provinces south of the Yangtze river and also in Sichuan, Hebei and Hainan Island, apparently following the assumption of Allen, they also describe the distribution of *M. m. vestita* (Milne-Edwards, 1892) as Tibet, possibly east to Batang on the Sichuan border. I think it can be safely assumed that the rhesus monkeys living in the southern Qinghai mountains bordering Tibet must also be *M. m. vestita*.

Allen and the Napiers believed that the natural range of the



Fig. 7: Rhesus monkey from Qinghai Province (photo by Tan Bangjie).

rhesus monkey in China "extends from the latitude of the Yangtze Valley southwards", and called the East Tomb population, "a successful introduction". They did not know that historically there were many rhesus living north of the Yellow River in northern Henan, southern Shanxi and southern Hebei, and also at localities to the east of the East Tomb, up to the sea coast of Hebei. They also did not know that isolated populations of rhesus monkeys continue to live in the mountains of a few counties in northern Henan and southern Shanxi. These facts suggest that the isolated population of the East Tomb area is not the outcome of "a successful introduction", but a persistent remnant population of the species' natural distribution.

Wen Huan-ran *et al.* (1981), after painstakingly checking through numerous ancient Chinese books and some county gazettes dating back a thousand years, concluded that rhesus monkeys have been widely distributed over northern China since 3,000 years ago. They once ranged from eastern Gansu, through western Shaanxi, southern and eastern Shanxi, northern Henan, southern and western Hebei, northeastward to eastern Hebei and ended at Chin-wang-dao, the famous seaport. According to Wen, the rhesus monkeys existing in eastern Gansu and western Shaanxi "seemed to be exterminated in the Ming dynasty (400-500 years ago)". Those in the northern section of the Taihang Mountain, on the Shanxi-Hebei border, also disappeared "probably before

the turn of the 20th century". There are remnant populations still living in the southern section of the Taihang, on the Shanxi-Henan border, and Yanshan Mountain, in northeastern Hebei, "but much less in numbers and much reduced in range than old times". According to investigations conducted in 1963 and 1974, groups of *M. mulatta* could still be found in mountain jungles in the vicinity of Jincheng, in southeastern Shanxi, and in Bo-ai and Hui-xian, in northern Henan. The county gazette of Lin-xian, to the north of the above mentioned counties, recorded that "large groups of hundreds of monkeys" inhabited the local mountains in the 18th century. These monkeys were exterminated in the 1920's and 1930's. However, a newspaper report published 8 May, 1984 stated that the provincial government of Henan recently created a "macaque natural reserve" in Jiyuan county (35° 15' N, 112° 55' E, on the Henan-Shanxi border north of the Yellow River) for 15 groups of rhesus, numbering more than 1,160 animals. Other reports said there are also monkeys in the vicinity of Yuanqu and Yangcheng and the Zhongtiao Mountain in southern Shanxi, confirming the fact that *M. mulatta* does exist in the Shanxi-Henan border region north of the Yellow River. This area is not so far from the mountainous regions in southwestern Henan and western Hubei (Shen-nong-jia) where *mulatta* had been known to exist long ago. This enables one to draw a diagonal line on a map from southwestern Yunnan to the East Tomb area of northeastern Hebei via Guizhou, Sichuan, Hubei, Henan and Shanxi, to demarcate the species distribution.

For many years after the downfall of the Manchu dynasty in 1912, there were no reports of the historical "Chihli macaques" of the East Tombs area. From the 1920's to early 1950's it was feared that they might be extinct. However, scientific workers of the Academia Sinica visited this area six times from 1959 to 1976, and discovered some remaining East Hebei rhesus in a few localities in Xinglong county (40° 40' N, 117° 50' E), notably in the mountains of Maoshan and Liulipingshan, both located to the north of the Great Wall and the East Tombs. An estimated 200 animals were living there in the early 1950's. According to these investigators, their population was decreasing. In 1963, a group of 20 animals was sighted. In 1976, local hunters believed that only 4-5 still survived. However, more recent information from a geographer of the Beijing Normal University is less pessimistic. On a visit to Xinglong County in August 1981, this geographer learned that 20-30 monkeys could still be seen in the surrounding mountains. He also saw a three-limbed monkey (injured when trapped by hunters on the Liuliping Mountain in 1975) being kept in the Summer Resort Palace at Chengde. Monkeys existing in counties east of this area, according to old books, were exterminated long ago.

Rhesus monkeys are, of course, found in many other places in China. They are distributed almost all over the province of Guangxi. Wu Mingchuan (1983) estimated the present population at between 36,000-50,000 animals. This number is, however, much smaller than a few decades ago. I recall that when I was collecting wild animals in Guangxi in the early 50's, cartloads of live monkeys, mostly rhesus, could be seen for sale in the open markets almost daily. When I visited Guilin and Liuzhou again in the autumn of 1982, no more than 2-3 dozen were being offered for sale, and all of these were rhesus. According to Quan Guoqiang *et al.* (1981), the Nanning trade center received 16,263 rhesus in 1956-1959. Of these, 12,305 were exported to foreign countries.

Although the rhesus is called "Guangxi" monkey because historically the majority came from that province, the species must be equally well represented in the provinces of Yunnan and Sichuan, especially now since they have been exploited for so long in Guangxi. According to Quan Guoqiang *et al.* (1981), the figure of monkey pelts purchased from Yunnan far exceeded that of Guangxi between 1974-1980; the annual average from Yunnan was 8,690 (6,584-12,727) compared to 1,691 (1,353-2,544) in Guangxi. The seven year figures for Yunnan show an upward trend in contrast to Guangxi's downward trend. It must be pointed out here that Guangxi boasts of the "best" monkey catchers in China, who excel in the tactics of fighting a "war of extermination" against monkeys. Since these catchers had seriously drained their province's monkey resources in the 1950's under the pretext of waging an anti-pest campaign, 16 catching teams were sent to Yunnan, Guangdong, and Guizhou in 1960 to help train the local hunters to catch monkeys. The results were often devastatingly successful. According to Liu Zhenhe *et al.* (1981), Guangdong had more than 30,000 rhesus before 1960, two thirds of them on Hainan Island. Guangxi catchers succeeded in rounding up more than 10,000 in western Hainan in 1960-61. The present populations are estimated at 2,000-3,000 in northern Guangdong and about 4,000 on Hainan. Chinese mammalogists continue to believe this animal on Hainan to be a valid and distinctive subspecies, *M. m. brevicaudus*.

Liu's report, however, did not include two other localities in Guangdong where *mulatta* also occurs. The first of these is a group of islands known as the Dawanshan Islands located in the mouth of the Pearl River. As early as 1866, Swinhoe named a young monkey taken from one of these islands "Inuus sancti-johannis", but this later proved to be a synonym of *M. m. mulatta*. Investigations conducted by Chinese scientists in the spring of 1981 have ascertained that more than 30 groups, totalling nearly 1,000 animals, are living on four of these islands. The second locality is the 800 km² New Territory in Hong Kong. Field surveys conducted by Southwick and Southwick in 1980-1981 discovered 3 mixed groups of macaques (*M. mulatta*, *M. fascicularis*, and *M. fuscata*) in this area. Out of a total of 113 macaques, 65 were rhesus. The origin of these monkeys is unknown. Excluding the Japanese macaque, they could either be remnants of a natural population or releases from captivity more than 50 years ago. In view of the proximity of this area to the Dawanshan Islands, the first suggestion seems more likely.

Below is a brief survey of the rhesus monkeys in other Chinese provinces. In Sichuan, the *Sichuan Fauna* (1980) reported *M. m. mulatta* present in 74 counties, or more than one-third of the total number of counties in the province. Although the total number of individuals is not known, the low annual purchasing quota of only a few hundred per year certainly does not reflect a great abundance.

In Guizhou province, the *Guizhou Fauna* (1979) reported *M. m. mulatta* present in 23 counties, or less than one-half the total. These counties are located in the northern, northeastern, central and southern parts of the province. Annual catches also amount to a few hundred.

In Jiangxi province, *M. m. mulatta* is found in a few counties (Xinfeng, Anyuan, Huichang) in the south near Guangdong, and the Wuyi Mountain area across the Jiangxi-Fujian border. Its total population was estimated near 1,000 by Sheng Helin *et al.* (1982). However, two more colonies were discovered quite recently. One

at a "monkey hill" located less than 10 miles south of Jing-gangshan, the famous mountain base of the Chinese Red Army in the 1930's, which has been declared a nature reserve. This group, discovered in 1983, is sympatric with *M. arctoides*. A second colony was found in Fengxingshan, Jing-an County, to the northeast of Nanchang. In May, 1984, eight monkey catchers visited Fengxingshan and captured 76 monkeys, but police intervened and forced them to release all the captured animals.

In Fujian province, the rhesus ranges mainly through the southwestern mountains (chiefly the Meihaushan) and the northern mountains (chiefly the Wuyishan). Nature reserves have existed at both places since the early 1980's. Elliot (1913) named this monkey *Pithecus littoralis*.

In Hunan province, rhesus have been found thinly distributed in two localities. At Xinning, in south Hunan across the Hunan-Guangxi border, a population of some 30-40 animals was found in the Ziyun Mountain Reserve, and 300 km to the north, in northwestern Hunan, another population inhabits the newly-created Zhangjiajie Nature Reserve.

In Shaanxi province, the rhesus is restricted to a few counties (Nanzheng, Xixiang, Zhenba) in the southwest near the Sichuan border. The population in this province is small, with only about 60-70 individuals being recorded in the county of Nanzheng in the spring of 1981.

Rhesus monkeys also inhabit western Zhejiang and southern Anhui, which at a latitude near 119° E may be viewed as the eastern limit of the species.

By the end of October, 1983, two nature reserves (out of a total of 134 in China) had been created for the rhesus monkey. One of these is the Nanwan Nature Reserve in Lingshui county, southeast Hainan Island. It is a small peninsula about 15 km in length and 1 km in width, with a total area of 933 ha, rich in tropical vegetation and wild fruits. When it was established in 1976, only a few dozen rhesus were left. By reasonable management and regular feeding, the population had grown to 600-700 in the spring of 1983, and more than 100 have been supplied to scientific and medical institutions. The second reserve is the Pearl River Mouth Macaque Nature Reserve, established in February, 1982. This reserve is composed of four islands with a total area of 5,200 ha, and has no or very few human inhabitants. Before the establishment of the nature reserve, the local farmers, fishermen and garrison soldiers hunted considerably and carried out "pest control", killing over 1,000 monkeys in the 30 years before 1982. It is believed that if hunting and timber felling can now be restricted effectively within the reserve, the monkeys will multiply quickly in the favorable natural conditions.

Assamese Macaque, *Macaca assamensis* (McClelland, 1839)

According to Allen (1938), "the first definite record of [*M. assamensis*] for China is based on the three specimens secured by Dr. R. C. Andrews on the Namting River on March 3, 4, 1917." Allen thought this species occurred in western Yunnan only. Actually its range is much wider, though not to be compared with that of *M. mulatta*.

According to Li Zhixiang and Lin Zhengyu (1983), the Assamese macaque in Yunnan has two subspecies: a southern subspecies, *M. a. coolidgei* (Osgood), occurs in Xishuangbanna and several other counties (Luchun, Pingbian, Yingjiang, Longling, Menglian) in southern and southwestern Yunnan, and a northern subspecies, *M. a. assamensis*, from Gongshan, is found

near the Tibetan border, and from Lijiang, near the Yangtze River bend. It is therefore distributed in an area between 22° N and 28° N in that province.

In Guangxi province, it is found in several southwestern counties (Longzhou, Ningming, Chongzuo, Daxin, Jingxi, Napo, Debao) and a few northern counties (Tian-e, Huanjiang). Shen Lantian (1978) said it is also found in the Daming Mountain, northwest of Nanning. Many of these ranges overlap with those of *M. mulatta* and *M. arctoides*. In Guizhou province, it is known to occur in a single county, Jiangkou, in the northeastern part of the province near Hunan.

Wu Mingchuan (1983) estimated the *M. assamensis* population in Guangxi at between 3,000-5,000, concentrated in the counties of Tian-e and Huanjiang. According to Shen Lantian (1978), it is particularly numerous in a 68 km² area of limestone hill jungles between Longzhou and Ningming, near the Sino-Vietnamese border.

Whether *Macaca assamensis pelops* exists in Tibet is not known. However, I think it may be present in areas bordering Nepal, Sikkim and Bhutan.

Differences between the two Yunnan subspecies, according to Li and Lin (1983), are *coolidgei*'s lighter, predominately gray body color, shorter dorsal hairs (50-60 mm) and slender tail, com-



Fig. 8: Pair of *Macaca assamensis* with young from Guangxi Province (photo by Tan Bangjie).

pared to the darker brown color, longer dorsal hairs (90-100 mm) and bushy tail of *assamensis*. The live specimens that I collected from southern Guangxi in the 1950's generally conformed with the description of *coolidgei*.

In Guangxi, the Chinese name for this monkey is "xiong-hou", or bear monkey (Fig. 8). Another name is "baimian-hou", or white-faced monkey, in contrast to *M. arctoides*, the "hongmian-hou", which means red-faced monkey. Unlike *M. mulatta*, which is popular with research scientists as well as the public, *M. assamensis* is seldom used as a laboratory animal or kept as a pet in households, mainly because it is less clever and looks sullen. It therefore sells for a lower price than *M. mulatta*. Nevertheless, it is on the second class protection list in China.

Pig-tailed macaque, *Macaca nemestrina* (Linnaeus, 1766)

Information concerning this species of monkey is very scanty in China, as it has a limited range and small population only in southern Yunnan. A few specimens have been collected from Menglon and Menghai of Xishuangbanna, and the counties of Jinggu and Lincang, north of Xishuangbanna. The specimens were designated as *Macaca nemestrina leonina* (Blyth) by Li Zhixiang and Lin Zhengyu (1983). It has a lighter body color in comparison with *M. n. nemestrina* and *M. n. blythi*. The native name in Yunnan is "pingding-hou", or flat-crowned monkey. It also is on the second class protection list.

Stump-tailed macaque, *Macaca arctoides* (Geoffroy, 1831)

Whether the stump-tailed macaques of southern and southwestern China should be classified as a subspecies of the same species or distinct species has been debated for a long time by scholars studying Chinese primates. The prevailing opinion, with which I heartily agree, is to treat them as two independent species, *Macaca arctoides* and *M. thibetana*.

M. arctoides has been referred to as *Lyssodes speciosus melli* (Matschie) by Allen (1938), *Macaca speciosa arctoides* (Geoffroy) by Ellerman and Morrison-Scott (1951), *M. s. speciosa* (F. Cuvier) by Napier and Napier (1967) and *M. arctoides* by Fooden (1976). Most Chinese authors follow Fooden's nomenclature.

Allen (1938) reported *M. arctoides* as present in northwestern Fujian (Kuaitun, Chungan), northern Guangdong (Linhshan, Lochangho) and Guangxi (Chichin). The actual range is much wider, including parts of Yunnan, Jiangxi and Hunan.

When I was collecting wild animals in Guangxi in 1952 and 1953, it was not difficult to purchase this monkey from the markets at Nanning (Fig. 9). One could buy a few dozen at a time, at prices roughly equivalent to that of the Assamese macaque, which was about $\frac{1}{2}$ to $\frac{1}{4}$ less than the price of a rhesus monkey. All of these *M. arctoides* came from Chongzuo, Longzhou and Daxin counties in southwest Guangxi. Wu Mingchuan (1983) said *M. arctoides* is also found at Tiandong (western Guangxi), Jinxiu (eastern Guangxi) and the Shiwandashan mountains (southern Guangxi), which means that it has a wide range over the southern half of that province. He estimated the present population in Guangxi at between 3,000-4,000 animals.

In Guangdong province, some groups still exist in the northern counties of Yingde, Yangshan and Ruyuan, all located to the west of the Hankow-Canton Railway near the Guangdong-Guangxi border. According to Liu Zhenhe *et al.* (1981), there were 3,000-4,000 *M. arctoides* in this area before the early 1960's; this population has now been reduced to not more than 1,000 animals.



Fig. 9: *Macaca arctoides* (old male) from Guangxi Province (photo by Tan Bangjie).

In southern Hunan, it is present in unknown numbers near the Hunan-Guangdong and Hunan-Guangxi borders in the counties of Yizhang, Xinning, Suining and Guidong.

In Jiangxi province, it is only found in the western mountains near the Jiangxi-Hunan border, notably the Jing-gang-shan and the Wugong-shan. The total population in Jiangxi, of both *arctoides* and *thibetana*, was estimated at around 1,000 by Sheng Helin *et al.* (1982).

In Fujian, *M. arctoides* inhabits mountains both in the northwest (Wuyishan) and southwest (Daimaoshan) of the province. Specimens have been collected from Chung-an, Long-yen, Shanghang and Liancheng.

Lastly, this species is widely distributed in the province of Yunnan. Li Zhixiang *et al.* (1983) collected specimens from Menglun, Xishuangbanna; Pingbian, in southern Yunnan near the Vietnam border; Lincang and Yungde, in western Yunnan at 24° N; Jingdong in the Wuliang mountains, and Xiping and Shuanbai in the Ailao mountains in central Yunnan; and Lushi in the Gaoligong mountains in northwest Yunnan, north of 26° N. Li said the range of this monkey does not extend beyond 27° N. This is true in most of the provinces, with the exception of Wugongshan in western Jiangxi and Wuyishan in northwest Fujian, both of which are located near 28° N.

The Chinese name "duan-wei-hou" or short-tailed monkey ap-

plies to both *M. arctoides* and *M. thibetana*. In Guangdong and Guangxi, *M. arctoides* is distinguished as "hongmian-hou", red-faced monkey, or "ni-hou", which means clay monkey because of its blackish brown hair color.

There are other species of monkeys which are red-faced, but probably none with a shade of red as striking as *arctoides*. However, I must point out that *arctoides*' face is not always red. When young, the face is beige or even whitish-colored; this gradually turns red with age, becoming scarlet during adulthood and finally deepening to crimson or dark purple in old age. The red color is obviously a secondary sex characteristic, as it is most striking during the sexually most active period of the animal's life. In Guangxi, I have also seen a number of adult males with bright red scrota and adult females with red nipples. A few females have one red nipple and one blue nipple.

I have stated that Assamese macaques are rarely used as laboratory animals or kept as pets in China. This is even more true of the red-faced stump-tailed macaque because it is dull and sullen and also has an unpleasant musky odour. It is included on the list of second class protected animals.

Tibetan macaque, *Macaca thibetana* (Milne-Edwards, 1870)

The Chinese Dictionary of Zoology, published in 1922, gave this monkey the ridiculous name of "zang-you-hou", meaning the Tibetan chieftain monkey, which is of course quite impolite to the minority nationality. So, when the first specimen came to our zoo from Sichuan in 1951 and someone asked its name, I replied inadvertently "sichuan-hou", Sichuan monkey, and this became its common name in Chinese literature. Later, I learned from hunters that its native name is "ching-hou" (blue monkey) or "ching-pi-hou" (blue-pelted monkey). Since many Chinese publications call this monkey "duan-wei-hou" (stump-tailed monkey), which includes both *arctoides* and *thibetana*, I suggest naming the former "hongmian duan-wei-hou", the red-faced stump-tailed macaque, and the latter "maomian duan-wei-hou", the hairy-faced stump-tailed macaque.

The reason I use the terms red-faced and hairy-faced to distinguish them is obvious enough. *M. thibetana* usually has a flesh or dirty-grayish colored face which rarely changes color with age. Instead, when approaching adulthood, a grizzled beard grows out from the cheeks and chin, especially on the males, giving the face a very strange look (Fig. 10). The "beard" of the *M. thibetana* in the Huangshan Mountain, Anhui province, is particularly long and rich, and radiates evenly in all directions, which leads me to wonder whether it might be a distinctive race.

The body hairs of *M. thibetana* are also quite different from *M. arctoides*. *M. thibetana* are born light tan and darken with age to a brown or grayish-brown back, the stomach turning grayish white. *M. arctoides* are born creamy white but then darken more drastically to a chocolate-brown or black back and grayish-brown stomach. *M. thibetana* has a denser coat, thick with underfur, and the hair on its crown is not parted medially as in *M. arctoides*. *M. thibetana* is also larger in size. Xiong Chengpei (1984) recorded the measurements of 57 live specimens captured for the Hefei Zoo from the Huangshan area. Of the 57 specimens, one of the heaviest weighed 33.5 kg and two others weighed 27 kg, although the average weight for adults was about 15-16 kg and the average length 733 mm.

This species is widespread in western Sichuan, where it is found



Fig. 10: *Macaca thibetana* female from Sichuan Province (photo by Tan Bangjie).

in 43 counties (Sichuan Fauna, 1980). In Guizhou province, it is also fairly evenly distributed from north to south, being found in the counties of Jiangkou, Suiyang, Zheng-an, Chingzhen, Guiding, Sandu, Xingyi and Zhijin (Guizhou Fauna, 1979). In Yunnan province, it is found only in the northeast, bordering Sichuan to the west and Guizhou to the east. In Guangxi, it is also restricted to the northeast of the province. Wu Mingchuan (1983) said about 1,500 *thibetana* are present in Gongcheng, Xing-an and Tian-e. Shen Lantian (1979) noted their presence in the following additional counties: Ziyaan, Chuanzhou, Longsheng, Lingui, Yangso, Lipu and Youngfu. In Anhui province, it is found in the southeast, including counties such as Chimen, Taiping, Xiuning, Shexian and Yixian, with Huangshan as the center of distribution. In western Hubei, it is sympatric with the rhesus monkey and the golden monkey in the Shen-nong-jia area. In addition, it is found in southern Gansu and eastern Tibet. The stump-tailed macaque inhabiting northeast Jiangxi near the Anhui border could be this species instead of *arctoides*.

Thus it is clear that both *thibetana* and *arctoides* are found in the provinces of Guangxi, Yunnan and Jiangxi, though in different parts. The general tendency is for *thibetana* to be distributed more to the north and west, and *arctoides* more to the south. *M. thibetana* is endemic to China and belongs to the second class protection list.

The populations of *thibetana* on Emei Mountain, Sichuan, and Huangshan Mountain, Anhui, are famous in China. This is mainly because the mountains are sacred to pilgrims as well as popular

with tourists. The Emei monkeys in particular have a long history of association with monks and travellers. The monkeys live around the temples and are usually fed tidbits, similar to the spoiled bears of Yellowstone Park. A press report, published in October, 1982, stated that more than six "monkey incidents" occurred in 1982 on Emei Mountain with travellers being bitten or robbed, especially by three year old and deformed monkeys. One of these deformed animals was hare-lipped, another one-eyed, and a third had only three fingers on its right hand. I think it is reasonable to assume that they must be ex-monkey "kings", dethroned by younger and stronger "new kings", and this accounted for their sour temper. The report advised visitors to bring peanuts or fruit cut in slices and wrapped in paper so they can "throw the food to the monkeys and escape while they are busy snatching the food".

Xiong Chengpei (1984) reported at length on the behavior of the *thibetana* on Mt. Huangshan. These monkeys inhabit deciduous broad-leaf forest and evergreen and deciduous mixed forests between 600-1,500 m in altitude. They migrate seasonally, moving up to elevations above 1,300 m in summer and coming down to 500-600 m in winter. They live in groups of 20-70 animals. Each group maintains a territory within which the group moves in irregular circles under the leadership of its "king". Generally, the various groups respect each other's territory. Unintentional trespassers are scared away, but group invasions lead to battles.

The social ranks within a group are classified by Xiong into four grades: Grade 1, the "king" himself; Grade 2, two to four "runner-up males" serving as "the king's assistants" and a number of favored females with their young. These females spent much of their time courting favors (such as grooming or being groomed) from the "king" and his "assistants", or making trouble (e.g., by seizing food) among innocent monkeys. Grade 3 includes the majority of the group members, who are ordinarily submissive and well-behaved. Grade 4 are the few animals Xiong calls "the insulted"; these are the defeated opponents of the "king", the violators of group discipline, and occasionally a new member from another group.

Sexual maturity is usually reached in the fifth year. The face of the female may then turn reddish at the height of heat. Sexual relations can occur throughout the year, but there is a peak period of activity from late September to early November, when a female may mate as many as 17 times in a day, each copulation generally lasting from 40-60 seconds. Gestation is about 8 months, after which an infant is born weighing near 550 gm and measuring perhaps 319 mm with a 31 mm tail. Babies and their mothers are respected by all members of the group, including the "king". Analysis of 5 groups totalling 114 individuals indicates a sex ratio of 1 female: 1.8 males.

Farmers of the Huangshan commune used to be skillful in capturing *thibetana* alive. They captured more than 100 for the Hefei Zoo in the 1970's, using bait in winter and camouflaged pitfalls 3-5 m long, 2-3 m wide and 1 m deep. Xiong Chengpei (1984), curator of the Hefei Zoo, said his zoo purchased 57 monkeys of mixed ages from these farmers in 1972, 8 in 1974, 32 in 1975 and 16 in 1977. He admitted that the rate of fatalities among the captive monkeys was very high. Our zoo in Beijing received a pair of adults from Hefei in January, 1975. They were extremely nervous and in a constant state of high tension, and lived for only a short period.

Taiwan Macaque, *Macaca cyclopis* (Swinhoe, 1862)

For reasons generally understood, we have not been able to collect much information concerning the only species of monkey indigenous to Taiwan. Naturally, one thing we are deeply concerned about is whether this animal is endangered. Several years ago it was feared that it might already be extinct or on the brink of extinction. Therefore, it gives one a mixed feeling of relief and anxiety to learn from Poirier's report (1984) that *M. cyclopis* are now being trapped at a rate of up to 1,000-2,000 animals per year. This shows that there are some thousands still surviving, but also makes one worry about how long this rate of exploitation can continue.

As far as I know, no Taiwan macaques are presently being kept by any zoo in continental China. Our zoo in Beijing had a colony of over a dozen in the 1940's and early 1950's, which died out before 1960. A similar small group of Taiwan macaques were kept by the Shanghai Zoo. News reports on the capture of an albino female *cyclopis* in 1978 were widely circulated in China and aroused much interest. The Kunming Institute of Zoology even offered to pair its male albino rhesus monkey, captured from northern Yunnan, with this Taiwan female. The offer was unfortunately ignored.

This monkey belongs to the first class on the list of Chinese protected animals.

Of all the endangered animals in China, gibbons deserve the most urgent protection for they are really on the brink of extinction. Each of the three species has fewer than 100-200 representatives in China and they are still threatened by hunting and habitat destruction. Country people believe that the meat and bones of these animals have high medicinal value as a tonic, and people in western Yunnan use it as a cure for epilepsy. For this reason, gibbons have been heavily hunted throughout their range for the past few decades. The gibbons at Longzhou and Jingxi, in southwest Guangxi near the Vietnam border, were exterminated in the 1950's before Chinese zoologists could collect any data.

The only places where gibbons are still to be found in China are in southern and southwestern Yunnan and a few localities on the island of Hainan. They are scarce everywhere, as we shall see below.

White-browed or hoolock gibbon, *Hylobates hoolock* (Harlan, 1834)

Dr. R. C. Andrews collected five specimens of this species from localities near the Namting River, on the Sino-Burmese border, as early as 1917, thus extending its range from Bengal, Assam and upper Burma to the extreme western part of Yunnan province. The Beijing Zoo received a few from this area in the 1950's. Later, the Kunming Institute of Zoology collected some specimens from Yingjiang, Lianghe, Tengchong and Baoshan, all located north of the Namting River and along the Nujiang (Salween) River. Scientists from this institute disclosed at the 1983 Chinese Mammalogist Meeting that this gibbon can still be found in the vicinity of Yingjiang, but not Tengchong, and its total number does not exceed 50. Yang Dehua *et al.* (1982) were told by technical workers of the forest department of Baoshan in February, 1982, that they had failed on three visits to locate any *hoolock* in the forests of Tengchong.

White-handed or lar gibbon, *Hylobates lar* (Linnaeus, 1771)

It was not known that *Hylobates lar* occurred in China until scientists discovered it in the vicinity of Lancang county, north of Xishuangbanna, in the 1970's. Three groups were sighted at that time, but when people returned to survey in 1982, no *lar* were seen and their status is now uncertain. Since gibbons are known to occur in the vicinity of Cangyuan, not far to the north, scientists believe that most likely they are this same species.

Black-crested or black gibbon, *Hylobates concolor* (Harlan, 1826)

As stated earlier, this species has two subspecies, *concolor* and *leucogenys*, distributed over Hainan and Yunnan. Liu Zhenhe *et al.* (1984) disagree with Allen (1938), who identified the Hainan animal as *H. c. concolor*. Liu *et al.* compared the animals from both Hainan and Yunnan, and found that the adult females from Yunnan have blackish areas from the chest to the lower abdomen, unlike those from Hainan. Hence, they decided that the Hainan animal must belong to a different subspecies, which they designated as *H. c. hainanus*, after *Hylobates hainanus* (Thomas, 1892). If this is true, China may have three subspecies of *H. concolor* instead of two.

The typical subspecies, *H. c. concolor*, is found in an area from southern Yunnan (Jiangcheng, Luchun, Yuanyang) on the Sino-Vietnamese border, northward to Ailao Mountain and the Wuliang Mountain in central Yunnan (Xinping, Shuanbai, Jingdong), and westward to Baoshan.

The white-cheeked subspecies, *H. c. leucogenys*, is found only in the Xishuangbanna region, including the following localities near the Lao border: Mengla, Mengpeng, Shangyong, and Longmen.

The Hainan subspecies, if it is valid, was found in 12 counties in the 1950's, but now exists in only two.

As for their numbers, scientists from Yunnan disclosed last year that there are 6-7 groups of *H. c. concolor* in the Wuliangshan and 4 groups in the Ailaoshan. The gibbons often inhabit the same forest as the stump-tailed macaques. More than 1,000 *H. c. leucogenys* were living in the forests of Xishuangbanna in the 1960's; now less than 100 can still be found, all concentrated in the southern part of the region. Yang Dehua *et al.* (1982) said, "living in the hostel in Mengla county in the 1960's, one could clearly hear the distant calling of gibbons in the morning. But not now". The writer has visited Xishuangbanna twice recently and heard no gibbons.

The situation is even more severe on Hainan Island. According to Liu Zhenhe *et al.* (1984), where there were 866,000 ha of forested land occupied by up to 2,000 gibbons in the early 1950's now there are only 200,000 ha of forest left on the whole island. Surveys in the spring of 1983 made it clear that gibbons can only be found in two places on the island; Bawangling Mountain in Changjiang county and Limuling Mountain between the counties of Baisha and Qiongzong. This last mountain is covered with 15,000-20,000 ha of virgin forest inhabited by a total of 30-40 gibbons. No more gibbons can be found in the Wuzhishan (Five-Fingered) Mountains and Jianfengling Mountains, where most of them occurred before 1950. The report states that owing to the inefficient measures of control, poaching still continues against the remnant populations. The Miao hunters living in the mountains are apt to lure the gibbons to within shooting distance by imitating their calls.

An unlikely siamang

A press report in 1983 said a creature believed to be a siamang had been killed by a hunter at Cangyuan county, on the Yunnan-Burmese border, in January, 1980. The only thing left for a group of "scientists" to examine in November, 1982, was a broken foot which was said to be webbed between the second and third toes. It was on this evidence that they identified the creature as a siamang. I doubt it, not only because the locality is far from Sumatra and Malaya, but also because the description given by the hunter was incorrect. The "big creature that seemed half-man, half-beast" was described as having a height of 1.5 m and a weight of 40 kg, both way beyond the size of a siamang. Its large eyes with prominent eyelashes and eyebrows, large flat nose, dark gray body hair, the hair on its head reaching its shoulders, flat belly and thick waist, also do not fit the description of a siamang. Furthermore, the report stated with a mysterious air that the animal was shot riding on the back of a red deer (which does not exist in Yunnan) strolling out of the forest! In a letter to the editor, I expressed my amazement that it was the first time I had ever heard of one wild animal species riding on the back of another outside the circus.

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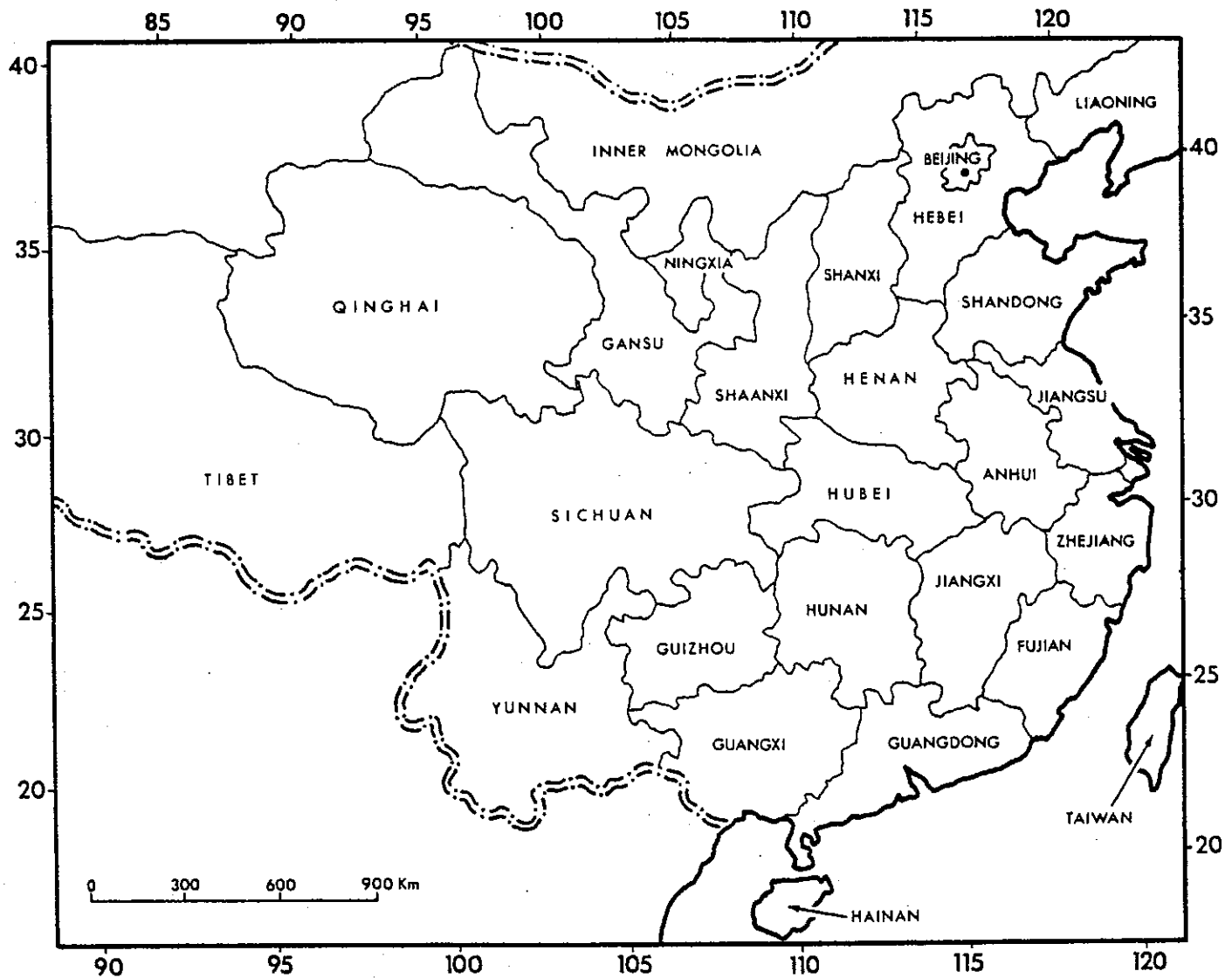


Figure 11. Provinces of China

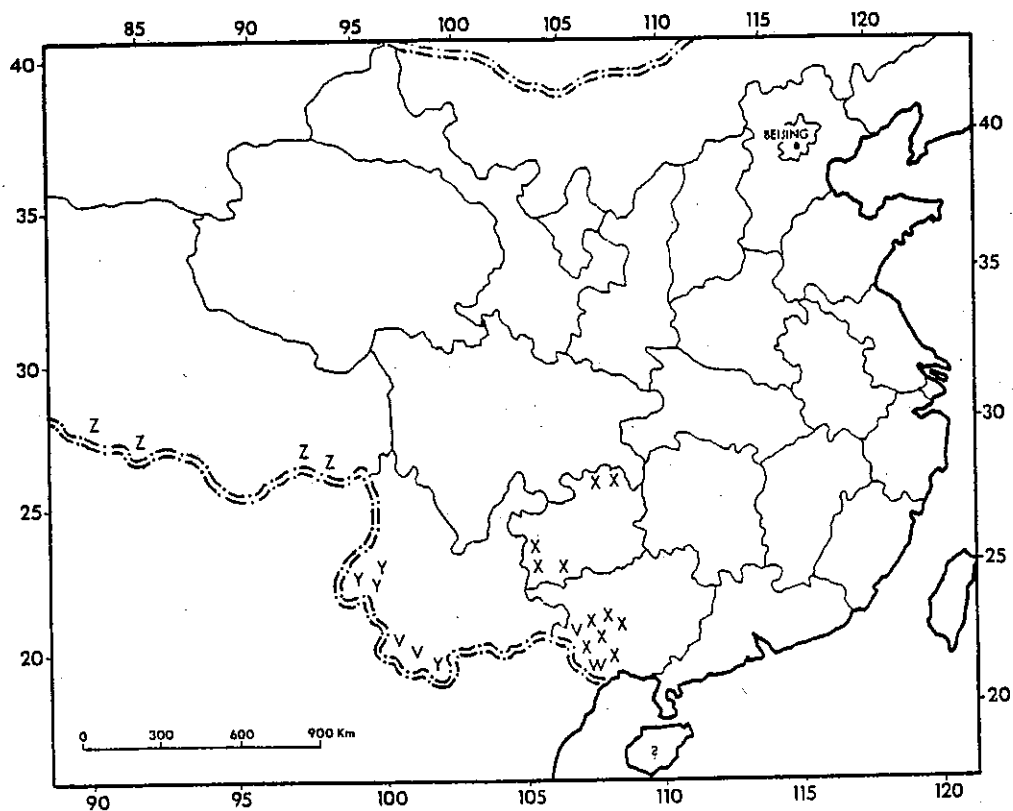


Figure 12. Distribution of the Loris and Langurs in China

Key: V = Slow loris (*Nycticebus c. bengalensis*) Y = Phayre's langur (*P. phayrei crespisculus*)
W = White-headed langur (*Presbytis leucocephalus*) Z = Himalayan langur (*P. entellus lania*)
X = Tonkin langur (*Presbytis francoisi*) ? = Douc langur (*Pygathrix nemaeus*)

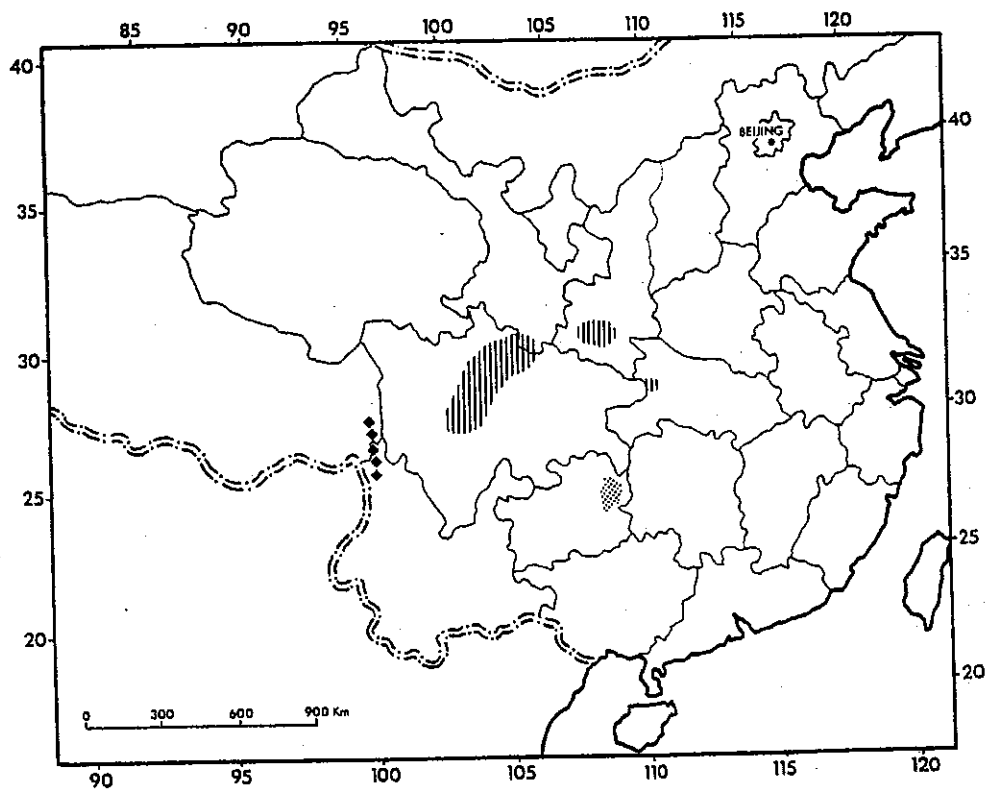


Figure 13. Distribution of Snub-nosed Monkeys in China

Key: Lines = Sichuan golden monkey (*Rhinopithecus roxellanae roxellanae*)
Dots = Guizhou snub-nosed monkey (*R. r. brelichi*)
Diamonds = Yunnan snub-nosed monkey (*R. r. bieti*)

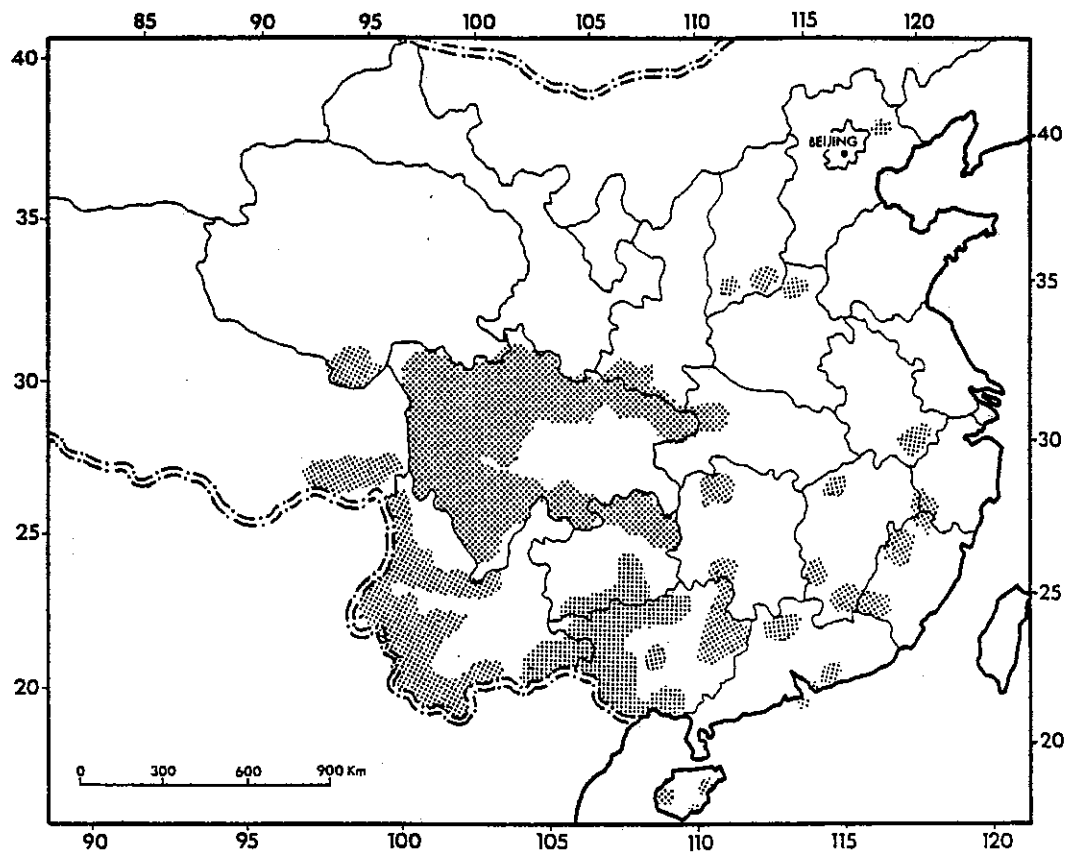


Figure 14. Distribution of the Rhesus Monkey (*Macaca mulatta*) in China.

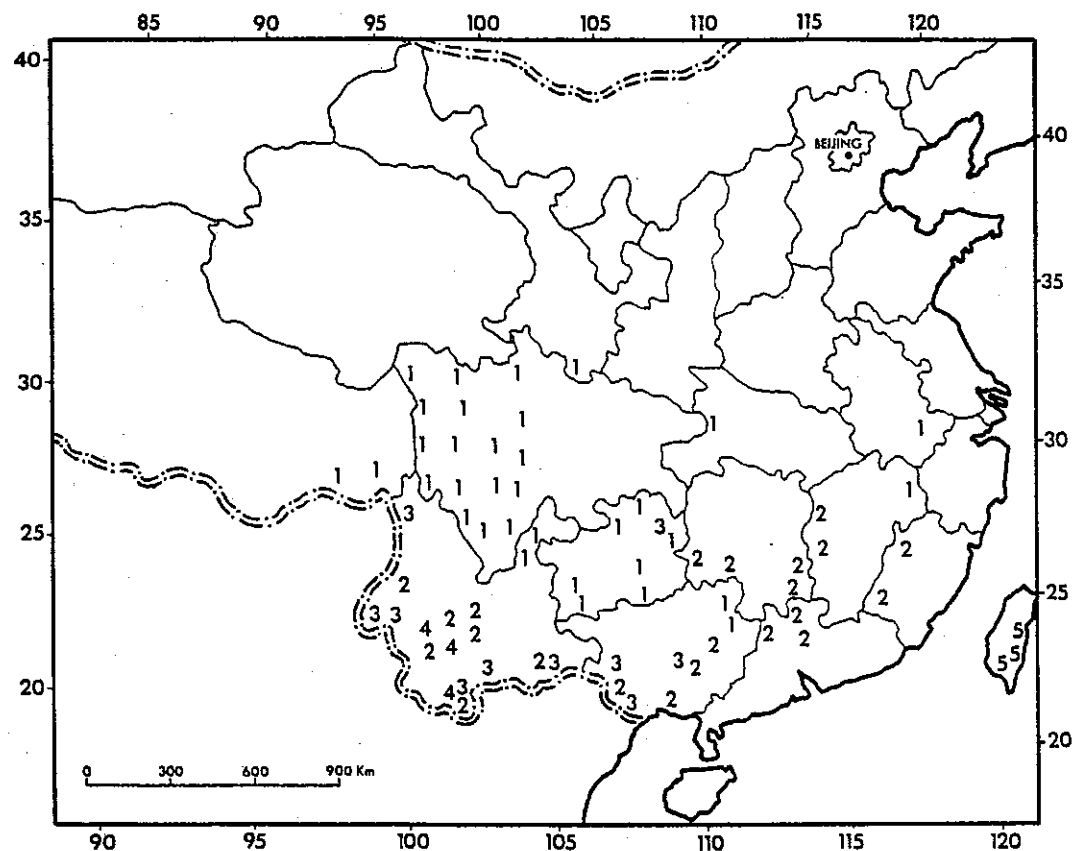


Figure 15. Distribution of Macaques other than Rhesus in China

- | | |
|---|---|
| Key: 1 = Tibetan macaque (<i>Macaca tibetana</i>) | 4 = Pig-tailed macaque (<i>M. nemestrina leonina</i>) |
| 2 = Stump-tailed macaque (<i>M. arctoides</i>) | 5 = Taiwan macaque (<i>M. cyclopis</i>) |
| 3 = Assamese macaque (<i>M. assamensis</i>) | |

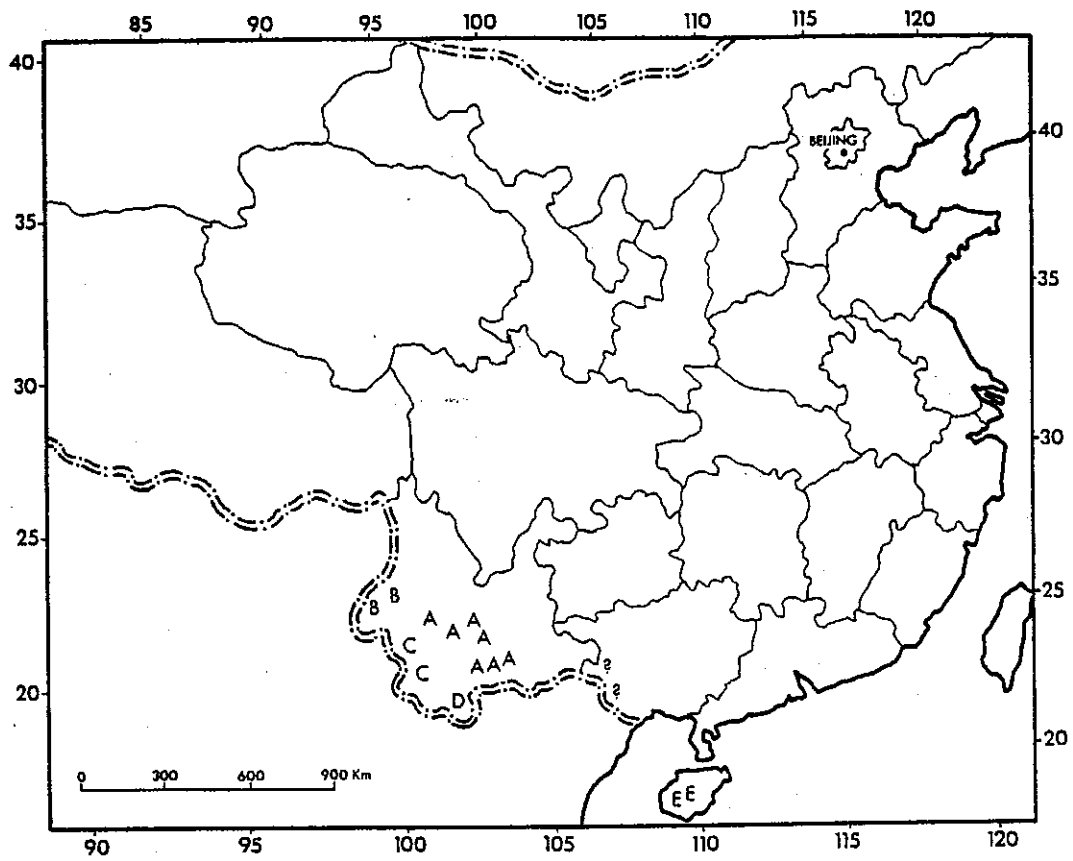


Figure 16. Distribution of Gibbons in China

Key: A = Black-crested gibbon (*Hylobates c. concolor*) D = White-cheeked gibbon (*H. c. leucogenys*)
 B = White-browed gibbon (*H. hoolock*) E = Hainan black gibbon (*H. c. hainanus*)
 C = White-handed gibbon (*H. lar*) ? = exterminated

Captivity

Spider Monkeys In Captivity And In The Wild

Introduction

The spider monkeys (*Ateles* spp.) of Central and South America are among the most attractive and appealing of Neotropical primates and are commonly exhibited in zoos around the world. Since they were relatively easy to obtain in years past, they have been considered common by the zoo community and have rarely received the kind of attention given to animals like the great apes, the golden lion tamarin and the lion-tailed macaque. Nonetheless, the accumulating evidence from a number of field studies and surveys (Klein, 1972; Freese, 1976; Hernandez-Camacho and Cooper, 1976; Neville *et al.*, 1976; Mittermeier and Coimbra-Filho, 1977; van Roosmalen, 1981; Rylands and Mittermeier, 1982; Soini, 1982) indicates that these monkeys may be among the most endangered in the entire Neotropical region. Indeed, it already appears that *Ateles* and *Lagothrix* are the most endangered genera in Amazonia and several Central American populations are in a precarious position as well (Mittermeier *et al.*, in press). These monkeys are much sought after as food items and as pets for local people, they tend to prefer undisturbed habitat and they mature and breed slowly (Eisenberg, 1976), making it difficult for populations to bounce back in the face of exploitation. They are usually the first primates to disappear in disturbed areas and have been eliminated from large areas of primary forest in Amazonia by market hunting (Mittermeier and Coimbra-Filho, 1977; Rylands and Mittermeier, 1982; Soini, 1982). As will be evident from reading this paper, several of the 16 recognized subspecies of *Ateles* should be considered endangered and may in fact already be on the verge of extinction, and there is no doubt that the status of these monkeys in the wild and in captivity requires much more attention than it has received to date.

The captive situation is further complicated by poor understanding of *Ateles* taxonomy. The most recent treatment dates back some 40 years (Kellogg and Goldman, 1944) and is in need of revision, and even this study (which remains very useful) has rarely been used as a guideline for sorting out subspecies for captive breeding programs. Additional confusion has been added by several papers which recognize all *Ateles* to be one species (Hershkovitz, 1969, 1972; Hernandez-Camacho and Cooper, 1976; Wolfheim, 1983), leading some zoo people to believe that any breeding combination of these animals would be appropriate. Although we recognize a number of deficiencies in the Kellogg and Goldman (1944) system and are currently revising it, we still think it is the most appropriate arrangement to use for this genus and follow it in this paper.

As a result of the confusion in *Ateles* taxonomy and the belief that these animals are generally common and not in need of special conservation attention, there has been some inadvertent hybridization in captive *Ateles* groups, reducing the conservation value of

a number of captive colonies. However, we hope to make it clear in this paper that many *Ateles* taxa are in more danger than a number of other primates that have long been the focus of special zoo breeding programs (e.g., lowland gorillas, Bornean orangs), and are worthy of at least as much attention from the zoo world. Furthermore, since many of the countries with wild *Ateles* populations now have bans on primate export, few if any additional animals will be available from the wild in the future and efforts to save this genus in captivity will depend on careful management of existing stock.

To draw attention to the plight of *Ateles* in captivity and in the wild, the WWF-U.S. Primate Program has initiated a special *Ateles* project that will include a number of field studies of these monkeys and a detailed survey of the captive population in the world's zoos. The field aspect of this project will be described in more detail in subsequent issues of *Primate Conservation* and will not be covered here. However, it should be noted that it includes a number of ongoing WWF-supported studies being carried out in Amazonia Peru, Brazil and Columbia, on the Pacific slope of Ecuador and in Belize, and planned studies in Suriname and several other areas (Table 1).

Table 1. Ongoing and Proposed Field Studies of *Ateles* Supported by the WWF-US Primate Program.

Country	Year	Project Title	Investigator
Belize	1983*	Survey of primate populations in southwestern Belize (PAF)	J. Dahl
Brazil	1984-1985	Effects of habitat disturbance on rainforest wildlife in Brazilian Amazonia	A. Johns
Colombia	1985	Distribution and abundance of <i>Ateles</i> and <i>Lagothrix</i> in Colombia (PAF)	T. Deller
Ecuador	1984	Conservation status of <i>Ateles fusciceps</i> in the Reserva Ecologica Cotacachi-Cayapas, northwestern Ecuador	R. Madden
Peru	1984	Environmental determinants of population density on the Peruvian black spider monkey (<i>Ateles paniscus chamek</i>), Peru, (PAF)	M. McFarland
	1984	Synecological study of a primate community in the Pacaya-Samiria National Reserve (PAF)	P. Soini

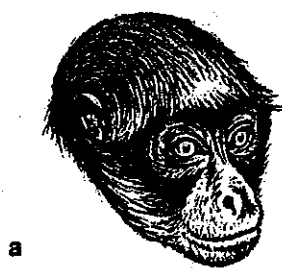
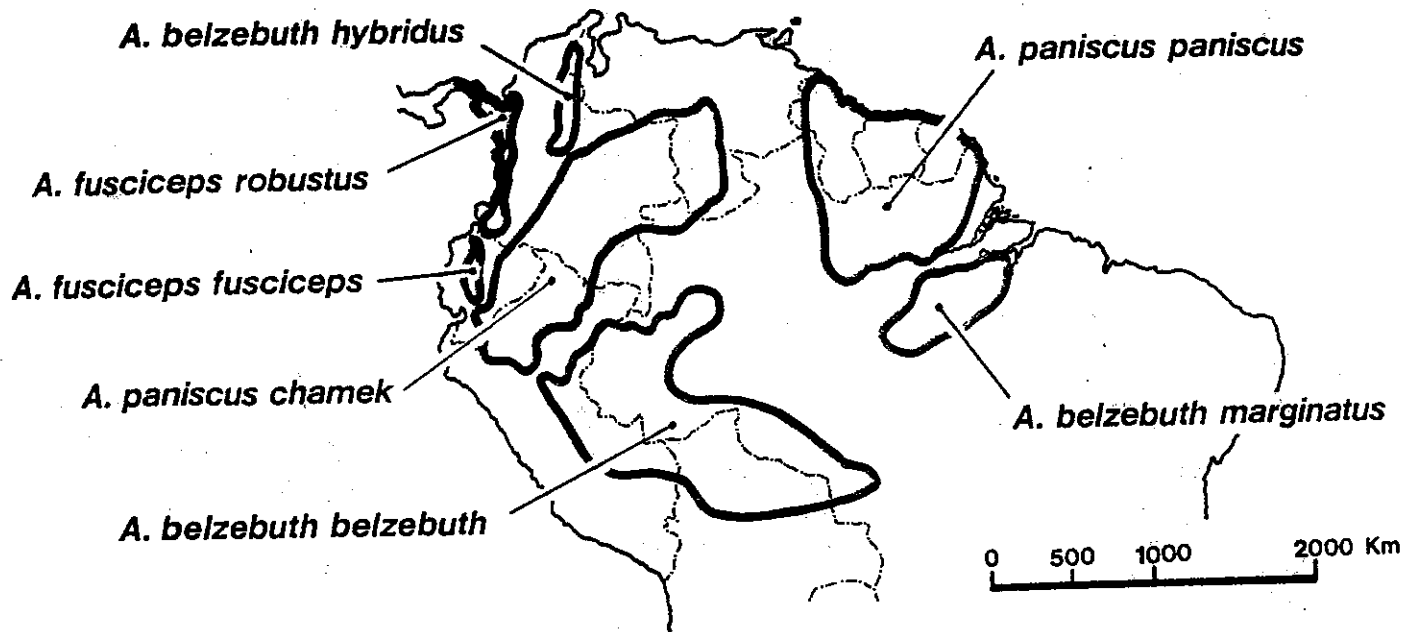
*: The year given is the WWF-US fiscal year of project funding.
PAF = Primate Action Fund.

The main purposes of this article are:

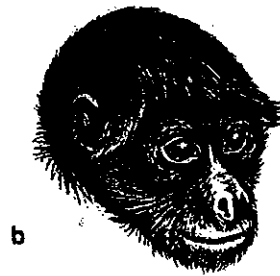
1. to provide an assessment of the current taxonomic situa-

SPIDER MONKEYS OF SOUTH AMERICA

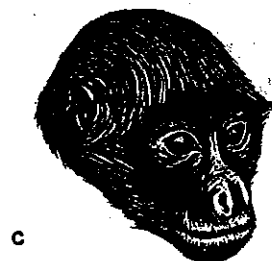
Fig. 1



A. belzebuth hybridus



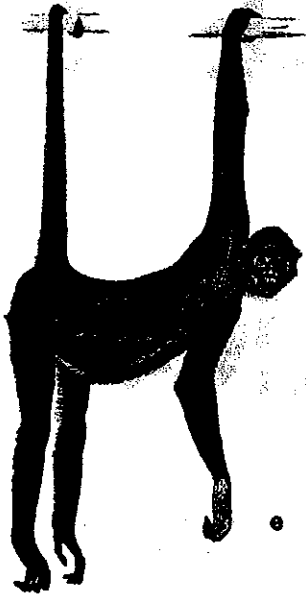
A. fusciceps robustus



A. fusciceps fusciceps



A. paniscus paniscus



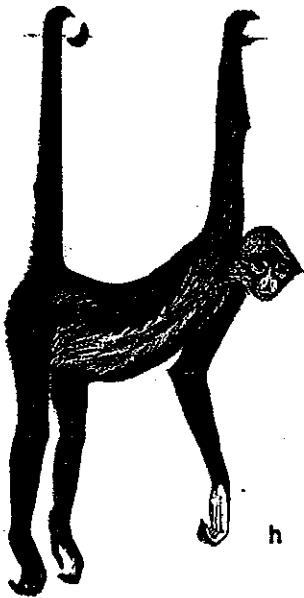
A. fusciceps robustus



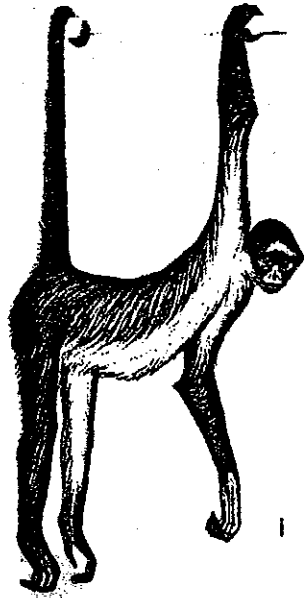
A. paniscus chamek



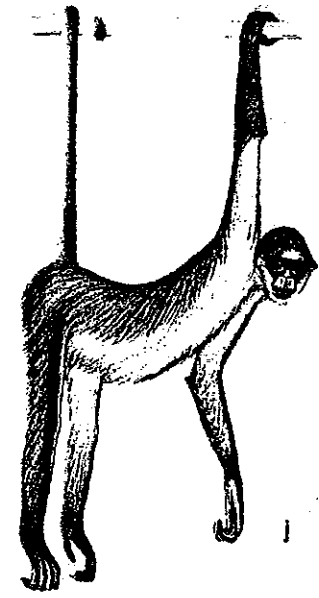
A. paniscus paniscus



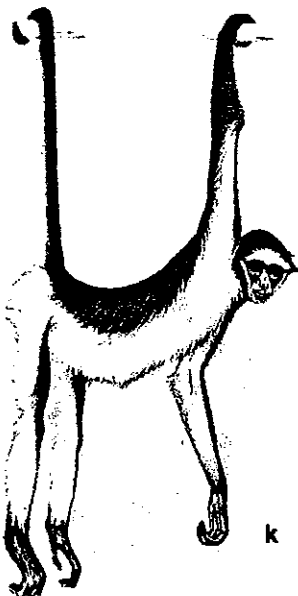
A. fusciceps fusciceps



A. belzebuth hybridus



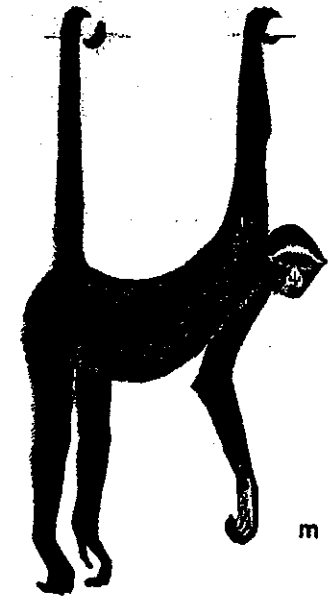
A. belzebuth hybridus



A. belzebuth belzebuth



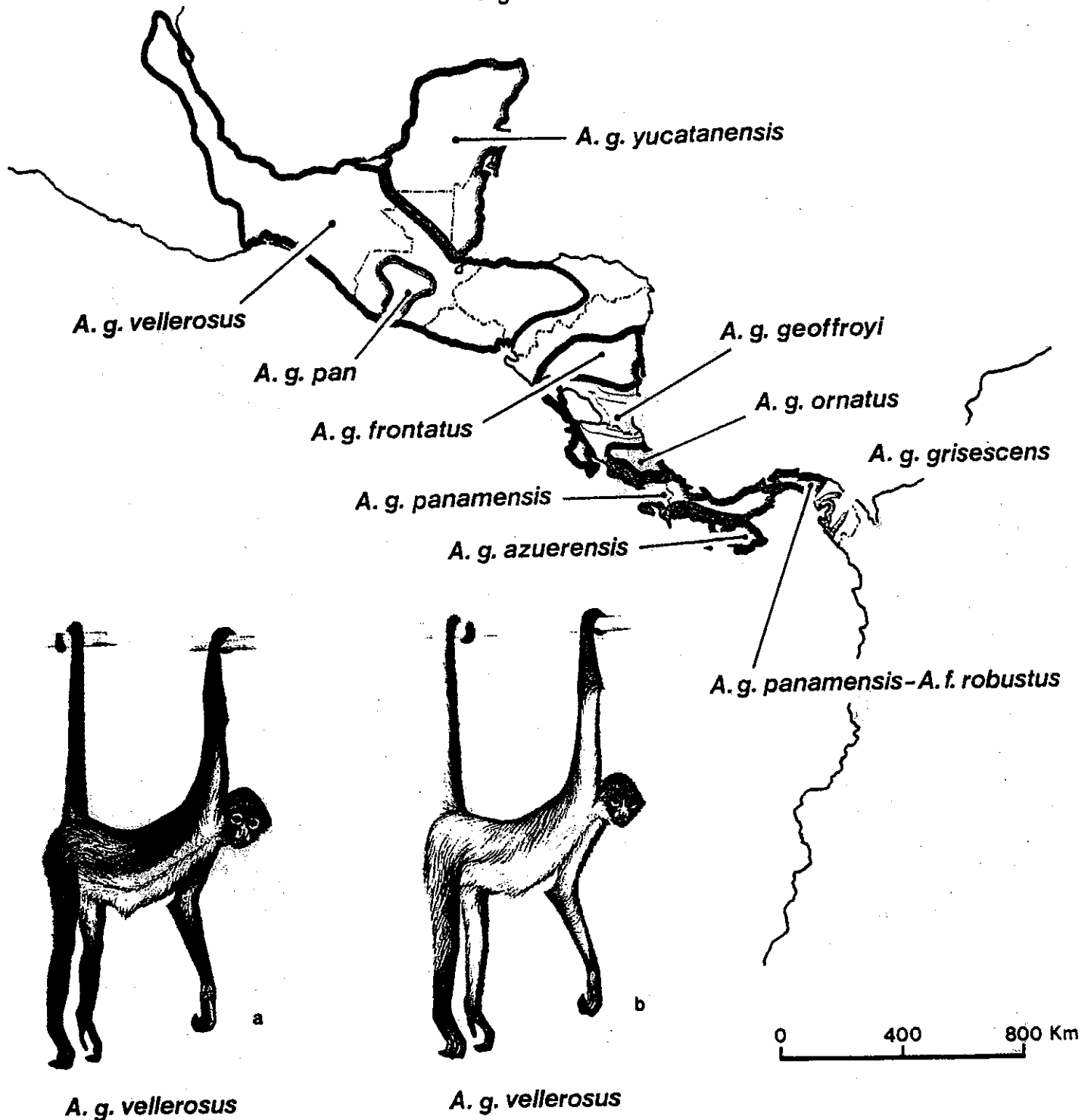
A. belzebuth belzebuth



A. belzebuth marginatus

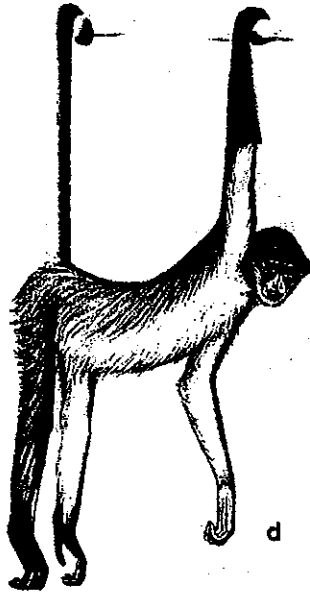
SPIDER MONKEYS OF CENTRAL AMERICA

Fig. 2

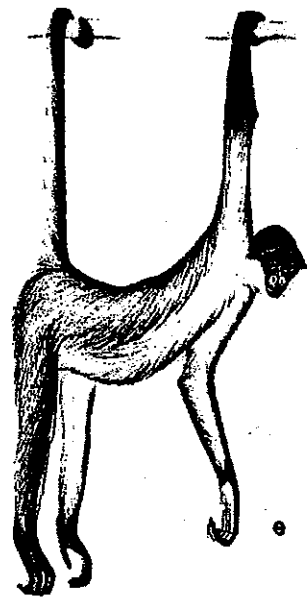




A. g. pan



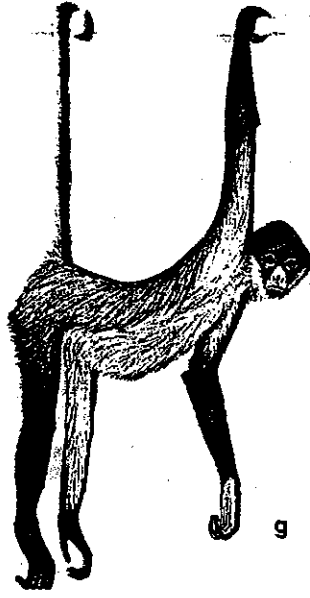
A. g. yucatanensis



A. g. frontatus



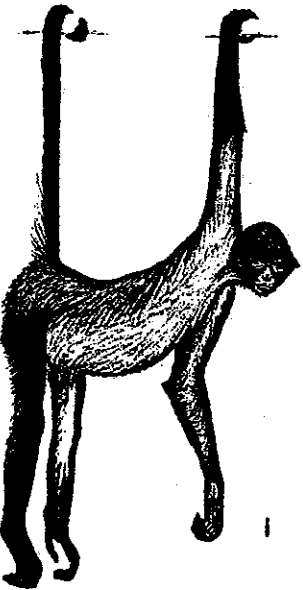
A. g. geoffroyi



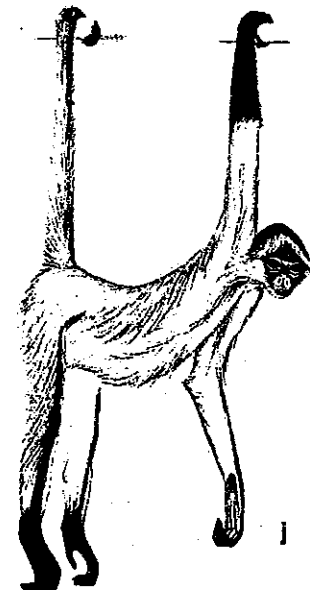
A. g. ornatus



A. g. panamensis



A. g. azuerensis



A. g. grisescens



A. g. panamensis-A. f. robustus

tion of *Ateles* using Kellogg and Goldman (1944) as a foundation, and to provide a color guide to recognized *Ateles* taxa;

2. to summarize the existing data on distribution and status of wild populations of *Ateles*;
3. to present results of our survey on distribution of spider monkeys in captivity; and
4. to provide recommendations concerning captive management of existing collections.

Ateles Taxonomy and Distribution

We follow the more conservative Kellogg and Goldman (1944) arrangement (Table 2) in this report for several basic reasons. First and foremost, their study represents the most comprehensive treatment of this genus to date. Secondly, it is the classification used by zoological and conservation communities (e.g., *International Zoo Yearbook*, ISIS, CITES, and *IUCN Red Data Book*), and so it will prove the most useful to captive institutions in identifying or developing their collections. Finally, on the basis of our preliminary investigations, we also consider it to be the more valid arrangement, although certain changes will undoubtedly have to be made.

Table 2. *Ateles* taxonomy of Kellogg and Goldman (1944)

Species	Subspecies
<i>paniscus</i>	<i>paniscus</i> <i>chamek</i>
<i>belzebuth</i>	<i>belzebuth</i> <i>marginatus</i> <i>hybridus</i>
<i>fusciceps</i>	<i>fusciceps</i> <i>robustus</i>
<i>geoffroyi</i>	<i>geoffroyi</i> <i>vellerosus</i> <i>pan</i> <i>yucatanensis</i> <i>frontatus</i> <i>ornatus</i> <i>panamensis</i> <i>azuerensis</i> <i>grisescens</i>

In using Kellogg and Goldman (1944), three points should be considered. The first involves the observation that "distinct" subspecies apparently hybridize in some areas (esp. Central America), a point raised by those who favor the "one species view" of *Ateles* taxonomy. Rossan and Baerg (1977) have described wild hybridization of the red-bellied *A. geoffroyi* 'panamensis' with the all-black *A. fusciceps robustus* in an area of sympatry in Panama east of the Canal Zone. In our examinations of museum specimens we also noted a certain degree of variability in color within certain subspecies, in addition to subtle intergradations between several subspecies. Nonetheless, there appear to be a number of external characters which one can use to distinguish most of the different forms.

Secondly, cytogenetic studies of *Ateles* remain inconclusive. Chromosomal variations between recognized taxa support the "multiple-species view" (e.g., Benirschke, 1975; Kunkel *et al.*, 1980), but variability within taxa may be interpreted as supporting the "one-species view" (Kunkel *et al.*, 1980). Much further work on karyology is required, and is planned as part of our project.

Third, available distribution maps in Kellogg & Goldman (1944) greatly overestimate the actual distributions of spider monkeys. In almost every instance in which a species or subspecies has been studied in detail, its occurrence within the range given by Kellogg and Goldman (1944) is found to be extremely patchy, covering what amounts to only a very small percentage of the area depicted in range maps. In reality, spider monkeys are not uniformly distributed; they remain reliant on areas of undisturbed high forest, and, in many cases, they have been exterminated from large portions of their former ranges even in areas where suitable habitat still exists (e.g., Soini, 1972; Hernandez-Camacho and Cooper, 1976; Mittermeier and Coimbra-Filho, 1977; Rylands and Mittermeier, 1982). The false impression of uniform widespread distribution given by existing range maps for *Ateles* must be replaced with accurate field data so that we can better assess the status of the difference species and subspecies in the wild.

For the purposes of this paper we have attempted to assess the conservation status of each of the 16 recognized subspecies, listing the protected areas and zoological institutions in which they are presently known to occur. The reader should keep in mind that *Ateles* is a wide-ranging genus, known to exist in 17 Central and South American countries (Table 3) and protected to a different extent and facing different problems in each. Even if parks and reserves exist within the range of a particular *Ateles*, there is no guarantee that the animals are safe from poaching and other human activities or even that spider monkeys still survive in them. According to the *Red Data Book* (IUCN, 1982a), *A. belzebuth*, *A. geoffroyi* and *A. paniscus* are all considered Vulnerable, while *A. fusciceps* is listed as Indeterminate at the present time, and several countries provide legal protection for these animals. However, protective measures are rarely enforced and spider monkeys continue to decline throughout their range as their tropical forest habitat is cut and as they continue to be hunted as sources of meat.

Ateles Species Descriptions and Status

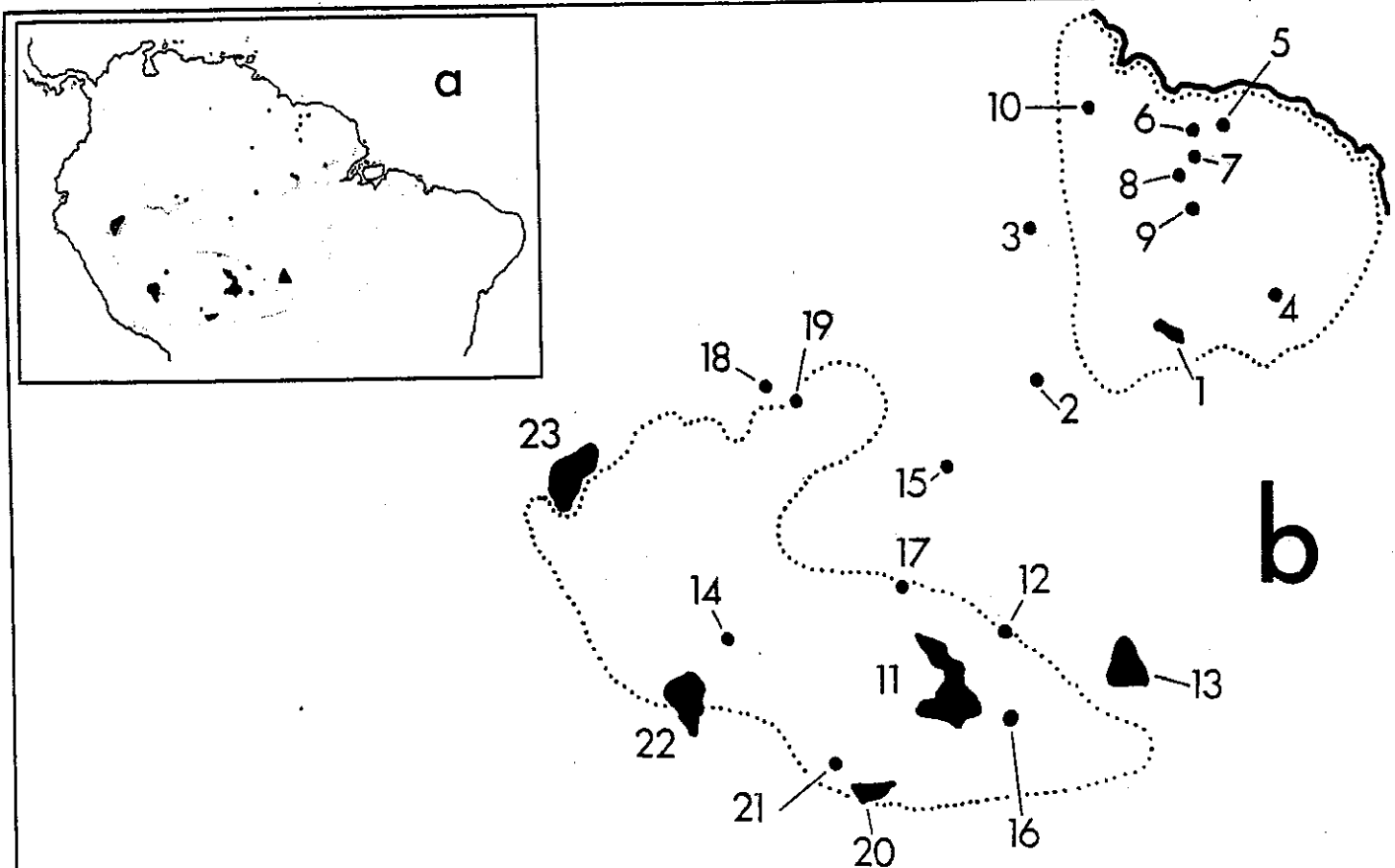
In this section, we describe the external distinguishing characteristics, and summarize the current conservation status of each of the sixteen recognized *Ateles* subspecies, both in the wild and in captivity.

The descriptions presented here are based upon the examination of museum specimens and captive animals, and field observations by Mittermeier in Central and South America. Special attention is paid to the descriptions of Kellogg and Goldman (1944), and, in cases where no living or museum material was available, we have relied heavily on their review. Color representations are provided in Figs. 1 - 2, the artwork for which was done by S. D. Nash.

The distribution of spider monkeys in the wild is briefly described for each subspecies and depicted in Figs. 3 - 6. These figures also give protected areas by country, with a distinction being made between areas in which the presence of *Ateles* has been confirmed by recent observations and those in which it is

Table 3. Occurrence of *Ateles* subspecies by country in Central and South America. Figures for extent of forest cover and rate of deforestation taken from *Technologies to Sustain Tropical Forest Resources* (OTA, 1984).

Country	Closed forest cover (1,000 ha)	% deforested per year	Spider monkeys present
Brazil	357,480	0.4	<i>A. belzebuth</i> <i>belzebuth</i> <i>A. b. marginatus</i> <i>A. paniscus</i> <i>paniscus</i> <i>A. p. chamek</i>
Peru	69,680	0.4	<i>A. b. belzebuth</i> <i>A. p. chamek</i>
Colombia	46,400	1.8	<i>A. b. belzebuth</i> <i>A. b. hybridus</i> <i>A. fusciceps robustus</i> <i>A. geoffroyi</i> <i>grisescens</i> <i>A. p. chamek</i> (?)
Mexico	46,250	1.3	<i>A. g. vellerosus</i> <i>A. g. yucatanensis</i>
Bolivia	44,010	0.2	<i>A. p. chamek</i>
Venezuela	31,870	0.4	<i>A. b. belzebuth</i> <i>A. b. hybridus</i>
Guyana	18,475	no data	<i>A. p. paniscus</i>
Suriname	14,830	no data	<i>A. p. paniscus</i>
Ecuador	14,250	2.4	<i>A. b. belzebuth</i> <i>A. f. fusciceps</i>
French Guiana	8,900	no data	<i>A. p. paniscus</i>
Nicaragua	4,496	2.7	<i>A. g. frontatus</i> <i>A. g. geoffroyi</i>
Guatemala	4,442	2.0	<i>A. g. pan</i> <i>A. g. vellerosus</i> <i>A. g. yucatanensis</i>
Panama	4,165	0.9	<i>A. g. grisescens</i> <i>A. g. panamensis</i> <i>A. f. robustus</i>
Honduras	3,797	2.4	<i>A. g. vellerosus</i>
Costa Rica	1,638	4.0	<i>A. g. frontatus</i> <i>A. g. ornatus</i> <i>A. g. panamensis</i>
Belize	1,354	0.7	<i>A. g. yucatanensis</i>
El Salvador	141	3.2	<i>A. g. vellerosus</i>



Key to (b) above

Ateles p. paniscus

Brazil

1. Rio Trombetas Biological Reserve
385,000 ha, est. 1979
- * 2. Anavilhanas Ecological Station
350,000 ha, est. 1981
3. Caracará Ecological Station
80,000 ha, proposed
4. Jari Ecological Station
207,370 ha, proposed

Rylands and
Mittermeier, 1982

Rylands,
pers. comm.

Rylands, 1985

Suriname

- * 5. Brownsberg Nature Park
8,400 ha, est. 1969
- * 6. Raleighvallen-Voltsberg Nature Reserve
56,000 ha, est. 1961
- * 7. Tafelberg Nature Reserve
140,000 ha, est. 1966
- * 8. Eilerts de Haan Gebergte Nature Reserve
200,000 ha, est. 1966
- * 9. Sipalwini Savanna Nature Reserve
100,000 ha, est. 1971

Mittermeier and
van Roosmalen,
1982

Guyana

10. Kaieteur National Park
11,655 ha, est. 1929 (as nature reserve)

IUCN, 1982b

Ateles p. chamek

Brazil

11. Pacáas Novos National Park
764,802 ha, est. 1979
12. Jari Biological Reserve
268,150 ha, est. 1979
13. Iquê-Juruena Ecological Station
200,000 ha, proposed
14. Rio Acre-Sena Madureira Ecological Station
77,500 ha, est. 1981
15. Abufari Biological Reserve (?)
288,000 ha, est. 1982
16. Guaporé Biological Reserve
600,000 ha, est. 1982
17. Cunã Ecological Station
100,000 ha, est. 1981
18. Juamã-Japurá Ecological Station
273,284 ha, est. 1983
19. Jutai-Solimões Ecological Station
288,187 ha, est. 1983

Rylands and
Mittermeier, 1982

Rylands, 1985

Bolivia

20. Isiboro-Secure National Park
1,233,000 ha, est. 1965
21. Parque Nacional Pilon-Lajas
100,000 ha, est. 1977 (as Biosphere Reserve)

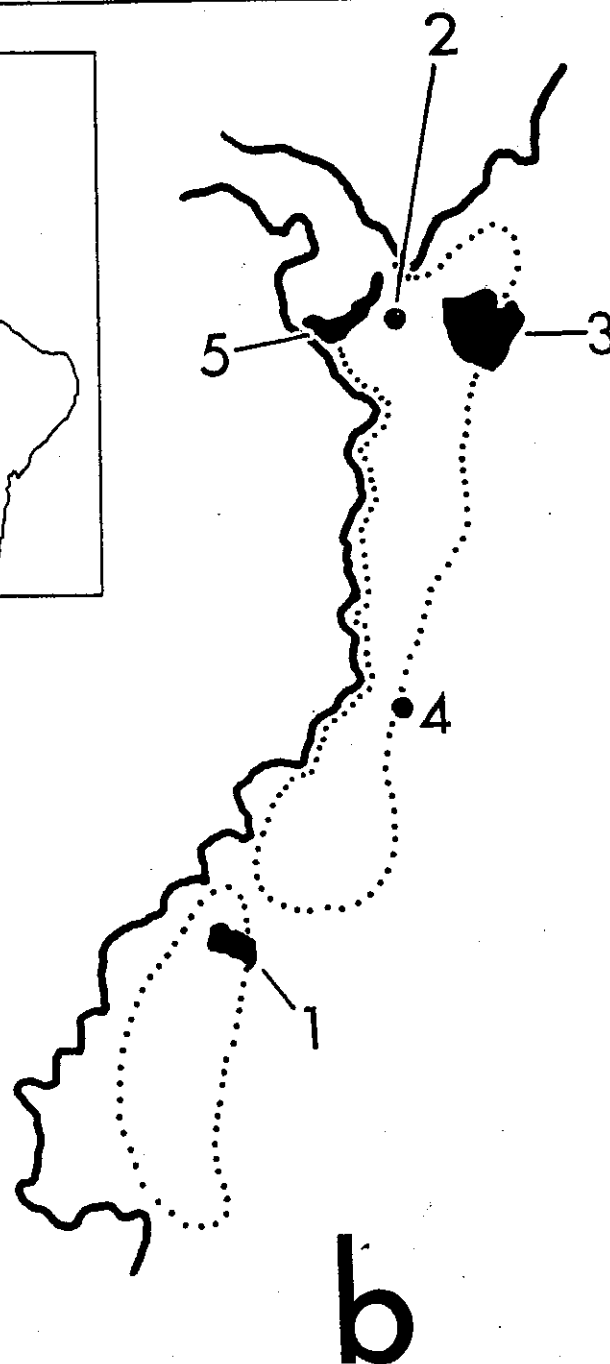
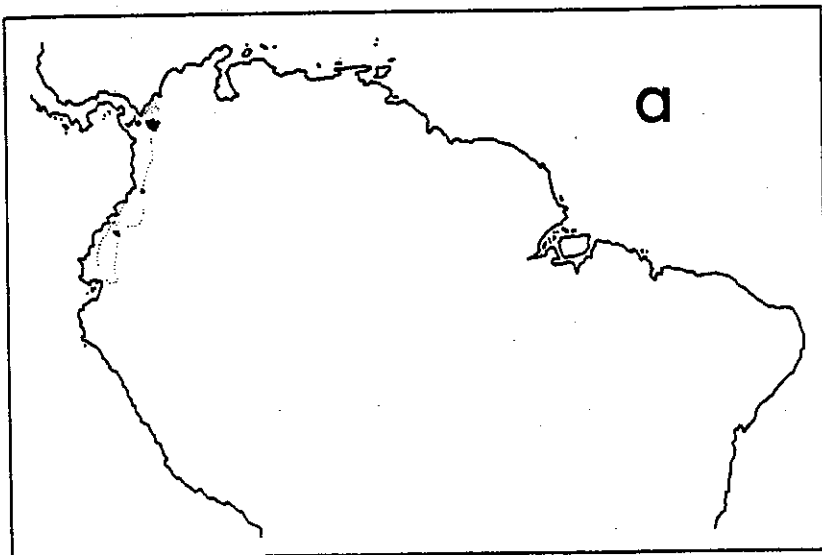
IUCN, 1982a,
1982b

Peru

- *22. Manu National Park
1,532,806 ha, est. 1973
- *23. Pacaya Samiria Nature Reserve
2,080,000 ha, est. 1977

Soini, 1982

Fig. 3: Protected areas in which *Ateles paniscus* is believed to occur. Asterisks (*) indicate areas where its presence has been confirmed. The ranges for the subspecies (Kellogg and Goldman, 1944) are represented by dotted lines.



Key to (b) above right

Ateles f. fusciceps

Ecuador

1. Cotacachi-Cayapas Ecological Reserve
45,000 ha, est. 1979

R. Madden.
pers. comm.

Ateles fusciceps robustus

Colombia

2. Parque Nacional Los Katios
3. Parque Nacional Natural Paramillo
460,000 ha, est. 1977
4. Parque Nacional Natural Los Farallones
de Cali
150,000 ha, est. 1968

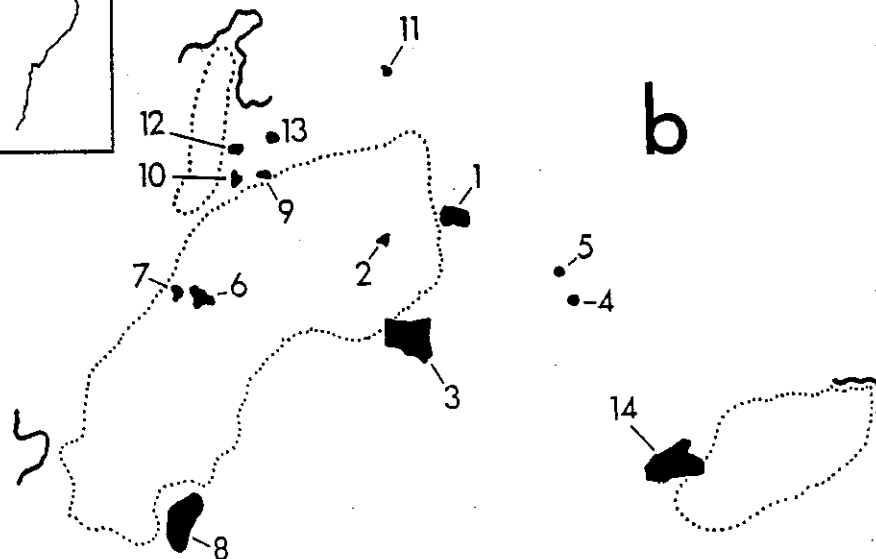
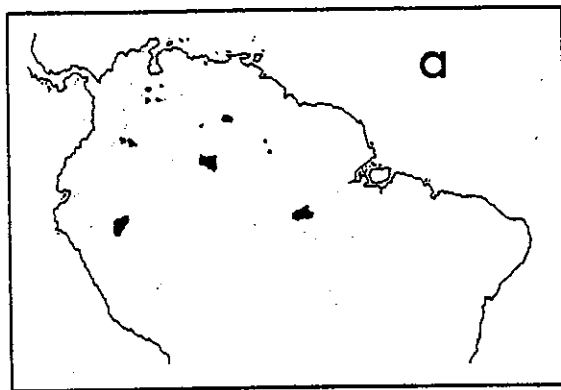
Hernandez-
Camacho and
Defler, in press;
IUCN, 1982b

Panama

5. Darien National Park
597,000 ha, est. 1980

IUCN, 1982b

Fig. 4: Protected areas in which *Ateles fusciceps* is believed to occur. The ranges for the two subspecies (Kellogg and Goldman, 1944) are represented by dotted lines.



Key to (b) above right

Ateles b. belzebuth

Venezuela

1. Jaua-Sarisarinama National Park
330,000 ha. est. 1978
2. Parque Nacional Yapacana
320,000 ha. est. 1978

Brazil

- * 3. Pico da Neblina National Park
2,200,000 ha. est. 1979
4. Maracá Ecological Station
101,312 ha. est. 1981
5. Caracará Ecological Station
80,000 ha. est. 1982

Colombia

- * 6. Parque Nacional Natural La Macarena
501,350 ha. est. 1948
7. Parque Nacional Natural Cordillera de
Los Picachos (?)
286,000 ha. est. 1977

Peru

8. Pacaya-Samiria National Reserve
2,080,000 ha. est. 1977

R. Bodini, pers.
comm.: IUCN,
1982b

Rylands and
Mittermeier, 1982

Klein and Klein,
1976; Struhsaker
1976

Soini, 1982

Ateles belzebuth hybridus

Colombia

9. Santuario de Fauna y Flora Arauca
90,000 ha. est. 1977
10. Parque Nacional El Cocuy (?)
306,000 ha. est. 1977

Venezuela

- *11. Parque Nacional Guatopo
92,640 ha. est. 1958
12. Parque Nacional El Tama
139,000 ha. est. 1978
13. Ticoporo Forest Reserve (?)

Hernandez-
Camacho and
Defler, in press

Mondolfi and
Eisenberg, 1979

R. Bodini, pers.
comm.: IUCN,
1982b

R. Bodini, pers.
comm.

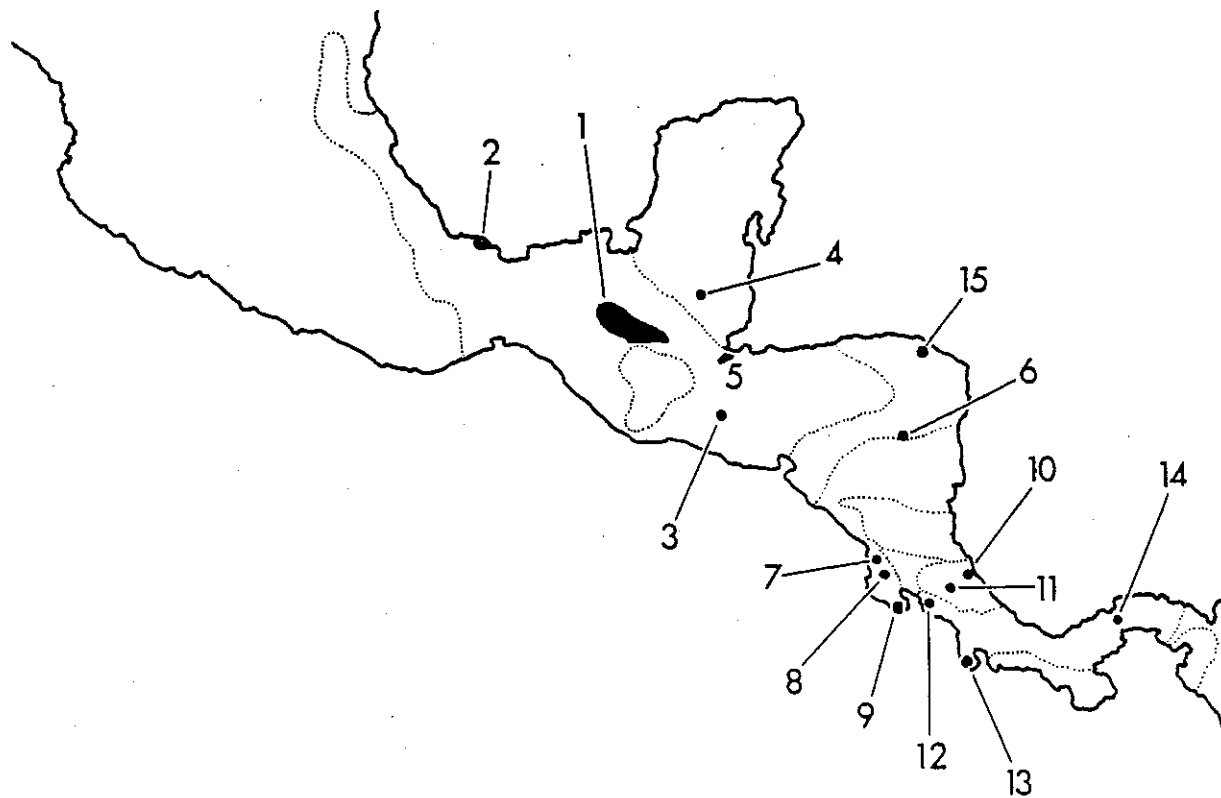
Ateles belzebuth marginatus

Brazil

- *14. Amazonia National Park
1,000,000 ha. est. 1974
(found only in 10 km buffer zone)

Rylands and
Mittermeier, 1982
Branch, 1983

Fig. 5: Protected areas in which *Ateles belzebuth* is believed to occur. Asterisks (*) indicate areas where its presence has been confirmed. The ranges for the subspecies (Kellogg and Goldman, 1944) are represented by dotted lines.



Key to above

Ateles geoffroyi vellerosus

Mexico

- | | |
|-------------------------------------|---------------|
| 1. Montes Azules Biosphere Reserve | IUCN, 1982b |
| 331,000 ha, est. 1979 | |
| * 2. Biological Reserve Los Tuxtlas | Estrada, 1983 |
| 1,000 ha | |

El Salvador

- | | |
|------------------------------|-----------------|
| 3. Montecristo National Park | Daugherty, 1972 |
| 1,990 ha, proposed | |

Guatemala

- | | |
|----------------------------|----------------|
| * 4. Tikal National Park | Cant, 1978 |
| 57,600 ha, est. 1955 | |
| 5. Rio Dulce National Park | Wolfheim, 1983 |
| 24,200 ha (?), est. 1955 | |

Ateles geoffroyi frontatus

Nicaragua

- | | |
|--------------------------|-------------|
| 6. Saslaya National Park | IUCN, 1982b |
| 11,800 ha | |

Costa Rica

- | | |
|---|--|
| * 7. Santa Rosa National Park | Freese, 1976;
R. Mittermeier,
pers. obs. |
| 21,500 ha, est. 1971 | |
| * 8. Monteverde Cloud Forest Biological Reserve | |
| 4,500 ha, est. 1972 | |
| 9. Cabo Blanco National Reserve (rare) | |
| 1,172 ha, est. 1963 | |

Ateles geoffroyi ornatus

Costa Rica

- | | |
|------------------------------------|---|
| * 10. Tortuguero National Park | P. Onthank,
pers. comm.;
Boza, 1978 |
| 18,947 ha, est. 1970 | |
| 11. Braulio Carrillo National Park | IUCN, 1982b |
| 32,000 ha, est. 1978 | |

Ateles geoffroyi panamensis

Costa Rica

- | | |
|-------------------------------|---|
| 12. Carara Biological Reserve | |
| 7,600 ha, est. 1978 | |
| * 13. Corcovado National Park | R. Mittermeier,
pers. obs.
S. Boinski,
pers. comm. |
| 41,789 ha, est. 1976 | |

Panama

- | | |
|--|------------|
| * 14. Barro Colorado National Monument | Dare, 1974 |
| 5,400 ha, est. 1979 | |

Ateles geoffroyi ? (possibly *vellerosus*)

Honduras

- | | |
|-------------------------------------|---------------------------------|
| * 15. Rio Platano Biosphere Reserve | Freohlich and
Schwerin, 1983 |
| 350,000 ha, est. 1979 | |

Fig. 6: Protected areas in which *Ateles geoffroyi* is believed to occur. Asterisks (*) indicate areas where its presence has been confirmed. The ranges for the subspecies (Kellogg and Goldman, 1944) are represented by dotted lines.

believed to exist. *Ateles* has also been reliably reported from localities which lie outside the distributions given by Kellogg and Goldman (1944), and these represent range extensions for each of the species and subspecies indicated. In addition, spider monkeys are known to be absent from a number of protected areas which lie within their presumed ranges. For parks and reserves in which the subspecies' presence has not been confirmed, we have based its likely identity on Kellogg and Goldman (1944).

Information on the status of *Ateles* in captivity is currently available through the *International Zoo Yearbook* (IZY) and the records of the International Species Inventory System (ISIS). To this, we have added data obtained from responses to our recent questionnaire. This is presented in tabular form for each subspecies, relevant sources of information being provided in each instance. Information received in response to our questionnaire updates material presented in both IZY and ISIS. In IZY, spider monkeys are listed annually under the section *Mammals Bred In Captivity and Multiple Generation Births*, the different species being designated by an asterisk to indicate that they are rare. In light of this, it is surprising that they are not presently listed in another IZY appendix, *Census of Rare Animals in Captivity*. The IZY listings for *Ateles* are very rarely to the subspecific level, some institutions merely listing births under "*Ateles* spp." ISIS data sheets provide more detailed information on the demographics of participating collections, and many institutions do list animals by presumed subspecies. This resource provides a good data base for North American collections, but is not yet as international in scope as the IZY reference section.

For the purpose of this report, we distinguish between the presence of *Ateles* in different collections on the following bases. Those collections for which the authors have confirmed the presence of a given subspecies, either by personal observation or the examination of photographic material, are marked by an asterisk (*) in the appropriate tables. Institutions which have reported the likely production of hybrids or where the authors have personally observed cases of hybridization are marked by a cross (+). Institutions which identify the animals to subspecies, but have not had these identifications confirmed by the authors, are listed under that subspecies and left unmarked. In cases where the reporting institution has not indicated the subspecies, we have listed the collection in a separate species table.

Neither the numbers of animals in each collection nor the breeding records are presented in this report. This will be done following the second phase of our survey, after which we will be better able to confirm initial identifications. Hopefully, we will also receive responses from zoos that have not yet provided information on their *Ateles* collections, Latin American zoos being especially important in this regard.

Ateles paniscus

Ateles paniscus paniscus

Vernacular name: Guiana black spider monkey

The pelage of *A. p. paniscus* is all black and contrasts with the bare skin around the eyes and on the nose and muzzle, which may be flesh-colored or light red (Fig. 1d,g). The tail is distinctive in this subspecies, being very robust, particularly at the base, and tapering abruptly near the tip. The length of hair of adult specimens (75-100 mm) is much greater than that of adults of

A. p. chamek and *A. fusciceps robustus* (40-75 mm), two other taxa with which *A. p. paniscus* might be confused.

This all black animal is found in northeastern Amazonia, north of the main stream of the Amazon and east of the Rio Negro/Rio Branco, and occurs in Suriname, Guyana, French Guiana, Brazil, and possibly in Venezuela (IUCN, 1982a). Within its range it is known to exist in 4 protected areas in Brazil, 5 in Suriname, and one in Guyana, while its status in French Guiana remains unknown (Mittermeier and van Roosmalen, 1982; Rylands, 1985; Rylands and Mittermeier, 1982) (Fig. 3).

In Brazilian Amazonia, *Ateles* appears to be restricted to *terra firme* primary forest (Mittermeier and van Roosmalen, 1981; van Roosmalen, 1981) and it is one of the first primates to disappear in the face of forest destruction (Mittermeier, 1977). In addition, it is heavily hunted in many areas as a source of food and to supply bait for spotted cat hunters. As a result, it has already been exterminated from many primary forests that would otherwise be perfectly suitable habitat (Rylands and Mittermeier, 1982). In Suriname, *Ateles paniscus paniscus* is a prime source of bush meat. Being large, loud and conspicuous, it is easily hunted in new areas opened for exploration, and it should be considered the most vulnerable primate species in Suriname (Mittermeier and van Roosmalen, 1982).

In captivity, *Ateles paniscus paniscus* appears to be more commonly represented in European and South American collections (Table 4).

Ateles paniscus chamek.

Vernacular name: Black-faced black spider monkey

The pelage of *A. p. chamek* is entirely black (Fig. 1f). It is possible to distinguish *A. p. chamek* from *A. p. paniscus* by the shorter length of hair on its body and tail, and the lesser amount of lighter-colored skin exposed on the face. The tails of both *A. p. chamek* and *A. p. paniscus* are reported to be exceptionally long (almost twice the head and body length combined: see Allen, 1914 and Cruz Lima, 1945 for descriptions of *A. longimembris*; Kellogg and Goldman, 1944). This ratio appears to be significantly greater than that found in *A. fusciceps robustus*, another all black animal. Heltne and Kunkel (1975) distinguish between *A. p. chamek* and *A. fusciceps robustus* (= *rufiventris*) by the presence of blond or gold hair on the medial surfaces of the thighs or pubic region which are said to be characteristic of *chamek* (although they indicate that this coloration may also occur in some specimens of *fusciceps*).

This subspecies is found in western Amazonian Brazil (including western Mato Grosso), northeastern Peru, eastern Bolivia (IUCN, 1982a). It occurs in at least 9 protected areas in Brazil (Rylands and Mittermeier, 1982; Rylands, 1985), 2 in Bolivia (IUCN, 1982a; 1982b) and 2 in Peru (Soini, 1982) (Fig. 3).

This subspecies suffers from much the same threats as does *A. p. paniscus*, being hunted regularly and little able to cope with encroachment by man on its forest habitat. Although good populations of *A. paniscus chamek* are reported from protected areas such as Manu National Park in Peru (Freese, 1975), it appears that it has been exterminated over a large part of its former range in this country (Soini, 1982).

In captivity, *A. paniscus chamek* is reported from North and South American and European collections (Table 5).

Table 4
Institutions exhibiting *A. p. paniscus*.

Continent	Institution	Source(s)
North America	+ Slater Park Zoo (?) Pawtucket, R.I. (property of Franklin Park Zoo Boston, Mass.) Jackson Zoological Park Jackson, Miss.	Questionnaire (Franklin Park) ISIS
South America	* Center for Jungle Warfare Instruction (CIGS) Manaus, Amazonas, Brazil * Centro Nacional de Primatas Belem, Pará, Brazil * Museo Goeldi Belem, Pará, Brazil * Paramaribo Zoo Paramaribo, Suriname * São Paulo Zoo São Paulo, Brazil	A. Rylands, pers. comm. R. Mittermeier, pers. obs. S. Nash, pers. obs. photos R. Mittermeier, pers. obs.; photos R. Mittermeier, pers. obs.
Europe	+ Apenheul Apeldoorn, Netherlands + Banham Zoo Banham, England * Paignton Zoological and Botanical Gardens Paignton, England Southport Zoo Southport, England Twycross Zoo Twycross, England * Zoologischer Garten und Aquarium Berlin Berlin, West Germany	Questionnaire Questionnaire Questionnaire, photos Questionnaire, IZY Questionnaire Questionnaire, photos

Asterisks (*) indicate that identifications have been confirmed.
Crosses (+) indicate the likely presence of hybrids.

Table 5
Institutions exhibiting *A. p. chamek*

Continent	Institution	Source(s)
North America	+ Caldwell Children's Zoo Tyler, Texas	Questionnaire
	? Cleveland Metroparks Zoo Cleveland, Ohio	Questionnaire, ISIS
	+ ? Slater Park Zoo Pawtucket, R.I. (property of Franklin Park Zoo Boston, Mass.)	Questionnaire (Franklin Park)
	Gladys Porter Zoo Brownsville, Texas	Questionnaire, IZY, ISIS
South America	* Quistacocha Zoo Iquitos, Peru	R. Mittermeier, pers. obs.
	* + Parque las Leyendas Lima, Peru	R. Mittermeier, pers. obs.
Europe	+ Apenheul Apeldoorn, The Netherlands	Questionnaire
	Kilverstone Wildlife Park Thetford, England	Questionnaire
	Twycross Zoo Twycross, England	Questionnaire
	Wassenaar Zoo Wassenaar, Holland	Questionnaire

Asterisks (*) indicate identification has been confirmed.

Crosses (+) indicate the likely presence of hybrids.

Question marks (?) indicate uncertain identification at level of subspecies.

Ateles paniscus spp. A large number of zoos claim to have *Ateles paniscus*, but are either uncertain about or simply have not reported the subspecies maintained (Table 6).

Table 6
Institutions exhibiting *Ateles paniscus*, subspecies unreported

Continent	Institution	Source(s)
North America	Baltimore Zoo Baltimore, Maryland	ISIS, IZY
	Busch Gardens Tampa, Florida	Questionnaire, IZY
	Cohanzick Zoo Bridgeton, New Jersey	ISIS
	El Paso Zoological Park El Paso, Texas	Questionnaire
	Glen Oak Zoo Peoria, Illinois	Questionnaire, ISIS

Table 6 (cont.)

	Great Plains Zoo	ISIS
	Sioux Falls, South Dakota	
	Henry Doorly Zoo	ISIS, IZY
	Omaha, Nebraska	
	Jardin Zoologique de Quebec	Questionnaire, ISIS
	Quebec, Canada	
	Micke Grove Zoo	ISIS
	Lodi, California	
	Monkey Jungle	Questionnaire, IZY
	Miami, Florida	
	Riverview Park Zoo	IZY
	Canada	
	Roger Williams Park Zoo	ISIS
	Providence, Rhode Island	
	Roosevelt Park Zoo	ISIS
	Minot, North Dakota	
	+ Sedgewick County Zoo	Questionnaire, ISIS
	Wichita, Kansas	
	Sequoia Park Zoo	ISIS
	Eureka, California	
	Terry Lou Acres Zoo	ISIS
	Scotch Plains, New Jersey	
	Toledo Zoological Gardens	ISIS
	Toledo, Ohio	
South America	Emperor Valley Zoo	Questionnaire
	Trinidad	
Europe	Belfast Zoological Gardens	IZY
	Belfast, Northern Ireland	
	Municipal Zoological Gardens	IZY
	Blackpool, England	
	+ Parque Zoológico de Barcelona	IZY, R. Mittermeier,
	Barcelona, Spain	pers. obs., photos
	Parque Zoologique du Bois	IZY
	D'Atilly	
	France	
	+ Royal Zoological Society of	Questionnaire, IZY
	Ireland	
	Dublin, Ireland	
	Stadt Tiergarten - Zoo Landau	IZY
	Landau, West Germany	
Africa	+ National Zoological Gardens	Questionnaire, IZY
	Pretoria, South Africa	
Asia	Ehime Prefectural Dogo Zoo	IZY
	Matsuyama, Japan	
	Phoenix Zoo	IZY
	Miyazaki, Japan	
	Zoological Gardens of Sri	IZY
	Lanka	
	Colombo, Sri Lanka	

Crosses (+) indicate the likely presence of hybrids.

Ateles fusciceps

Ateles fusciceps fusciceps.

Vernacular name: Brown-headed spider monkey

The brown-headed spider monkey is a little known subspecies that can be distinguished from other *Ateles* by its brown head, which contrasts with an all black body (Fig. 1c,h). It occurs on the Pacific side of the Cordillera in Ecuador (Kellogg and Goldman, 1944; IUCN, 1982a). It probably occurs in the Reserva Nacional Cotachi-Cayapas, and its status there is currently being investigated through a project funded by the World Wildlife Fund-U.S. Primate Program.

To the authors' knowledge, the only record of this subspecies having ever been in captivity comes from the San Diego Zoo, which supposedly maintained several during the early part of this century (D. Brockman, pers. comm.).

Ateles fusciceps robustus.

Vernacular name(s): Colombian black spider monkey; robust black spider monkey

A. fusciceps robustus is an entirely black animal (Fig. 1e). The exposed skin on its face is generally black, although individuals are sometimes seen with thin flesh-colored rings around the eyes (Fig. 1b). The hair on its body is shorter than that seen in *A. p.*

paniscus, especially noticeable at the base of the tail in adults. Supposedly, it can be distinguished from *A. p. chamek* by the significantly shorter length of its tail, the absence of blond or gold hairs on its medial thigh and pubic region, and by the occasional presence of white chin whiskers (Heltne and Kunkel, 1975).

This spider monkey is found in the western cordillera of the Andes from southwestern Colombia northward into eastern Panama (Kellogg and Goldman, 1944; IUCN, 1982a). It exists in at least 3 Colombian national parks and one in Panama (Hernandez-Camacho and Defler, in press, IUCN, 1982b) (Fig. 4).

According to available information, collections of *Ateles fusciceps robustus* exist in North and South America and Europe (Table 7).

In addition to the institutions listed in Table 7, the Phoenix Zoo, Phoenix, Arizona claims to exhibit *Ateles fusciceps*, yet is not certain which subspecies.

Given the physical similarities which exist between *A. f. robustus* and *A. p. chamek*, and the fact that *robustus* must have been shipped in large numbers out of Barranquilla, Colombia during the late 1960's and early 1970's (Cooper and Hernandez-Camacho, 1975; Green, 1977; Mack and Mittermeier, 1984), it is likely that more *A. f. robustus* exist in captivity than is presently believed.

Table 7
Institutions exhibiting *A. f. robustus*

Continent	Institution	Source(s)
North America	* Erie Zoological Park Erie, Penn.	Questionnaire, photos
	* Glen Oak Zoo Peoria, Illinois	Questionnaire, photos
	* Kings Island Kings Mills, Ohio	Questionnaire, photos
	* Louisiana Purchase Gardens Monroe, Louisiana	Questionnaire, photos
	* National Zoo Washington, D. C.	Questionnaire, ISIS, IZY R. Mittermeier, pers. obs.
	* Utica Zoo Utica, New York	Questionnaire, ISIS
South America	* Zoológico Santa Cruz Bogota, Colombia	R. Mittermeier, pers. ob., photos
Europe	* Basel Zoo Basel, Switzerland	Questionnaire, photos
	* Parque Zoologique et Botanique Mulhouse, France	Questionnaire, photos
Australasia	* Taronga Zoo NSW, Australia	Questionnaire, photos
Asterisks (*) indicate identification has been confirmed.		

Ateles belzebuth

Ateles belzebuth belzebuth

Vernacular name(s): Long-haired spider monkey, white-bellied spider monkey

The dorsal surface of *A. b. belzebuth* is black or dark brown, contrasting with its undersurface, which can range from golden brown to yellowish or even white (Fig. 1k,l). A distinctive characteristic is the presence of a variable-sized triangle or strip of light-colored hair on its forehead. This may be accompanied by light-colored sideburns, which are sometimes quite prominent.

This subspecies of spider monkey occurs from central Venezuela south to the Rio Negro of Brazil and into eastern Colombia, Ecuador, and Peru (IUCN, 1982a). Within its range it is known to occur in at least 2 national parks in Venezuela (Bodini, unpublished); one national park and 2 ecological stations in Brazil (Rylands and Mittermeier, 1982; Rylands, 1985), one national park in Peru (Soini, 1982) and in Colombia's Parque Nacional Natural La Macarena (Klein and Klein, 1976) (Fig. 5). Recent reports, however, indicate that La Macarena has been severely degraded and it is questionable whether spider monkeys still exist there (see Struhsaker, 1976). It is not known whether this subspecies occurs in any protected areas in Ecuador.

According to the best available information, captive colonies of *Ateles belzebuth belzebuth* are restricted to South America and Europe (Table 8). The Zoologischer Garten Saarbrücken, West Germany believes it has *A. b. belzebuth*, but remains uncertain as to the subspecies.

Given the relatively large range of *A. b. belzebuth* and that it was probably shipped in significant numbers to the U.S. from Iquitos and Leticia, we imagine that it is present in more collections than from which it has been reported. It is likely that some institutions have not been able to identify this subspecies.

Ateles belzebuth hybridus

Vernacular name: Marimonda

A. belzebuth hybridus ranges in coloration from a light brown to a rich mahogany on the upper surfaces of its body, limbs and head (Fig. 1i,j). This variation appears to have some geographic correlation and it has been suggested that two different subspecies may exist (Hernandez-Camacho and Cooper, 1976). The abdomen is contrastingly lighter, though not as much as the white triangular

forehead patch and sideburns. The eyes of *hybridus* are either a light brown or a very striking light blue in color (Fig. 1a).

This spider monkey is found in northeastern Colombia, with a disjunct population in western Venezuela (Eisenberg and Mondolfi, 1979). It occurs in at least one protected area in Colombia (Hernandez-Camacho and Defler, in press) and 2 national parks in Venezuela (Bodini, unpubl.) (Fig. 5).

Ateles belzebuth hybridus is apparently the most common *A. belzebuth* subspecies in captivity. Our survey indicates that it can be found in zoos in North America, South America, Europe and Asia (Table 9). The total number of individuals, however, is not very large.

Ateles belzebuth marginatus

Vernacular name: White-whiskered spider monkey

Resembling *A. p. paniscus* more than other *A. belzebuth*, *A. b. marginatus* is all black in color, except for a white triangular forehead patch and sideburns (Fig. 1m).

This spider monkey is endemic to Brazil, occurring south of the Amazon in the state of Pará (Kellogg and Goldman, 1944; IUCN, 1982a). It is found on the outskirts of only one protected area in Brazil (Rylands and Mittermeier, 1982) (Fig. 5). Included within its presumed range is the recent Tucuruí hydroelectric project (see Kingston, 1984). However, with flooding almost completed, not a single spider monkey has been observed during rescue operations (W. R. Kingston, pers. comm.). It may already have been exterminated in this area, and perhaps throughout much of its range (A. Johns, pers. comm.). We consider this subspecies to be the most endangered of all the South American spider monkeys.

Given its geographic location and close resemblance to the other *A. paniscus* subspecies, it may be that this spider monkey would be more appropriately grouped with *A. paniscus* than with *A. belzebuth*.

It appears that *Ateles belzebuth marginatus* is found in captivity only in Brazil (Table 10). It apparently occurs in only a handful of collections in very small numbers and cannot be considered secure by any standards.

Ateles belzebuth spp. In addition to the institutions which have reported exhibiting different subspecies of *Ateles belzebuth*, a number of others report only at the specific level (Table 11).

Table 8
Institutions exhibiting *A. b. belzebuth*

Continent	Institution	Source(s)
South America	* + Parque de Las Leyendas	Questionnaire. IZY;
	Lima, Peru	R. Mittermeier, pers. obs.
	* + São Paulo Zoo	Questionnaire.
	São Paulo, Brazil	R. Mittermeier, pers. obs.
Europe	* Kilverstone Wildlife Park	Questionnaire.
	Thetford, England	R. Mittermeier, S. Nash, pers. obs.

Asterisks (*) indicate identification has been confirmed.
Crosses (+) indicate the likely presence of hybrids.

Table 9
Institutions exhibiting *A. b. hybridus*

Continent	Institution	Source(s)
North America	* Assiniboine Park Zoo Manitoba, Canada	Questionnaire, ISIS, IZY, photos
	* Louisiana Purchase Gardens Monroe, Louisiana	Questionnaire, photos
South America	* Emperor Valley Zoo Trinidad	Questionnaire, photos
Europe	* Kilverstone Wildlife Park Thetford, England	Questionnaire, R. Mittermeier, S. Nash, pers. obs.
	* Parque Zoologique et Botanique de la Ville de Mulhouse Mulhouse, France	Questionnaire, IZY, photos
	* Parc Zoologico de Barcelona Barcelona, Spain	Questionnaire, R. Mittermeier, pers. obs., photos
	* Silesian Zoological Garden Katowice, Poland	Questionnaire, photos
Asia	* Kebun Binatang Surabaya Jakarta, Indonesia	R. Mittermeier, pers. obs., photos

Asterisks (*) indicate identification has been confirmed.

Table 10
Institutions exhibiting *A. b. marginatus*

Continent	Institution	Source(s)
South America	* São Paulo Zoo São Paulo, Brazil	Questionnaire, R. Mittermeier, pers. obs., photos
	* Jardim Zoologico de Rio de Janeiro Rio de Janeiro, Brazil	W. Konstant, pers. obs., photos
	* Center for Jungel Warfare Instruction (CIGS) Manaus, Amazonas, Brazil	A. Rylands, pers. comm.
	* Hotel Tropical Manaus, Amazonas, Brazil	A. Rylands, pers. comm.
	* Hotel Tropical Santarem, Pará, Brazil	W. R. Kingston, pers. comm.
	* Centro Nacional de Primatas Belem, Pará, Brazil	R. Mittermeier, pers. obs.
	* Museu Goeldi Belem, Pará, Brazil	R. Mittermeier, pers. obs.

Asterisks (*) indicate identification has been confirmed.

Table 11
Institutions exhibiting *A. belzebuth*

Continent	Institution	Source(s)
North America	Roosevelt Park Zoo Minot, North Dakota	ISIS
Europe	+ Cotswold Wildlife Park Burford, England Zoological Society of London London, England Zoologischer Garten der Landeshauptstadt Saarbrücken Saarbrücken, West Germany	Questionnaire IZY IZY
Africa	+ National Zoological Gardens of South Africa Pretoria, South Africa	Questionnaire, IZY

Crosses (+) indicate the likely presence of hybrids.

Ateles geoffroyi

Ateles geoffroyi vellerosus

Vernacular name: Mexican spider monkey

The dorsal surfaces of *A. geoffroyi vellerosus* range from black to dark brown, except for a lighter band across the lumbar region, and contrast strongly with its lighter abdomen and inner limbs (Fig. 2a,b). Exposed flesh-colored skin is often present about the eyes. This subspecies can apparently be distinguished from *A. b. belzebuth* and the darker variety of *A. belzebuth hybridus* by the absence or marked reduction of a white triangular forehead patch and sideburns. It appears to grade in coloration into neighboring subspecies, *A. geoffroyi pan* and *A. geoffroyi yucatanensis*.

The *vellerosus* subspecies occurs in southern Mexico, El Salvador and much of Guatemala and Honduras. It is known to occur in at least one biosphere reserve (IUCN, 1982b) and one biological reserve in Mexico (Estrada, 1983), at least one and perhaps two national parks in Guatemala (Cant, 1978) and a national park in El Salvador (IUCN, 1982b) (Fig. 6). This may also be the subspecies which occurs in the Rio Platano Reserve in northeastern Honduras (Froehlich and Schwerin, 1983).

Ateles geoffroyi vellerosus does not appear to be common in captivity, and we are certain of only five North American zoos and two European zoos which exhibit this subspecies (Table 12). The Brookfield Zoo in Chicago, Illinois also maintains a single post-reproductive female.

Table 12
Institutions exhibiting *A. g. vellerosus*

Continent	Institution	Source(s)
North America	* Club Auto Safari Chapin Guatemala * La Aurora Zoo Guatemala City, Guatemala * + San Francisco Zoo San Francisco, Cal. * Turtle Back Zoo West Orange, New Jersey * Tuxtla Gutierrez Zoo Chiapas, Mexico	L. Calvo, pers. comm., photos L. Calvo, pers. comm., photos R. Mittermeier, pers. obs., photos Questionnaire, photos Questionnaire, R. Mittermeier, pers. obs., photos
Europe	* Frankfurt Zoological Garden Frankfurt, Germany * London Zoo London, England	Questionnaire, photos S. Nash, pers. obs., photos

Asterisks (*) indicate identification has been confirmed.
Crosses (+) indicate the likely presence of hybrids.

Ateles geoffroyi pan

Vernacular name: Guatemalan spider monkey

A. geoffroyi pan is very similar to the darker colored individuals of *A. geoffroyi vellerosus* (Fig. 2c). It is described as having a thick black coat, and is said to occur at high altitudes. It differs from *A. g. vellerosus* in that its dorsal coloration does not contrast as markedly with that of its ventral surface, and it does not possess a lighter colored "saddle" on its lumbar region.

This subspecies is supposed to occur in the central mountains of Guatemala, yet it is based on only 3 animals of unknown geographic origin (Kellogg and Goldman, 1944), and it may not be a valid taxon. It is not known whether *pan* occurs in any protected areas. The most recent record of it in captivity (ISIS) is that of a single female at the Nature Center in Asheville, North Carolina.

Ateles geoffroyi yucatanensis

Vernacular name: Yucatan spider monkey

A. geoffroyi yucatanensis is brownish-black on its head, neck and shoulders, becoming lighter brown on the lower back and hips and contrasting with its silvery-white underside, inner limbs and sideburns (Fig. 2d). It may be confused with lighter individuals of *A. geoffroyi vellerosus*.

As its name would imply, this subspecies is known from the Yucatan Peninsula and occurs in Mexico, Guatemala and Belize. It apparently does not occur in any protected areas in Mexico or Guatemala, but is found in the proposed Chiquebul Forest Reserve area in Belize (Dahl, 1984).

The only report of *Ateles geoffroyi yucatanensis* in captivity is an ISIS listing of a single female at the Brookfield Zoo, Chicago, Illinois.

Ateles geoffroyi geoffroyi

Vernacular name(s): Nicaraguan spider monkey, golden spider monkey

A. g. geoffroyi is silvery to brownish gray on the back, upper arms and thighs. A variable amount of black exists on the elbows, knees, and upper and lower arms and legs, while the hands and feet are always black. The chest is similar in coloration to the back, while the lower abdomen may be somewhat golden. The top of the head is dark, sometimes black, with mixed light and dark hairs directed forward, often forming a distinct light band over the forehead. The face is black, with flesh-colored "spectacles" around the eyes common. Lighter side whiskers are often present (Fig. 2f).

Geoffroy's spider monkey is found in southern Nicaragua and possibly northern Costa Rica (Kellogg and Goldman, 1944). It is apparently not found in any protected areas and is considered endangered in Nicaragua (IUCN, 1982a).

Ateles geoffroyi geoffroyi appears to be the most common spider monkey in captivity, particularly in North American zoos (Table 13), and this is undoubtedly the result of large numbers of these animals being exported from Nicaragua in the late 1960's and early 1970's (R. Mittermeier, pers. obs., 1970; Mack and Mittermeier, 1984).

Ateles geoffroyi frontatus

Vernacular name: Black-foreheaded spider monkey

A. geoffroyi frontatus is similar in color pattern to *A. g. geoffroyi*, although somewhat darker (Fig. 2e). This subspecies is

found in northwestern Costa Rica and extreme western and northern Nicaragua (IUCN, 1982a). It is reported to occur in one national park in Nicaragua (IUCN, 1982b), and one national park and two reserves in Costa Rica (IUCN, 1982b; Wolfheim, 1983) (Fig. 6).

Based upon known capture localities of specimens in their collection (Hacienda La Pacifica, Guanacaste, Costa Rica), the Basel Zoo, Switzerland, maintains a colony of *A. g. frontatus*.

Ateles geoffroyi ornatus

Vernacular name(s): Ornate spider monkey, golden spider monkey

A. geoffroyi ornatus appears to be a uniformly darker brown spider monkey than either *A. g. geoffroyi* or *A. g. frontatus* (Fig. 2g). The back is golden brown and the face, top of the head, forearms all around, outer sides of legs, hands and feet are black. The underside does not contrast strongly with the color on the back.

The ornate spider monkey is found in northeastern Costa Rica (IUCN, 1982a), where it is reported from only two protected areas (Fig. 6).

In reports to ISIS, Audubon Park Zoo lists *Ateles geoffroyi ornatus* in its collection. On the basis of photos provided, we also believe that several individuals may exist at the Welsh Mountain Zoo, North Wales, United Kingdom, and the Greater Baton Rouge and Louisiana Purchase Zoological Gardens in the United States.

Ateles geoffroyi panamensis

Vernacular name: Panamanian red spider monkey

A. geoffroyi panamensis is a brown spider monkey with a black face (often freckled with lighter skin) and is best distinguished from *ornatus* by the extent and intensity of its rufescent coloration, the extent of black being similar in the two subspecies. The abdomen is characteristically red, and the brown of the back and outer limbs contains a significant amount of this color also (Fig. 2h). Wild hybrids between *A. g. panamensis* and *A. fusciceps robustus* (Fig. 2k) have been described by Rossan and Baerg (1977), and Heltne and Kunkel (1975) describe the boundary zone between these two taxa in eastern Panama.

The Panamanian red spider monkey was found throughout much of Panama west of the Cordillera San Blas (but not including the Azuero Peninsula) and into central western Costa Rica (IUCN, 1982a). An introduced population occurs on Barro Colorado Island in Panama (descended from animals purchased in a Panama City market, J. Eisenberg, pers. comm.). Protected populations also occur in one Costa Rican national park and one biological reserve (IUCN, 1982b; Fig. 6).

A single *Ateles geoffroyi panamensis* from the Greater Baton Rouge Zoo is listed in ISIS records. Several animals are reportedly maintained at the Lincoln Park Zoo, Chicago (D. Meritt, pers. comm.). Given that Panama was an exporter of primates to the U.S. (although a minor one compared to Peru and Colombia) it is likely that this subspecies is better represented in U.S. collections than is believed at present.

Ateles geoffroyi azuerensis

Vernacular name: Azuero spider monkey

As we interpret the description of the two skins seen by Kellogg and Goldman (1944), the back of this animal is grayish-brown

Table 13
Institutions exhibiting *A. g. geoffroyi*

Continent	Institution	Source(s)
North America	* Beardsley Park Zoo Bridgeport, Conn.	Photos
	* Birmingham Zoo Birmingham, Alabama	Questionnaire, IZY, photos
	* + Brookfield Zoo Chicago, Illinois	ISIS, R. Mittermeier, pers. obs.
	* + Buffalo Zoo Buffalo, New York	Questionnaire, photos
	Central Florida Zoo Sanford, Florida	ISIS
	* Dallas Zoo Dallas, Texas	Questionnaire, R. Mittermeier, pers. obs., photos
	* Dreher Park Zoo West Palm Beach, Fla.	Questionnaire, photos
	* + Erie Zoological Park Erie, Penn.	Questionnaire, photos
	* Glen Oak Zoo Peoria, Illinois	Questionnaire, photos
	* + Greater Baton Rouge Zoo Baton Rouge, Louisiana	Questionnaire, photos
	* Henry Doorly Zoo Omaha, Nebraska	R. Mittermeier, obs., photos
	* + Jacksonville Zoo Jacksonville, Fla.	Questionnaire, photos
	* Kings Island Kings Mills, Ohio	Questionnaire, photos
	Knowland Park Zoo Oakland, California	ISIS
	* + Los Angeles Zoo Los Angeles, California	ISIS, R. Mittermeier, W. Konstant, pers. obs., photos
	Micke Grove Zoo Lodi, California	ISIS
	* + Roeding Park Zoo Fresno, California	ISIS, R. Mittermeier, pers. obs., photos
	* + San Diego Wild Animal Park Escondido, California	Questionnaire, ISIS, IZY, R. Mittermeier, pers. obs., photos
	* + St. Louis Zoo St. Louis, Missouri	Questionnaire, ISIS, IZY, R. Mittermeier, pers. obs., photos
	* Seneca Park Zoo Rochester, New York	Questionnaire, photos
Europe	Kobenhavns Zoologiske Have Copenhagen, Denmark	Questionnaire, ISIS
	* Welsh Mountain Zoo North Wales, U.K.	Questionnaire, photos

Table 13 (cont.)

Australasia	*	Auckland Zoo	Questionnaire.
		Auckland, New Zealand	photos
	* +	Royal Melbourne Zoo	Questionnaire.
		Victoria, Australia	photos
	*	Taronga Zoo	Questionnaire.
		NSW, Australia	photos

Asterisks (*) indicate that identification has been confirmed.
Crosses (+) indicate the likely presence of hybrids.

in color and somewhat darker than the underside. As in *ornatus*, the outer surfaces of the limbs are black, but the top of the head and neck are either black or blackish-brown in color (Fig. 2i). The only museum specimens collected of this subspecies apparently have been lost, and there is some question as to whether it should even be considered a valid taxon.

This little known animal is reported to occur in southern Panama from the Azuero Peninsula west to the Burica Peninsula (Kellogg and Goldman, 1944). This area has undergone extensive deforestation, however, and if *A. g. azuerensis* still survives it is likely to be only on the western forested slopes of the Azuero Peninsula (J. Froehlich, pers. comm.; C. Skinner, pers. comm.).

The Terry Lou Zoo in Scotch Plains, New Jersey reports having a single *Ateles geoffroyi azuerensis* to ISIS, but we have been unable to confirm this identification.

Ateles geoffroyi grisescens

Common name: Hooded spider monkey

It appears that this subspecies is variable in coloration, hair color having been described as 'rufescent' in some specimens, 'brownish', 'rusty-colored', 'grizzled-gray', 'dusky' or 'sooty black with a gold base' in others (Kellogg and Goldman, 1944; Hernandez-Camacho and Cooper, 1976; R. Madden, unpubl.). Some museum specimens we examined were much lighter in color than any of the above terminology would indicate (Fig. 2j). The interpretation of this variability is somewhat difficult. *A. geoffroyi grisescens* is reported to occur in a border area between South and Central American faunal regions (southeastern Panama and northwestern Colombia), near where populations of the all-black

A. fusciceps robustus and red *A. geoffroyi panamensis* converge and where natural spider monkey hybrids have already been reported (Rossan and Baerg, 1977). Descriptions of *grisescens* do agree that this subspecies possesses long, lax hair.

The hooded spider monkey is not known to occur in any protected areas at this time.

The Lincoln Park Zoo, Chicago, Illinois, lists a single *Ateles geoffroyi grisescens* in ISIS records. This is presumably an animal that was collected from Darien Province, Panama. We have not yet been able to confirm its identity.

Ateles geoffroyi spp.

In addition to the Central American spider monkeys identified to the subspecific level, a large number of zoos report having "*Ateles geoffroyi* spp." in their collections, or presume to have a certain subspecies, but remain unsure (Table 14).

The Central American *Ateles geoffroyi* present a major problem for both taxonomists and collection managers. The different subspecies appear to grade into one another and it has been an almost impossible task to maintain subspecific integrity in captivity. Fortunately, this is the best represented species of spider monkeys in captivity at this time and, if captive populations can be reasonably sorted out, a sustainable breeding program should be possible. This is particularly important for *A. g. geoffroyi* from Nicaragua, which does not appear to exist in any protected areas in the wild, but which is probably the most common *A. geoffroyi* subspecies in captivity.

Further taxonomic research on this species will probably result

Table 14
Institutions exhibiting *A. geoffroyi* spp.

Continent	Institution	Source(s)
North America	Akron Zoological Park	ISIS
	Akron, Ohio	
	Audubon Park Zoo	Questionnaire
	New Orleans, Louisiana	
	Brit Spagh Zoo	Questionnaire
	Great Bend, Kansas	

Table 14 (cont.)

North America

Busch Gardens Tampa, Florida	Questionnaire, IZY
Calgary Zoo Alberta, Canada	Questionnaire, ISIS, IZY
Central Florida Zoo Sanford, Florida	ISIS
Brookfield Zoo Chicago, Illinois	ISIS, IZY
Denver Zoo Denver, Colorado	ISIS, IZY
+ El Paso Zoological Gardens El Paso, Texas	Questionnaire, ISIS, IZY
Gladys Porter Zoo Brownsville, Texas	Questionnaire, ISIS, IZY
Great Plains Zoo Sioux Falls, South Dakota	ISIS, IZY
Highland Park Zoo Pittsburgh, Pennsylvania	ISIS
Honolulu Zoo Honolulu, Hawaii	IZY
Kemper Park Zoo Hattiesburg, Mississippi	ISIS
Knowland Park Zoo Oakland, California	ISIS
Lafayette City Park Zoo Norfolk, Virginia	ISIS, IZY
Lincoln Park Zoo Chicago, Illinois	ISIS, IZY
Lion Country Safari Laguna Hills, California	IZY
Little Rock Zoo Little Rock, Arkansas	Questionnaire
Midland Zoo Midland, Texas	ISIS
Monkey Jungle Miami, Florida	Questionnaire
Montgomery Zoo Montgomery, Alabama	Questionnaire, ISIS
+ New England Regional Primate Research Center Southborough, Massachusetts	Questionnaire, IZY
Parque Zoologico Nacional Santo Domingo, Dominican Republic	IZY
+ Pittsburgh Zoo Pittsburgh, Pennsylvania	Questionnaire, IZY
Potter Park Zoo Lansing, Michigan	IZY
Riverside Park Zoo Independence, Kansas	ISIS
+ Santa Ana Zoo Santa Ana, California	Questionnaire, ISIS
+ Sedgewick County Zoo Wichita, Kansas	Questionnaire, ISIS
St. Paul's Como Zoo St. Paul, Minnesota	ISIS

Table 14 (cont.)

North America	Staten Island Zoo	Questionnaire, IZY
	Staten Island, New York	
	The Zoo of Arkansas	ISIS
	Little Rock, Arkansas	
	Toledo Zoological Garden	Questionnaire, ISIS
	Toledo, Ohio	
	Van Saun Park Zoo	Questionnaire, ISIS,
	Paramus, New Jersey	IZY
	Zoological Gardens of Puerto Rico	IZY
South America	Mayaguez, Puerto Rico	
Europe	Parque Zoologico Santa Fe	Questionnaire
	Medellin, Colombia	
	Apenheul	Questionnaire
	Apeldoorn, The Netherlands	
	+ Cotswold Wildlife Park	Questionnaire, IZY
	Burford, England	
	Kilverstone Wildlife Park	Questionnaire
	Thetford, England	
	+ Royal Zoological Society of Ireland	Questionnaire
Africa	Dublin, Ireland	
	Twycross Zoo	Questionnaire
	Twycross, England	
Asia	National Zoological Gardens of South Africa	Questionnaire
	Pretoria, South Africa	
Asia	Nagoya Higashiyama Zoo	Questionnaire, IZY
	Nagoya, Japan	
	Phoenix Zoo	IZY
	Japan	
	Yatsu Zoological and Botanical Gardens	IZY
	Japan	
	Zoo/Aquarium Negara	IZY
Australasia	Kuala Lumpur, Malaysia	
	Adelaide Zoological Gardens	IZY
	Adelaide, Australia	
	Orana Park Wildlife Reserve	Questionnaire, ISIS
	Christchurch, New Zealand	
	Perth Zoo	G. G. George, pers. comm.
	Western Australia	
	Wellington Zoological Gardens	ISIS
Australasia	Wellington, New Zealand	
	Western Plains Zoo	G. G. George, pers. comm.
	Dubbo, New South Wales	

Crosses (+) indicate the likely presence of hybrids.

in the reduction of the number of subspecies recognized, but for the time being we feel that it is best to follow the Kellogg and Goldman arrangement until further data become available.

Status Summaries

Ateles paniscus (Figs. 7,9). This species appears to be the best protected of all *Ateles* in the wild, occurring in over 20 national parks, reserves and ecological stations in 5 different countries. It is reported, however, to have been effectively hunted out in many areas of its range.

According to existing reports, *A. p. paniscus* appears to be more common in European than in North American collections. It is possible, however, that a significant number exist in North America either unidentified, misidentified or unreported. Indeed, this situation is likely to be true for all *Ateles* spp. currently in captivity. We hope that this report will help these animals surface in the data pool.

Apparently, *A. p. chamek* is slightly more common in captive collections than *A. p. paniscus*. This is to be expected, at least in North America, based upon relative numbers of black spider monkeys exported from Iquitos, Peru and Leticia, Colombia (*A. p. chamek*) versus those which were exported from the Guyanas (*A. p. paniscus*) (Mack and Mittermeier, 1984).

Since the two *A. paniscus* subspecies and *A. f. robustus* are sometimes difficult to distinguish, we would like to request help in obtaining data on key distinguishing characters. Taxonomic descriptions indicate that both *A. p. chamek* and *A. p. paniscus* can be distinguished from *A. fusciceps robustus* by a higher ratio of tail length to head and body length (Allen, 1914; Cruz Lima, 1945). If these two measurements could be taken on wild-caught captive black spider monkeys during routine veterinary examinations and sent to the attention of William Konstant, WWF-U.S. Primate Program, we will use this data to determine if tail length is indeed a useful characteristic for identification.

Ateles fusciceps (Fig. 10). This is a poorly studied spider monkey species in the wild. At the present time we know virtually nothing of the Ecuadorian subspecies, *A. f. fusciceps*, and there is good reason to believe that it is highly endangered. Its status is the subject of a Primate Action Fund field study to begin in 1985. There is no record of this subspecies in captivity at this time.

A. fusciceps robustus occurs in a small number of protected areas, but lives in an area of the Neotropics (northern Colombia and eastern Panama) that is undergoing rapid deforestation. It also appears to be scarce in captivity, though we believe there may be a larger number than presently reported, with individuals possibly being assigned to the better known *A. paniscus*. This assumption is supported by records of export from the port of Barranquilla in northern Colombia and from Panama (Cooper and Hernandez-Camacho, 1975; Green, 1977; Mack and Mittermeier, 1984).

This is one subspecies for which we have cytogenetic data from wild-caught animals with known capture localities (Benirschke, 1975). This information may aid in locating it in collections in which it is currently misidentified.

Ateles belzebuth (Figs. 8,11). The status of the three *A. belzebuth* subspecies in the wild varies from poor to critical. *A. b. belzebuth* is the most widespread geographically and is protected in a number

of parks and reserves in four different countries. *A. belzebuth hybridus*, with a more restricted distribution, is protected in several areas in both countries where it occurs. Recent reports indicate, however, that both subspecies have been effectively hunted out in large portions of their former ranges. The situation for *A. belzebuth marginatus* is even more critical. It is restricted in range to a small area in Brazil south of the Amazon and is protected only on the outskirts of one national park. Recent WWF-supported surveys within its range have failed to locate this animal (A. Johns, pers. comm.), and it should be considered highly endangered.

In relative terms, the conservation status of *A. belzebuth* in the wild appears worse than that of *A. paniscus*, and similar to that of *A. fusciceps*.

In captivity, *A. belzebuth hybridus* is reported more frequently than either of the other two *belzebuth* subspecies. The outlook for its sustained management appears promising only if international cooperative breeding programs can be established, as it is currently maintained in a small number of collections scattered around the globe. *A. b. belzebuth* has been positively identified in only a handful of collections. However, based again on export data from the Peruvian and Colombian Amazon (Soini, 1972; Mack and Mittermeier, 1984), we feel that more must exist in captivity than are currently reported. *A. belzebuth marginatus* is known to occur in very small numbers at several institutions within its native Brazil. The outlook for its sustained captive management is bleak at the present time.

Ateles geoffroyi (Fig. 12). In the wild, the Central American spider monkeys should perhaps be considered more vulnerable than the three South American species. Only 2 of the 9 recognized subspecies (*A. g. vellerosus* and *A. g. frontatus*) appear to have any degree of protection in parks and reserves. Moreover, Central American countries are likely to lose a greater proportion of their remaining rain forest cover within the next two decades than will the South America countries (USDA, 1980). Five subspecies (*A. g. pan.*, *A. g. yucatanensis*, *A. g. geoffroyi*, *A. g. azuerensis* and *A. g. griseus*) are not known to occur in any protected areas at this time.

The situation in captivity is quite different. *A. g. geoffroyi* is by far the most common spider monkey in North American zoos, although it is likely to have been hybridized to a significant degree at both the subspecific and specific levels. This is perhaps the major stumbling block in managing *A. g. geoffroyi* effectively.

Most Central American spider monkeys were imported by the United States from Nicaragua and Panama (Mack and Mittermeier, 1984), suggesting that the most common subspecies in North American zoos should probably be *A. g. geoffroyi*, *A. g. frontatus*, *A. g. ornatus*, and *A. g. panamensis* (and perhaps *A. g. griseus*). We suspect that *A. g. vellerosus* and *A. g. yucatanensis* also exist in North American collections in small numbers, but that *A. g. pan.* and *A. g. azuerensis* are extremely rare in captivity, if they exist there at all (and if they are valid subspecies).

Recommendations for Sustained Captive Management

1. Identification of Captive *Ateles*

The first step toward better captive management of *Ateles* is the proper identification of existing animals. At the present time, few collection managers and curators feel capable of distinguishing

the different spider monkey species and subspecies from one another. This review should provide zoos with information which may be used to better identify animals in their collections.

2. Maintenance of Specific and Subspecific Integrity

Whether one chooses to view *Ateles* as a genus composed of one, three or four species, it makes good sense to maintain the integrity of distinguishable populations, especially since *Ateles* is such a wide-ranging genus that is represented in a number of different biogeographical zones. At the most basic level, such maintenance involves the simple segregation of differently colored animals. The text and color guide in this article should help in making the proper distinctions and, where possible, such procedures should be supplemented by cytogenetic analyses.

3. Contribution to Genetic Research

Aside from field research and examination of museum material, the best tool we have available at the present time to clarify questions of *Ateles* taxonomy is cytogenetic analysis. Kurt Benirschke of the San Diego Zoological Society has conducted some of the preliminary work on *Ateles* in this area and is interested in continuing such research. In order to establish a genetic data base which will be useful in identifying and managing spider monkeys in captivity, blood samples are needed from wild-caught animals with known capture localities. Admittedly, such specimens are rare in captivity, but it is important to determine what differences exist among subspecies of *Ateles* in the wild before this information can be applied to identification and management of captive-born stock. Requests for cytogenetic analyses should be submitted to William Konstant, WWF-U.S. Primate Program.

4. Establishment of Cooperative Breeding Programs

At this point it appears that several *Ateles* species and subspecies could benefit from cooperative breeding programs, both on a national and international level, and from consolidation of scattered, non-breeding collections. This should follow careful analysis of collections involved to ensure that specific and/or subspecific integrity are being maintained.

5. Communication with WWF-U.S. Primate Program

Our preliminary survey of the status of *Ateles* in captivity was aimed primarily at those institutions which have reported this genus in their collections. The WWF-U.S. Primate Program will continue to function as a clearinghouse for information concerning the status of spider monkeys in captivity. We encourage institutions which responded to our initial questionnaire to provide information updates on the status of their collections. In addition, we plan to conduct a more comprehensive survey by reaching many of those institutions whose collections are not currently represented in the existing data pool. Finally, it is clear that at some point in the future an *Ateles* studbook and an *Ateles* SSP should be developed by an interested institution to ensure that captive breeding of these important animals makes a significant contribution to their conservation.

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Fig. 7: *A. p. paniscus* ready for the cooking pot in a Suriname village (photo by Mark Plotkin).



Fig. 8: *A. b. belzebuth* shot for food in Colombia (photo by Frederico Medem).



Fig. 9: Juvenile Peruvian black spider monkey (*A. paniscus chamek*) from Amazonia. Photographed at hotel in Puerto Maldonado, Madre de Dios, where it was being kept as a pet (photo by Andy Young).



Fig. 10: Colombian black spider monkey (*A. fusciceps robustus*) at Zoologico Santa Cruz, outside Bogota, Colombia (photo by R. A. Mittermeier).



Fig. 11: Juvenile white-bellied spider monkey (*A. b. belzebuth*) from the Dept. of Amazonas, Peru (photo by R. A. Mittermeier).



Fig. 12: Panamanian spider monkey (*A. geoffroyi panamensis*) mother and infant on Barro Colorado Island, Panama (photo by R. A. Mittermeier).

APPENDIX

New Members of the IUCN/SSC Primate Specialist Group

The following members have been added to the group since the appearance of the last issue of the Newsletter.

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BACK COVER: The first two golden monkeys (*Rhinopithecus roxellanae roxellanae*) ever exhibited in the U.S., now on loan to the San Diego Zoo. On the left is Min-Min, a 10 year old male; on the right, Rong-Rong, a four year old female. Both are wild caught. (Photo courtesy of the Zoological Society of San Diego).